December 2014

ENVIRONMENTAL ASSESSMENT OF THE PROPOSED CAPITAL REGION RESOURCE RECOVERY CENTRE

VOLUME I

EXECUTIVE SUMMARY

Introduction

This report documents the Environmental Assessment (EA) of a new proposed integrated waste management facility, known as the Capital Region Resource Recovery Centre (CRRRC), which is proposed to be located in the east end of Ottawa. The purpose of the proposed CRRRC is to provide facilities and capacity for recovery of resources and diversion of materials from disposal for solid non-hazardous wastes that are generated by the Industrial, Commercial and Institutional (IC&I) and Construction and Demolition (C&D) sectors. The facility would primarily serve Ottawa, although the proposed service area extends to portions of eastern Ontario. Since it is currently not (and may never be) technically or economically possible to divert all materials from disposal, the CRRRC would also provide landfill disposal capacity on the same Site for post-diversion residuals and materials that are not diverted. Taggart Miller Environmental Services (Taggart Miller), a joint venture of Taggart Investments Inc. and Miller Waste Systems Inc., is the proponent for the proposed CRRRC.

The Province of Ontario and the City of Ottawa have clearly stated objectives to significantly increase the diversion of IC&I and C&D waste materials from disposal. Current diversion rates are considerably below City and provincial targets. Taggart Miller believes it can make a contribution towards achieving these objectives by developing and operating a new integrated waste management facility.

Two potential sites were considered for development of the proposed CRRRC.

One site - the North Russell Road Site - is located in the northwest part of the Township of Russell about three kilometres east of the boundary with the City of Ottawa, about five kilometres south of Provincial Highway 417 between the Boundary Road and Vars exits, and approximately three kilometres north of the Village of Russell boundary, and approximately four kilometres north of the centre of the Village of Russell.

The second site - the Boundary Road Site - is located in the east part of the City of Ottawa just southeast of the Highway 417/Boundary Road interchange. The property is located on the east side of Boundary Road, north of Devine Road and west of Frontier Road, and east of an existing industrial park on Lots 22 to 25, Concession XI, Township of Cumberland.

The proposed CRRRC requires approval under the *Environmental Assessment Act* (EAA), the *Environmental Protection Act* (EPA) and the *Ontario Water Resources Act* (OWRA). The applications for approval under the EPA and OWRA will be combined into an application for an Environmental Compliance Approval (ECA). Taggart Miller is submitting the documentation to support EA approval and EPA/OWRA applications jointly in one package. The application forms for the EPA/OWRA approvals will, however, only be submitted once EAA approval is received.

Methodology

The environmental assessment was carried out in accordance with the Terms of Reference (TOR), which was approved on December 17, 2012. The approach was generally to complete the EA studies using an EPA/OWRA level of detail where appropriate.

The first step in the process was to undertake a comparative evaluation of the two alternative Sites and identify a preferred Site for the project. Existing conditions were determined and described through published information and preliminary investigations/assessments on and in the vicinity of each of the Sites. The alternative Sites were then compared using the components, criteria, indicators and data sources presented in the approved TOR. Following identification of a preferred Site, the EA studies and EPA/OWRA studies were completed for that Site in three phases, as follows:

- Phase 1 was the completion of EA level assessments (using EPA level of detail where appropriate);
- Phase 2 was completion of any remaining EPA level work; and
- Phase 3 was completion of the EA application and documentation package, including the supporting EPA/OWRA level information.

The methodology used for the environmental assessment is described in Section 2.0 of this Environmental Assessment Study Report (EASR).

Consultation

Consultation with the public, agencies, Aboriginal communities and other stakeholders was ongoing throughout the EA process. A variety of consultation events and activities were used during the EA process. The consultation program for the EA was presented in the approved TOR. Public consultation sessions as well as notifications and website postings were hosted in both English and French. A groundwater workshop was conducted in English with French available if requested.

An overview of the consultation program methods and activities used during the EA study process are listed below:

- Letters and email correspondence distributed to the public (including those who requested to be on the project mailing list), government officials, Government Review Team (GRT) agencies and Aboriginal communities;
- Notices published in local newspapers;
- Project website (www.crrrc.ca) containing information on the EA process and public consultation activities;
- Four open houses in the community;
- A workshop on groundwater;
- Meetings with smaller groups;
- Meetings and liaison with interested Aboriginal communities;
- Meetings, site visits and telephone calls between Taggart Miller, the EA consultant and the Ministry of Environment and Climate Change (MOECC);
- Informal meetings, telephone calls and discussions with various stakeholders throughout the EA development; and
- The draft EA was made available for GRT and public comment prior to finalization and submission to the MOECC. The draft main EA document (excluding the technical appendices) was made available in both French and English, as will be the final main EA document. There was a seven week review period provided for the draft EA.

Responses to comments received during the EA process are provided in Volume II – Consultation Record and in Section 3.0 of the EASR.

Rationale for the Proposed CRRRC

Taggart Miller undertook an analysis to understand whether there was an opportunity to provide waste management services focused on improving resource recovery of IC&I and C&D wastes in the Capital Region and eastern Ontario. The analysis considered current market conditions and how these conditions might affect the opportunity. The study looked at established provincial and municipal programs, goals and policies, and identified existing facilities. It also considered factors affecting current and likely future diversion rates for IC&I and C&D waste materials. The analysis was presented in support of the approved TOR. A brief overview is provided in Section 4.0 of the EASR.

Taggart Miller then undertook an assessment to quantify and better understand the opportunity to provide these services to the IC&I and C&D sectors.

Based on the diversion rates available at the time of the TOR development and the indicated population growth, the quantity of IC&I and C&D material requiring management over the analysis/planning period was estimated to be approximately 1,000,000 tonnes per year using 2010 as the base year, increasing gradually to approximately 1,500,000 tonnes in 2046. The assessment showed that in the absence of increased diversion capacity/rates and/or additional approved disposal capacity, there could be an IC&I and C&D waste management capacity deficit in the proposed service area of anywhere from 350,000 tonnes per year to 1,250,000 tonnes per year in the 30 year planning period used for the CRRRC. Taggart Miller also noted that diversion rates for IC&I and C&D waste in the proposed service area (and the province generally) are only about 20% of current targets.

Based on this assessment Tagger Miller concluded that there is a clear opportunity and need for IC&I and C&D waste management services in the Capital Region and eastern Ontario over the planning period.

Since development of the TOR for this EA, both updating of provincial goals and policies and the Statistics Canada 2013 waste management surveys continue to reinforce the need for increased diversion of IC&I and C&D wastes from disposal. In June of 2013 the Minister of the Environment and Climate Change introduced Bill 91, the *Waste Reduction Act* – "…as a way forward to break Ontario's recycling logjam, boost diversion rates and establish a system that encourages the private sector to invest in more recycling and jobs in our province." (Minister of the Environment, 2013). Also, in 2013 Statistics Canada released the most recent waste management industry survey, which indicated that while IC&I and C&D waste in Ontario remains at about 65% of the waste generated in the province, it still only has a diversion rate of 12% (Statistics Canada, 2013a).

Assessment of Alternatives to the Proposed CRRRC

After concluding that there was a clear opportunity to provide waste management services to the IC&I and C&D sectors in eastern Ontario, Taggart Miller conducted an assessment to determine the best way to respond to this opportunity. In EA terms this is referred to as "Alternatives To" the proposed CRRRC. The assessment of Alternatives To was documented in support of the approved TOR. A brief overview is provided in Section 5.0 of the EASR.

Based on the results of the screening assessment completed during the TOR, Taggart Miller concluded that the establishment of diversion facilities on a Taggart Miller Site and management of residuals disposal by means of a landfill on the same Site - was the only reasonable and economically feasible alternative for Taggart Miller to pursue.

Conceptual Level Description of the Proposed CRRRC

Taggart Miller is proposing the following diversion facilities/operations for the CRRRC:

- Materials Recovery Facility (MRF);
- C&D processing;
- Organics processing;
- Petroleum hydrocarbon (PHC) contaminated soil treatment;
- Surplus soil management;
- Drop-off for separated materials or for separation of materials; and
- Leaf and yard materials composting (if there is enough material available).

There would also be a landfill for disposal of residuals and material not diverted.

A high level, conceptual description of each facility and associated activities was prepared as provided in Section 6.0 of the EASR, to complete the comparative evaluation of the two alternative Sites.

The EA provides in Sections 10.5 and 10.9 amending procedures should, respectively, the described organics processing system or preferred leachate management option not be viable.

Site Selection

The first step in the EA was a comparative evaluation of the two alternative Sites, the North Russell Road Site and the Boundary Road Site, to identify the preferred Site for the CRRRC. The evaluation was carried out using the methodology in the approved TOR and described in Section 2.0 of the EASR. The comparison considered nine environmental components, each having indicators and a set of data sources to be used to consider the potential effects of the CRRRC on the associated environment, in accordance with the approved TOR. The detailed assessment for each component is provided in Technical Supporting Document #1 (TSD #1) to the EASR and the results are summarized in Section 7.0 of the EASR.

During the first and second Open Houses associated with development of the TOR, proposed components and criteria to assess potential effects of alternative ways that the project could be implemented were presented and the public was invited to provide input and rank their relative importance. In addition, input was received from the public throughout the TOR process as described in the TOR.

The following table lists each component, grouped by their ranking of relative importance based on the input received, and the results of the comparative assessment of the alternative Sites.

Results of Comparison of Alternative Sites

Component	Preferred Site
Most Important	
Atmospheric	Boundary Road Site
Geology, Hydrogeology & Geotechnical	Boundary Road Site
Land Use & Socio-economic	Boundary Road Site
Traffic	Boundary Road Site
Important	
Surface Water	Boundary Road Site
Biology	Boundary Road Site
Agriculture	Boundary Road Site
Design & Operations	Boundary Road Site
Less Important	
Cultural & Heritage Resources	Boundary Road Site

The assessment clearly indicated that the Boundary Road Site is preferred for all nine of the environmental components used in the comparative evaluation. The Boundary Road Site was therefore identified as the preferred Site for the CRRRC. The remainder of the EA identified the preferred Site development concept at the Boundary Road Site and proceeded to complete the assessments to predict and assess the effects of the proposed CRRRC at the Boundary Road Site.

Description of the Environment Potentially Affected

Section 8.0 of the EASR provides a description of the components of the natural and human environments considered in the EA evaluation of the Boundary Road Site. Additional details are provided in TSD #2 through #9, and in sections of the Volume III and Volume IV reports.

In accordance with the approved TOR, the environmental components considered were: Atmosphere; Geology, Hydrogeology & Geotechnical; Surface Water; Biology; Land Use and Socio-economic; Cultural and Heritage Resources; Agriculture; and Traffic.

Identification of Preferred Site Development Concept

Alternative Site development concepts are different ways that the CRRRC, i.e., the diversion facilities, the landfill and other project components, can be implemented on the Boundary Road Site. The potential Site layout needs to consider the Site access location and general Site operational requirements, provide the land area required for each of these components, and take into account any physical or other constraints. The landfill component will require sufficient airspace volume so that disposal capacity is available for the residuals from the diversion facilities and other materials that are not diverted for the 30 year planning period.

In order to prepare the Site development concepts, the potential requirements for the diversion and landfill components were quantified at a greater level of detail. This required estimates of maximum annual tonnage to be received at the CRRRC, composition of the waste components and the corresponding size/processing capacity of each of the diversion facilities/processes and their estimated range of achievable diversion, and the resultant landfill airspace volume requirement.

The IC&I and C&D waste stream varies by generator and over time, and in the absence of enforced diversion regulations every business owner makes their own decision about diversion, what they send to disposal vs. diversion, and what waste management company/site they choose to contract with to fulfill their individual waste management needs. The types and quantities of the various materials the CRRRC will receive will depend on these and other factors, as will the corresponding diversion that can be achieved at the CRRRC over time and the required disposal capacity and rate at which that capacity is consumed. In order to conceptually plan the size and capacity of the various CRRRC components, it was necessary for Taggart Miller to make some assumptions using the estimated size and composition of the IC&I and C&D waste streams. Similarly, based on experience with other existing diversion facilities and end markets, the potential diversion rates for the various materials over time at the CRRRC can be estimated.

For a waste management facility such as this with an eastern Ontario service area, it was assumed that the waste and soil received could be up to 450,000 tonnes per year, which represents less than half of the predicted IC&I and C&D waste stream in the service area (aside from soil) that will need to be managed after about 2027. As described in the TOR, the projected waste deficit to be managed (diverted or disposed) in this service area is 350,000 tonnes per year to 1,250,000 tonnes per year in the period between 2016 and 2046. Even with the addition of the Ottawa (Carp Road) Landfill expansion, after approximately 2025 at current rates of consumption most or all of the currently approved IC&I and C&D waste disposal capacity in the service area will be exhausted.

Based on the typical composition of the waste material anticipated to be received at the CRRRC, an analysis was completed for the 30 year planning period. The results of this analysis provided an overall target ultimate diversion rate for the CRRRC and a range around the overall target value, as well as the corresponding tonnage range of material potentially requiring landfill disposal. From this, the landfill airspace volume required to support the diversion facilities over a 30 year planning period was determined. The results of the analysis are as shown in the following table:

Anticipated Ultimate Overall Diversion Rate		
	Target	**Anticipated Range**
Overall (30 years)	49%	43 – 57%
Overall (over 30 years, excluding soils)	40%	34 – 50%

The total tonnage received over a 30 year period is anticipated to range from just over 10 million tonnes at the lower end of the range to about 13 million tonnes at the higher end of the range. Using a typical method to convert tonnes of material requiring disposal to landfill airspace volume, for a 30 year planning period the analysis shows that the landfill component of the CRRRC could require approximately 9.4 to 10.7 million cubic metres of disposal capacity for materials that are not diverted. During this operating period, the CRRRC is projected to divert roughly a similar volume of material from landfill based on the target diversion ranges in the table above.

The preparation of alternative Site development concepts involved the arrangement on the property of all the diversion/ancillary components and the landfill component in ways that are functional in terms of Site operations.

For the landfill component, preparation of the alternative concepts incorporated the requirements of the Ontario Regulation (O. Reg.) 232/98 Landfill Standards, as well as Site-specific requirements including the characteristics of the thick clay deposit that underlies the Boundary Road Site. This and other factors result in a landfill with gradually sloping sides and a relatively low maximum height.

Two alternative Site development concepts for the CRRRC, Concept A and Concept B, were initially prepared by Taggart Miller and presented to the public at Open House #4 on June 5, 2013. For both Alternative Concepts A and B, the proposed main Site access is from Boundary Road near the north end of the Site, minimizing the travel distance along Boundary Road from Highway 417 to the Site access location. Appropriate roadway modifications would be made along the sections of Boundary Road approaching the access location and at the access location, based on the results of the traffic impact assessment and in accordance with City of Ottawa road design requirements. For Concept A the secondary Site access would be onto Frontier Road, while for Concept B the secondary access would be onto Devine Road. The two alternative Site development concepts are shown in Section 9.3 of the EASR.

Alternative Concept A has all administration, small load drop-off, IC&I and C&D recycling and organics diversion and processing facilities, soil management and associated Site operational components in the northern part of the property, to the north of the Simpson Drain. The proposed landfill component would occupy a single footprint in the southern part of the property, leaving a 100 metre wide buffer between the landfill and the property boundary.

Alternative Concept B has administration, small load drop-off and IC&I and C&D recycling in the northwest part of the property. Organics processing, soil management and other Site operational components would be located in the southwest part of the property. The proposed landfill component would have two separate footprints, a smaller one in the northeast part and a larger one in the southeast/south central parts of the property, again with a 100 metre wide buffer between the landfill and the property boundary.

The table below presents the characteristics of the conceptual design of the landfill component for each concept.

Landfill Component Conceptual Design Characteristics

Characteristic	Concept A	Concept B
Depth of excavation below ground	1 metre average	1 metre average
Perimeter berm	3 to 3.5 metres high, 35 metre top width	3 to 3.5 metres high, 35 metre top width
Landfill sideslopes	14H:1V up to about 12 to 13 metre height; 20H:1V top slope portion	14H:1V up to about 12 to 13 metre height; 20H:1V top slope portion
Maximum height above ground at peak	25 metres	North Mound - 20 metres South Mound - 25 metres
Total footprint area	90 hectares	93 hectares
Maximum airspace volume	11.5 million cubic metres	10.5 million cubic metres
Soil excavation volume	Approximately 900,000 cubic metres*	Approximately 930,000 cubic metres*
Daily cover	Imported material	Imported material

Note: * The excavated material is expected to be consumed in the construction of the landfill perimeter berms.

Input on which Site development concept was preferred was sought in several ways: 1) from the public at Open House #4; 2) by posting the two concepts on the CRRRC website; 3) through presentation of the two concepts to MOECC technical reviewers; and 4) through discussion with the Algonquins of Ontario and requests sent to other Aboriginal groups.

During discussions with members of the public at Open House #4, no attendees indicated a preference for Alternative B; feedback was only received in favour of Alternative A. Subsequent to Open House #4, the two alternatives were provided to and discussed with representatives of the MOECC; the MOECC preferred Concept A as it does not have the landfill split into two separate cells and because of the placement of the landfill footprint relative to the direction of groundwater flow (from a groundwater protection perspective). No comments on the preferred alternative were received in response to the CRRRC website posting. The concepts were also provided for comment to representatives of the Algonquins of Ontario and a meeting subsequently held to discuss them; there was no preference for one concept over the other.

Since all components of the proposed CRRRC must be designed to meet MOECC standards at the property boundary, the primary factor considered by Taggart Miller to identify the preferred concept was compatibility of proposed Site operations with neighbouring land uses; optimization of Site operations was also considered as a secondary factor.

Considering these factors, Taggart Miller identified Alternative Concept A as the preferred Site development concept for the CRRRC.

Detailed Description of Proposed CRRRC

The preferred Site development concept was refined in further detail in Section 10.0 of the EASR. Specifically, geotechnical requirements such as the need to provide stability berms and the stormwater management features were added to the design. Additional details on how each component of the CRRRC would work, including Site operational flow charts, were developed. The refined description of the proposed CRRRC presented in Section 10.0 was used as the basis for the assessment of potential impacts from the CRRRC (Section 11.0 of the EASR and TSD #2 to #9) and for evaluation of alternative leachate management options (Section 12.0 of the EASR and TSD #10).

Prediction and Assessment of Potential Effects

Section 11.0 of the EASR presents an overview of the predicted effects of the proposed CRRRC on each of the environmental components. The detailed results are provided in TSD #2 to #9 and in sections of Volumes III and IV. The assessment was undertaken in accordance with the approved TOR.

Atmosphere

The details of the noise assessment are provided in TSD #2. As required by the MOECC, the assessment evaluated noise associated with landfilling operations and ancillary facilities (i.e., stationary noise sources), as well as noise associated with off-Site truck traffic along the haul route to the Site from Highway 417. The noise assessment was carried out at the most sensitive points of reception (PORs) identified within the Site-vicinity.

The predicted noise levels associated with landfill operations and ancillary facilities are compliant with the relevant MOECC noise guidelines. The maximum predicted change in noise levels along the off-Site haul route based on the expected truck traffic is classified as 'noticeable' for residential receptors along Boundary Road and 'insignificant' elsewhere in the Site-vicinity, within MOECC standards for acceptable changes in noise level.

The details of the air quality and odour assessment are provided in TSD #3. The methodology for assessing potential effects to air quality and odour resulting from the proposed CRRRC followed accepted MOECC practices and involved three steps:

1) Calculating representative emission rates;

2) Dispersion modelling to predict resulting concentrations of indicator compounds in the environment; and

3) Comparison of predicted concentrations to MOECC standards and guidelines.

In addition to assessing air quality and odour effects of the proposed CRRRC, the potential greenhouse gas (GHG) effects were also assessed. In addition, a comparative life cycle assessment of the proposed CRRRC project was carried out, which compares the diversion from landfill of a portion of the incoming waste to landfilling all of the waste. The model used for the assessment was the Greenhouse Gases (GHG) Calculator created by Environment Canada, and its supporting technical document prepared by ICF Consulting. For the present analysis, landfilling of all the IC&I waste received was compared to two levels of diversion: the low and high ends of the target range in Table 9.1-1. At the lower diversion rates for all materials, the aggregate GHG reduction (compared to landfill alone) was found to be 29,000 tonnes CO2eq. per 100,000 tonnes of waste received and, at the higher diversion rates, 66,000 tonnes CO2eq. per 100,000 tonnes of waste received. Based on the assumed receipt of a maximum of 450,000 tonnes of all waste/soils at the CRRRC in a given year, once operating at capacity, this equates to an annual GHG emission reduction of between 113,000 tonnes and 257,000 tonnes CO2eq, compared to straight landfilling of these same wastes.

In determining the predicted air emissions associated with the CRRRC works and activities, consideration was given to those mitigation measures integral to the design and implementation of the works and activities.

The MOECC has point-of-impingement (POI) air quality criteria for various compounds. The MOECC POI criteria are used to assess specific impacts of an individual facility.

All of the predicted maximum POI concentrations meet the relevant standards. The CRRRC regulated sources would include LFG, combustion processes and materials handling emissions. Mobile equipment was conservatively included in the assessment of POI compliance, even though such equipment is not considered for ECA permitting purposes under O. Reg. 419/05.

Geology, Hydrogeology & Geotechnical

The details of the Geology, Hydrogeology & Geotechnical assessment are provided in the Volume III report. The CRRRC Site is underlain by approximately 32 metres to 40 metres of soil, representing one of the thicker areas of soil deposits within the area. Much of the area is underlain by deposits of offshore marine silts and clays associated with the former Champlain Sea. These marine deposits are underlain by glacial till deposits situated above the bedrock. Most boreholes drilled on-Site encountered a 1 metre to 2 metre thick veneer of silty sand at surface overlying marine silty clay, while a few boreholes encountered the upper weathered zone of the underlying marine silty clay at surface. The silty clay is the dominant soil deposit, about 30 metres thick, overlying a comparatively thin (varying between 4 metres to 8 metres thick) glacial till layer above the bedrock. An apparent continuous but thin (0.1 metre to 0.65 metre), near flat lying layer of sandy silt to silty sand, trace clay (referred to as the silty layer) was encountered at a consistent depth of approximately 4 metres to 6 metres below ground surface. Beneath the glacial till, bedrock consisting of limestone and shale of the Carlsbad Formation was encountered. The groundwater level is close to ground surface and the local and regional direction of groundwater flow is eastward. The estimated groundwater flow velocity is very slow, i.e., in the surficial silty sand up to about 1 metre per year, to about 10 millimetres per year in the silty layer and even slower in the silty clay.

Geological: The assessment of potential geological impacts was based on interpretation of the geological setting of the area; the main aspects assessed were the evidence of and potential for movement along bedrock faults in the regional area within which the CRRRC Site is located; the potential for fault rupture at the CRRRC Site; and the potential for subsurface settlement from earthquake ground shaking (liquefaction).

Review of published geologic and seismic information for the region surrounding Ottawa-Gatineau carried out as part of the CRRRC studies found no evidence that mapped bedrock faults have ruptured to the ground surface since the retreat of glacial ice and the Champlain Sea from the Ottawa Valley. This conclusion does not preclude the possibility that vertical and/or horizontal fault movements have occurred in the region but are as yet undetected. Based on available information, however, there is no indication of surface ruptures from historical earthquakes at the proposed CRRRC Site or its immediate vicinity. Joints and faults within the Ottawa-Bonnechere Graben, within which the Site is located, often contain calcite, indicating that they have been cemented after the formation of the basement rocks. The presence of calcite within most of the fault planes and their 40 to 65 million years ago and older crystallization ages suggests that there has been no Quaternary movement (including during the past 11,700 years) along calcite-bearing faults and joints in the bedrock surrounding and probably beneath the CRRRC Site.

Fault rupture at the ground surface is a potential geological hazard because the surface fault rupture causes localized differential displacements that can adversely affect engineered structures and facilities. To identify the potential for fault rupture at the ground surface of a site, the important faults are those that are accumulating strain in the present-day tectonic strain field. Empirical studies indicate that only the larger faults generate displacements at the ground surface and it is these larger faults that can present a significant hazard to engineered structures. Considering the regional, local and Site geological conditions within the CRRRC Site and surrounding area, and the nature of “active” faults, it was concluded that the probability of future fault movement resulting in large differential displacements at the surface or shallow subsurface is negligible.

The Geological Survey of Canada has studied the effects of possible large prehistoric (Holocene) earthquakes on the marine clay deposits in eastern Ontario. Published information on this topic was reviewed and integrated with Site-specific investigation of the clay deposit that underlies the CRRRC Site. The purpose of the review was to assess if the clay deposit beneath or in the area of the Site is likely to have been disturbed by earthquake shaking in eastern Ontario. Based on available regional and Site-specific information, it was concluded that although the possibility of smaller-scale deformation cannot be precluded, there is no evidence of deformation or displacement at the CRRRC Site. Differential settlement associated with strong earthquake shaking (liquefaction) is therefore not considered to be a hazard at the CRRRC Site.

Hydrogeological: Because of the naturally poor water quality at depth beneath and in the area of the Site, water supply is generally provided by means of shallow dug wells that obtain their water primarily from the surficial silty sand layer. The potential impacts of the CRRRC on off-Site groundwater quantity and off-Site groundwater quality were assessed quantitatively. These assessments were carried out using standard groundwater flow and groundwater contaminant modelling.

The groundwater quantity assessment used a regional groundwater flow model to study the potential for the Site development to affect (lower) off-Site groundwater levels and thereby affect water supply in the area around the Site that utilizes shallow dug wells or affect baseflow to off-Site surface water features. The simulated groundwater level drawdown does not extend beyond the property boundary for any of the scenarios modelled and therefore the CRRRC is not predicted to have any impact on groundwater quantity (and off-Site dug well supply) outside of the property boundary.

Modelling of long term groundwater quality impacts from leachate for new or expanding landfill sites is required under O. Reg. 232/98 (MOE, 1998a). Typically, the modelling is conducted to demonstrate that the proposed design will meet the requirements of the MOECC Reasonable Use Guideline B-7. All modelled leachate parameter results in the silty layer were negligible (i.e., the impact of the landfill is not measurable in the silty layer). Considering the proposed design and operation of the other components of the CRRRC, the landfill and the overall Site is predicted to meet the MOECC Reasonable Use Performance Objective (RUPO) and not result in adverse effects on off-Site groundwater quality.

Geotechnical: The results of stability analyses (under both static and seismic loading conditions) and settlement analyses were used as the basis for the design of the landfill component of the CRRRC. The static stability analyses indicated that the landfill should be designed with a 3.5 metre high perimeter berm around the landfill with a 36 metre top width; flat sideslopes of 14 horizontal to 1 vertical to 20 horizontal to 1 vertical; and specific setbacks and sideslope inclinations for various facilities adjacent to the landfill (and for excavated features such as ponds elsewhere on the Site). The result is a landfill shape that is relatively flat and lower when compared with many other landfills.

Dynamic (seismic) stability analyses were also carried out to assess the seismic stability of the proposed landfill configuration when subjected to strong earthquake shaking, as well as estimate the associated movements of the waste and underlying clay soils. The analysis considered the Site-specific subsurface conditions, i.e., thick clay soil deposit, and design earthquakes having a return period of 1:2,475 years, consistent with the design shaking set out in the Building Code of Canada; this is also consistent with design guidelines established for solid waste landfills in the United States. The computed seismic loading-induced lateral movements of the landfill for all of the analyzed time histories are less than 350 millimetres. The calculated earthquake-induced deformations of the landfill are the result of deformations occurring in the upper clay layers directly below the landfill. These results are indicative of a stable landfill under the design seismic loading conditions.

The development of the landfill (i.e., the placement of up to 25 metres of waste) will induce time-dependant consolidation of the underlying clay soil deposit. Due to the low hydraulic conductivity of the silty clay, the settlements will be time-dependant in nature and will occur over many years/decades. The results of the analyses indicate that, under the highest portions of the landfill, the settlements resulting from primary consolidation and secondary compression of the deposit are expected to be in the order of 6 to 8 metres, by about 100 years from the start of consolidation. The analyses were used to evaluate the potential differential settlements of the subgrade (and leachate collection system) beneath different points in the landfill footprint and to design the leachate collection system and assess its expected performance.

In terms of the engineering significance or potential effects of surface or subsurface displacements from potential future fault movement on the design and performance of the proposed CRRRC landfill, both the landfill mass itself and the proposed leachate containment and collection system (and its components), are very capable of withstanding significant differential displacements. There is no constructed or manufactured liner system at the base of the landfill as designed; rather, the containment of landfill leachate relies on the natural containment properties of the 30 metres of low permeability silty clay underlying the Site. The proposed leachate containment and collection system has been designed to withstand relatively large differential movements and continue to perform its intended function. For example, this containment and collection system has been designed to function when experiencing the predicted movements associated with long term consolidation of the clay deposit beneath the landfill, i.e., total settlements of 6 to 8 metres under the central portion of the landfill. The containment and collection system has also been designed to accommodate lateral displacements of up to 350 mm under seismic loading conditions. In addition, the groundwater analyses show that even if there was an early failure of the leachate collection system, then the thickness and low hydraulic conductivity of the natural silty clay deposit would provide the required off-Site groundwater protection. As such, the effects of surface or subsurface displacements from local fault movement, in the very unlikely event that it occurs during the contaminating lifespan of the landfill, are inconsequential for engineering design or performance of the landfill component of the CRRRC.

Surface Water

The surface water assessment is provided in the Volume IV D&O Report. The aspects of surface water examined in the assessment are surface water quantity and surface water quality. The post-development model results were compared to the pre-development results, with consideration of proposed mitigation systems.

The proposed stormwater management system was designed to meet the requirements of O. Reg. 232/98. The proposed system uses the same three discharge locations that serve the Site in its pre-development condition, and consists of a series of ditches and linear ponds to provide conveyance and storage and to control post-development discharge after storm events, and to provide an Enhanced (MOECC) Level of treatment in terms of total suspended solids (TSS) removal.

The following conclusions were reached for the surface water assessment:

- The total Site drainage area is not expected to change, although the drainage area boundaries within each of the three on-Site sub-catchments will be shifted to provide stormwater management for the proposed Site development. The sub-catchment area contributing to the Regimbald Municipal Drain will increase somewhat, as will the area contributing to the Simpson Drain, while that associated with the Wilson-Johnston Drain will decrease;
- Under the post-development scenario, the increase in respective impervious land use and average slopes for the sub-catchment areas is expected to result in a decrease in annual infiltration and a corresponding increase in annual runoff for the overall Site;

- The proposed stormwater management ponds are sized to meet storage volume requirements to manage peak flows from design storms without flooding, and the detention and controlled release will mitigate the shifting of post-development on-Site sub-catchment areas; and
- The proposed works are predicted to result in water quality conditions that are comparable to existing conditions and meet MOECC Provincial Water Quality Objectives (PWQO). Post-closure, the ponds will continue to operate resulting in minimal changes to water quality and no adverse downstream effects.

Biology

Overall the Site is characterized by a mix of thickets, immature deciduous forests, swamps, agricultural fields and disturbed areas. Potential adverse effects of the project on the aquatic and terrestrial environment were identified. Effects from the CRRRC project may occur either directly or indirectly. The detailed biological assessment is presented in TSD #4.

The results of assessments of potential direct effects were:

- Vegetation communities: All vegetation species to be removed on the Site are common to the Site-vicinity and widespread in the area. There will be no vegetation removal outside of the Site related to the CRRRC. The loss of the non-native dominated vegetation communities on the Site is not considered to be ecologically important from a vegetation perspective.
- Wildlife habitat: The wildlife habitat on the Site is considered disturbed and fragmented. Barn swallow, listed Threatened under the *Ontario Endangered Species Act* (ESA), was observed nesting on the Site. In order to remove the on-Site habitat, authorization will be sought from the Ministry of Natural Resources and Forestry through a notice of activity under O. Reg. 323/13. A mitigation and restoration record will be prepared and new barn swallow habitat will be created within 1 kilometre of the Site and monitored for three years. Following the creation of the new habitat, it is expected that there will be no net residual impact on barn swallow or barn swallow habitat as a result of CRRRC. As such, there will be no adverse effects to local populations of species and the loss of wildlife habitat on the Site is not considered to be ecologically important.
- Migratory bird habitat: The *Migratory Birds Convention Act* prohibits the destruction of migratory bird nests (passerine, waterfowl and raptor) during the breeding season, which in Ontario extends from approximately May 1 to July 31. Where possible, vegetation removal will be scheduled outside the migratory bird breeding season. If it is not possible to complete the clearing outside this window, a biologist will conduct nest searches no more than 24 hours prior to the construction activities to avoid destruction of migratory bird nests.
- Fish habitat: The Simpson Drain on the Site will be maintained in its existing condition (with removal of the existing beaver dam to avoid obstruction of flow through the Drain) throughout the construction and operation of the project, and there will be no direct loss of fish habitat in this surface water feature.
- Construction will require the complete removal of existing ditches in the north, south and west parts of the Site. The fish habitat in the north ditch is marginal and of poor quality, and removal of this feature will not result in direct loss of fish habitat on the Site. The south ditch is not considered fish habitat and removal of this feature will not result in a direct loss of fish habitat on the Site.

- The ditch in the west part of the Site is a constructed feature that is isolated from all other surface water features in the Site-vicinity. Although it is characterized by poor quality aquatic habitat, it contains a fish community and is considered direct fish habitat. Because this ditch will be removed during the construction of the project, and the direct loss of fish habitat in this ditch cannot be mitigated, the CRRRC project will have an adverse effect on the fish habitat in this feature. Prior to any construction on the property, the fish will be salvaged and relocated to a nearby surface water feature. By removing and relocating the fish to a nearby feature with a similar fish community and habitat structure, it is expected that there will be no adverse impacts to the fish community.
- Wildlife Vehicle Collisions: The construction and operation of CRRRC will result in an increase in the volume of vehicle traffic in the Site-vicinity, with the majority of Site-related traffic along the 800 metre long section of Boundary Road (an arterial road) between Highway 417 and the Site entrance location. The potential for vehicle collisions with wildlife may increase, however the incremental increase in the number of wildlife-vehicle collisions associated with the CRRRC is expected to be negligible relative to baseline conditions. The Site is isolated from other wildlife habitats by active roads, including Boundary Road, Frontier Road, Devine Road and Highway 417.

The results of assessments of potential indirect effects were:

- Habitat Fragmentation/Changes to Wildlife Movement Corridors: The lands to the east are in open agricultural use (crops), and the Site is bounded by a 400 series divided highway (Highway 417) to the north and an industrial park and Boundary Road to the west. The NCC has hypothesized the existence of a wildlife movement corridor from the Cumberland Forest through the Vars Forest, across Highway 417 and then to the west of Boundary Road, based on their high level assessment. This hypothesized corridor is fragmented by Highway 417 in its northeast and Boundary Road to the west/northwest, which would significantly limit wildlife movement between the Vars and Cumberland Forests and anything to the south of that four lane divided highway. To the extent there may be wildlife movement across Highway 417, the vegetation to the south of Devine Road would provide a continued movement corridor to the area west of Boundary Road. Based on the data collected during the field surveys on the Site, there were no signs of an existing wildlife movement corridor on the Site such as heavily used game trails or high numbers of wildlife. The wildlife habitat in the Site-vicinity is patchy, disturbed and fragmented. All of the wildlife species identified on the Site are habitat generalists, habituated to the disturbed, fragmented landscape and are mobile species. It is expected that because of the current fragmented landscape, the construction and operation of the project will not affect the overall movement of wildlife between habitats to any material degree. The fragmentation of habitats or any changes to wildlife movement corridors in the Site-vicinity are not considered to be ecologically important adverse effects.
- Air Emissions: Wildlife in the Site-vicinity may potentially be exposed to airborne chemicals through air emissions from CRRRC. All air constituents generated by CRRRC will meet MOECC guidelines/standards at the property boundary. MOECC standards generally consider both human and ecological risk.
- Dust Deposition: Dust deposition in surface water has the potential to alter surface water chemistry and increase the sediment load in receiving surface water features. Dust can also affect vegetation. With the implementation of mitigation measures and best management practices the amount of airborne dust will be minimized. The results of the air quality modelling predicted that the total suspended particulate air concentrations within the Site-vicinity, as a result of the project, will meet provincial guidelines.

- Noise: Noise effects from the project on wildlife were assessed using decibels (dB)(Lin), which best describes the full range of frequencies at which wildlife species hear and vocalize. Wildlife habitat utilization patterns outside of the Site are not predicted to be altered as a result of project noise and the increase in noise levels as a result of CRRRC and their potential effect on wildlife is not considered to be an ecologically important adverse effect.
- Increased Erosion: Increased erosion on the Site can cause a disturbance and change in aquatic communities through sediment loading or a decrease in available aquatic habitat through erosion of the banks. Through the implementation of the proposed mitigation measures, it is anticipated that there will not be any material increase in erosion and associated transported sediment effects on the Site or in the Site-vicinity.
- Alteration of Surface Water Regime: Through the surface water assessment, it is anticipated that because under existing conditions the Site is prone to flooding and the groundwater levels are close to the surface, by meeting the pre- and post-construction peak flows via the north and south ditches, the post-development base flow will be similar to pre-development conditions. Overall, it is not expected that changes in the surface regime will be ecologically important.
- Alteration of Groundwater Regime: The direction of groundwater flow is not expected to change as a result of the CRRRC. On the Site, it is predicted that as a result of CRRRC, the groundwater zone of influence will not extend beyond the Site boundary. As such, off-Site groundwater levels will not be affected. On-Site, there is currently limited infiltration of surface runoff into the groundwater system. What infiltration occurs would be into the surficial silty sand layer and generally not deeper into the subsurface because of the underlying low permeability silty clay deposit. As such, surface water features on the Site, including the Simpson Drain, are fed primarily by surface flows. The surface water features and the vegetation communities on-Site and in the Site-vicinity should not be affected by any changes in the groundwater regime.
- Surface Water Quality: Surface water on-Site will be managed through stormwater ponds. The facility incorporates several environmental design features to prevent release of untreated Site water into the receiving environment, including separation of leachate and potentially contaminated runoff from processing areas from clean runoff and design of the stormwater ponds to achieve an Enhanced Level of TSS removal. Off-Site surface water quality should therefore not be adversely impacted as a result of the CRRRC project
- Groundwater Contamination: The engineered containment and leachate collection and management system for the CRRRC has been designed to safeguard off-Site groundwater resources. The performance of the containment systems will be monitored and the leachate collection system will be monitored and regularly maintained. Based on the groundwater assessment, it is predicted that there will be no adverse off-Site groundwater impacts as a result of the CRRRC.
- Pests: Increased use of the active landfill area by pests including nuisance birds, insects and rodents could result in avoidance of the area by some wildlife and reduced reproductive success. Standard mitigation measures will be implemented to reduce the potential for adverse effects to the current local wildlife populations. With the implementation of the above mentioned mitigation measures, use of the Site by nuisance wildlife and pests is not anticipated to be an ecological concern.

Based on the impact assessments, potential direct and indirect effects of the CRRRC are not expected to adversely affect the biology in the Site-vicinity.

Land Use & Socio-economic

The assessment of effects on the land use and socio-economic environment, which is broken down into three sub-components: land use, socio-economic and visual, is provided in TSD #5.

Land Use Assessment: The Site and the majority of the lands surrounding the Site are designated General Rural Area in the City of Ottawa's Official Plan. The majority of the Site lands are currently zoned Rural (RU) in the City of Ottawa's Zoning By-law; however a small portion is zoned Rural Heavy Industrial (RH) and currently permits waste processing and transfer. The majority of the land east of the Site is designated Agricultural. The potential effects on existing and proposed future land use in the area as a result of the preferred Site Development Plan were assessed through a review of current relevant planning policy to determine the potential for future development in the area, i.e., the compatibility between the proposed CRRRC and other existing and possible future land uses within the Site-vicinity, taking into account the impact predictions of other disciplines. Planning-related guidance documents considered included: MOECC Guideline D-4; the Provincial Policy Statement 2014; the recommendations of the 2003 Eastern Ontario Smart Growth Panel; City of Ottawa Official Plan and 5-year review of the Plan completed in 2013; existing zoning; and relevant National Capital Commission planning documents. It was concluded that the proposed CRRRC is a compatible land use from a planning perspective.

Socio-economic Assessment: The following data were developed/collected as indicators to assess the potential socio-economic effects of the proposed CRRRC in accordance with the approved TOR: 1) estimated person hours of employment for the construction and operation of the CRRRC; 2) an estimate of the tax revenue generated by the CRRRC for the municipality; 3) estimated value of goods and services required for construction and operation of the CRRRC; and 4) estimated business impacts (positive or negative) from the CRRRC on nearby commercial activities.

During the construction phase, the CRRRC is expected to generate approximately 400,000 person-hours of employment, which represents approximately 160 to 200 full-time equivalent positions over one year. Gross income paid to the construction phase workers will total approximately $16.3 million that translates to approximately $80,000 to $100,000 per year gross income, which is much higher than the median individual or household income in the Site-vicinity. During the operation phase, the CRRRC is expected to generate approximately 198,000 person-hours of employment per year, which represents approximately 80 to 100 full-time equivalent positions over the 30 year planning period of the CRRRC at a gross income paid to the Operation Phase workers totalling approximately $7.2 million per year. This translates to approximately $70,000 per year gross income, which is expected to exceed the median individual annual income in the Site-vicinity. It can also be assumed that there will be spin-off benefits to the local economy as a result of increased direct CRRRC-related income. Direct effects of the CRRRC on employment are expected to be beneficial.

In addition to one-time building permit revenue for the City of Ottawa estimated at $286,000, the CRRRC is expected to directly increase annual municipal property tax revenue for the City of Ottawa by $1.6 to 3.7 million annually for a thirty year period. Direct effects of the CRRRC on municipal tax revenue are expected to be beneficial.

Construction costs for goods and services (excluding labour) are estimated at $58 million for initial construction works and activities, followed by an average of approximately $700,000 per year for 30 years. Operational costs for goods and services (excluding labour) over the 30 year planning period of the CRRRC are estimated at $3.2 million per year in capital expenditures and $16.2 million per year in operating expenditures. Much of this spending on goods and services will occur within the Site-vicinity (City of Ottawa), representing opportunities for local businesses to capitalize on this spending. Direct effects of the CRRRC on spending and businesses are expected to be beneficial.

Based on the results of the impact assessments, no adverse effects on local businesses due to air quality and odour, noise or traffic associated with the CRRRC project are expected.

Visual Assessment: Screening of the Site from off-Site vantage points will be provided by leaving an adequate width (15 to 20 metres) of existing tree cover around the perimeter of the property where possible. Constructed screening consisting of earth berms 2 to 3 metres high with trees transplanted on them will be required at the northeast and southeast corner areas and along a portion of the west central Site boundary. It is noted that a portion of the constructed screening proposed at the northeast corner could be replaced by transplanting trees in the gap in the existing tree line at the north end of the Frontier Road cul-de-sac. Due to the presence of vegetation in the area surrounding the Site and the design of the Site, including the perimeter berms and tree planting, there will be little visual impact from off-Site nearby viewpoints.

Cultural and Heritage Resources

The assessment for this component was divided into the two components of archaeology and cultural (built) heritage, the detailed results of which are provided in TSD #6 and #7, respectively.

An archaeological study concluded that there are no registered archaeological sites and no areas of archaeological potential identified by the Stage 1 Archaeological Assessment, and no further archeological investigations of the Site are required.

Five properties in the vicinity of the Site were identified as requiring cultural heritage assessment to determine if any of the properties had cultural heritage value or interest (in accordance with *Ontario Heritage Act Regulation* 9/06). They were identified for study because they are structures older than 40 years, i.e., pre-1973. Each of the five properties was evaluated for cultural heritage value or interest. Using the *Ontario Heritage Act Regulation* 9/06, “Criteria for Determining Cultural Heritage Value or Interest,” and using the City of Ottawa’s Heritage Survey and Evaluation Form, it was found that none of the five properties demonstrate cultural heritage value or interest and are therefore not eligible for designation under the *Ontario Heritage Act*.

The assessment concluded that the development of the Site will not have an adverse effect on archaeological or cultural heritage resources.

Agriculture

The majority of the Site was historically cleared for agricultural purposes. A substantial portion of the Site has since been allowed to re-vegetate. The soils in this area have been developed on water deposited parent material consisting of fine sands and clay. This natural limitation combined with the level nature of the Site and the lack of sufficient outlet to provide under-drainage results in the entire Site being quite constrained for agriculture by poor drainage. Even those areas that have been cleared showed evidence of surface wetness and extended wetness during spring and fall.

The agricultural assessment, the details of which are provided in TSD #8, included potential effects on on-Site and off-Site agricultural land uses. In terms of on-Site agricultural land use, the Site Development Plan will remove a small area of land currently under marginal agricultural production. This area of land has significant constraints to agricultural production as noted above. It was therefore concluded that the proposed CRRRC project will not have a significant adverse impact on on-Site agricultural production, given that it is quite limited.

In terms of potential effects on off-Site Agricultural Uses:

- The removal of the limited extent of lands currently under production on-Site will not impact the viability of other farming operations.
- Evaluation of the compatibility of the proposed CRRRC with livestock operations within 2 kilometres of the Site using the Ministry of Agriculture Food and Rural Affairs Minimum Distance Separation (MDS) Formulae and Guidelines showed that there is sufficient distance between existing livestock operations and the Site to ensure compatibility of the proposed CRRRC with these facilities. The actual setback distance between the existing barns and the CRRRC lands exceeds MDS requirements, generally by a factor of two to five times.
- Agricultural production in the Site-vicinity is predominantly field crops. No loss in off-Site productive lands due to such impacts as infrastructure improvements, increased runoff or other direct action was identified.
- Because the design and operational objectives for the CRRRC includes the control of any emissions resulting from the operation to levels within Provincial standards, no material changes to the agricultural productive potential of the lands in the Site-vicinity are predicted.
- Farming practices also include the movement of farm equipment for cultivation, seeding and harvesting. The location of the principal access to the Site from Boundary Road will limit access to the CRRRC Site from other roads and there are no farm access points off Boundary Road between the location of the Site access and Highway 417. This should limit conflicts between road traffic and the movement of farm equipment on these roads to existing levels.

In summary, the proposed CRRRC development was assessed as compatible with and not predicted to adversely impact off-Site agricultural land uses and farming practices.

Traffic

The complete assessment of the impacts of CRRRC Site-related traffic is provided in TSD #9. The number of expected Site generated trips was determined by considering the amount and types of waste expected to be received at the Site, the anticipated diversion and other Site activities. The calculations assumed that the facility is operating at a maximum annual capacity of 450,000 tonnes per year of incoming material/waste. Assuming the Site operates about 300 days per year, on a typical day the Site would receive an average of 1,500 tonnes per day of various materials/waste. It was however recognized that on some days there could be receipt of surplus or contaminated soil from excavation and/or remediation projects in addition to typical IC&I and C&D materials/waste and soil received, as such projects are by definition episodic and event-driven. In order to account for this event-related soil traffic, for purposes of fully considering potential traffic impacts, it was assumed that the Site might on a peak day receive a maximum 3,000 tonnes per day of waste and soil at the CRRRC (but within the overall assumed maximum of 450,000 tonnes per year of incoming material).

The estimated maximum daily truck trips corresponding to the 3,000 tonnes per day scenario described above is 271 trucks entering and 271 trucks exiting the Site. Assuming a 10 hour day, and applying a peaking factor to all trips entering and exiting the Site to account for random arrivals, the total number of peak hour trips are 40 trips per hour entering and exiting. Accounting for hauling of leachate off-Site for treatment at the City of Ottawa Robert O Pickard Environmental Centre (ROPEC), the maximum peak AM and PM hour number of trucks used in the assessment was 43 truck trips per hour entering and exiting the Site.

The distribution of Site generated trips was assigned to the adjacent roads by examination of the most convenient and efficient route(s) to and from major developed and populated areas. The vast majority of the trips will utilize the Highway 417 interchange and Boundary Road to the Site access location, which is the direct route to/from Highway 417. The total volume of traffic along Boundary Road adjacent to the CRRRC determined that the truck traffic from the CRRRC at maximum daily receipts would represent approximately 8% of the peak hour traffic along Boundary Road.

The assessment examined the operation of the Site access point onto Boundary Road, and the intersections of Devine/Boundary, Boundary/Mitch Owens, the eastbound Highway 417 on/off ramps, and the westbound Highway 417 on/off ramps. The traffic analysis evaluated the operation of the intersections in the area of the CRRRC Site under the peak AM and peak PM traffic scenarios in terms of Level of Service (LOS) and expected length of queue. The analysis showed that there would be no requirement for modifications to any of the four existing intersections analysed due to the CRRRC-related truck traffic.

Analysis of the proposed Site access location along Boundary Road determined that a dedicated southbound left turn lane was warranted, together with the associated lengths of tapers, vehicular storage and parallel lanes. The access road itself would provide a driveway length of approximately 500 metres between Boundary Road and the gate to the CRRRC facility; together with the proposed separate truck queuing lane area, there is adequate space for all truck queuing such that it would not back up onto Boundary Road.

Net Effects and Effects Monitoring

For each environmental component, net effects taking into account in-design and other mitigation measures as appropriate were identified and proposed effects monitoring programs were developed. The CRRRC is predicted to not adversely affect any of the environmental components assessed. Proposed monitoring programs were developed, including the following:

- An annual summer dust monitoring program for two summer seasons after the operational start up to verify the effectiveness of the mitigation measures and determine the need for continued monitoring, as well as ongoing monitoring of fugitive dust sources;
- A noise monitoring program to log hourly data during the monitoring period once per year during operations;
- A groundwater monitoring program that complies with O. Reg. 232/98 (MOE, 1998a) including groundwater and leachate level and sample collection three times per year. In addition, water wells within 500 metres of the Site will be sampled, with consent from the owner, one time prior to start of operations at the facility;
- Geotechnical monitoring including subgrade settlement, unit weight of the as-placed waste, lateral displacement of the silty clay beneath the perimeter berm of the landfill and porewater pressure dissipation below the landfill;
- A surface water monitoring program that includes collecting samples from four on-Site locations four times per year, in accordance with O. Reg. 232/98;

- A biological monitoring program consisting of benthic and sediment monitoring bi-annually at six locations, monitoring for barn swallows for a period of three years and ongoing review of conditions of revegetation and maintenance;
- Monitoring of potential nuisance or perception-related effects through a complaint and response line and other community outreach activities. For example, a Community Liaison Committee will be established pending interested volunteers to assist in the community monitoring of CRRRC operations; and
- An annual report to MOECC on facility environmental/operational performance.

Assessment of Leachate Management Options

Leachate generated from the landfill will be collected within the landfill and removed from the leachate collection system by pumping. Surplus liquid wastewater from organics processing will be collected. Both of these wastewaters will require management and treatment to achieve acceptable quality prior to releasing the treated effluent to the natural environment. The methodology of assessing the leachate management options involved the following steps:

- Screen potential on-Site leachate treatment technologies;
- Select preferred on-Site treatment option based on criteria including performance and cost-effectiveness;
- Identify potential off-Site leachate receiver/treatment alternatives potentially available to Taggart Miller;
- Determine off-Site leachate receiver/treatment alternatives potentially available to Taggart Miller;
- Describe alternatives to convey leachate to available off-Site leachate treatment alternatives;
- Develop leachate management system options; and
- Compare on-Site and off-Site alternative leachate management options using the evaluation criteria provided in Appendix B of the approved TOR.

The complete assessment is provided in TSD #10 and described in Section 12.0 of the EASR.

A total of nine treatment technologies were reviewed as potential approaches for on-Site treatment. The preliminary evaluation of the available treatment technologies concluded that four technologies would be the more suitable for use as the main treatment stage: activated sludge, sequencing batch reactor (SBR), rotating biological contactor (RBC), and Siemens PACT® (Powder Activated Carbon Treatment c/w aerobic biological treatment step).

These options were compared considering flexibility, reliability, ease of use, capital costs, operational costs and operation and maintenance in a qualitative manner. Based on this assessment, the sequencing batch reactor was identified as the preferred on-Site primary treatment approach.

A review was then carried out to identify possible off-Site treatment options that could potentially be available to Taggart Miller. Based on the available information, and given that the proposed CRRRC is within City boundaries and will be servicing primarily City waste generators, the City of Ottawa wastewater treatment plant (ROPEC) was identified as the most appropriate off-Site wastewater receiver/treatment option for the proposed CRRRC. For ROPEC to accept wastewater from the CRRRC Site, the leachate should meet the Sewer Use By-law quality requirements (or as otherwise negotiated with the City). To meet this objective it is expected that on-Site pre-treatment will be required.

The two options available to convey pre-treated leachate from the CRRRC to ROPEC are: 1) tanker truck; and 2) a dedicated forcemain pipe to the City of Ottawa sanitary sewer system. Both of these options are currently used to convey leachate from waste disposal facilities in Ottawa to ROPEC. Based on consultation with the City of Ottawa, it is understood that the City of Ottawa would prefer the wastewater from CRRRC to ROPEC to be trucked, at least initially, so that information and assurance on leachate quantity and especially quality over time could be obtained. In view of the City of Ottawa's understood preference, the preferred method of conveyance is by tanker truck at this time.

Based on the foregoing, two wastewater management options were developed: 1) on-Site treatment with discharge to the Simpson Drain, and 2) on-Site pre-treatment for off-Site treatment at the City of Ottawa wastewater treatment plant (ROPEC) and discharge. The comparison of the two identified wastewater management options considered the environmental components as set out in the approved TOR. The preferred leachate management system was identified as on-Site pre-treatment for trucking off-Site to ROPEC.

Implementation of this preferred leachate management option requires Taggart Miller to enter into agreement with the City of Ottawa to accept the wastewater from the CRRRC at ROPEC. If the City of Ottawa option proves not to be available, it will be necessary to treat the wastewater using another approach. The EA provides in Section 10.9, 12.5 and 15.1 of the EASR for an amending procedure to determine the preferred option in that event.

Cumulative Impact Assessment

In the TOR, Taggart Miller proposed to undertake a cumulative impact assessment (CIA), or cumulative effects analysis, of the potential effects of the CRRRC project. Such an assessment is not currently a requirement of the provincial EA process. To carry out this assessment, a framework often used in federal EA processes (Canadian Environmental Assessment (CEA) Agency) was considered, as well as guidance from other jurisdictions, in particular California. Cumulative effects are defined by the CEA Agency as "changes to the environment that are caused by an action in combination with other past, present and reasonably foreseeable future human actions". An assessment of cumulative effects provides a more complete understanding of what might happen to environmental components of value or concern beyond the influence of the project alone.

This analysis considered the residual (non-zero) effects of the CRRRC and the potential for these residual effects to interact with other projects or activities, which when combined may result in a greater and in particular adverse effect to an environmental component. The methodology identified the appropriate environmental components for analysis as well as identified other past, present and/or reasonably foreseeable future projects or activities that may affect the same components. The predicted effects of the CRRRC and the potential for the effects of the other identified projects and actions to overlap with those of CRRRC in time, space and type of effect were considered. Finally, the significance of any identified residual cumulative effects was evaluated.

Valued Ecosystem Components (VEC) for this analysis were taken from the list of components used in the assessment of environmental effects of the CRRRC. Any components on which the CRRRC is predicted to have a "non-zero" residual effect were carried forward into this cumulative impact analysis. Based on the studies completed for the proposed CRRRC, this includes: atmosphere; hydrogeology; surface water; biology; land use & socio-economic, agriculture and traffic.

To identify off-Site activities in the area whose effects may overlap with those of the CRRRC, the existing zoning and land use in the vicinity of the Site was considered as well as specific existing land uses in the area of the Site south of Highway 417. The only known new future planned land use in the Site-vicinity is a proposed new terminal to de-couple double tractor trailers to single trailers for travel to sites within the City of Ottawa between (north of) Pomerleau Ltd. and the CRRRC properties and Highway 417 with frontage along Boundary Road.

A residual effects interaction assessment was completed to identify overlaps in terms of types of effect between the residual effects of the CRRRC and the potential residual effects of other projects and activities on each environmental component.

To assess the significance of cumulative effects requires, among other things, consideration of whether further effects can be sustained by a component without irreversible effects. The significance of any residual cumulative effects was determined taking into account the probable magnitude, frequency and reversibility of the residual effects of the CRRRC in combination with the residual effects of the identified existing and future activities in the Site-vicinity.

In general, there is little indication of baseline environmental quality concerns or existing cumulative environmental impacts on the Site or in the Site-vicinity arising from past/present activities and projects. Air quality appears to be typical of the Ottawa urban environment and there is no evidence of measurable adverse cumulative air quality impacts associated with current activities in the Site-vicinity. Noise levels are typical of a Class 1 area and are dominated by road noise from Highway 417 and Boundary Road. Aquatic and terrestrial biological resources do not exhibit indicators of adverse cumulative impacts in the Site-vicinity, other than benthic organisms associated with surface water quality as discussed below. There are no obvious existing social, agricultural or traffic issues that could be attributed to the cumulative impact of past and present activities and projects on and in the vicinity of the Site.

Except as discussed below, the probable residual effects of the CRRRC that have the potential to overlap in time and space with the residual effects of the other identified activities and projects described above are expected to be generally negligible and in any event less than significant. The effects are not expected to result in any substantial alteration of existing baseline conditions, nor are they expected to result in an exceedance of applicable regulatory standards to the extent that they interact cumulatively. Any effects that do interact cumulatively will be of low significance from an environmental perspective as they are likely to be of low magnitude, intermittent in frequency at most and reversible after the activity(ies) ceases.

The only areas of potential cumulative impact significance are surface water quality, given the elevated existing concentrations of some parameters (iron and phosphorous) in surface water, and traffic, given the tractor/trailer de-coupling proposal.

Special care will therefore be taken to monitor surface water quality leaving the CRRRC with respect to these parameters to ensure that surface water quality downgradient of the Site is not further degraded for these parameters. The proposed CRRRC stormwater management plan incorporates a number of features to ensure surface water leaving the Site meets regulatory requirements, and also includes contingency measures based on ongoing monitoring results. No need for additional surface water mitigation measures were identified as a result of this cumulative impact assessment.

With respect to traffic, there is some uncertainty about the number of tractor-trailers that may utilize the proposed de-coupling facility and the long-term traffic impacts they may present at the Boundary Road/Highway 417 interchange. This will presumably be considered by the City of Ottawa when assessing this proposal and any required near or longer term road improvements. No need for additional traffic mitigation measures beyond the left turn lane and road improvements already proposed for the CRRRC access off Boundary Road have been identified as a result of this CIA.

Monitoring and Contingency

The proposed CRRRC has been designed to incorporate mitigation measures to minimize the potential environmental effects. Following identification of mitigation measures, the environmental effects of the CRRRC were evaluated. Although efforts have been made to be conservative in estimating the environmental effects, there is always a degree of uncertainty in any prediction of effects. Effective monitoring and contingency measures are intended to address this uncertainty and confirm assumptions used in the assessment.

An effective monitoring program provides results to: indicate whether the facility is working as expected and that the assumptions used in the assessment were correct; assess on an ongoing basis whether mitigation measures as designed and operated are effective; and identify unforeseen problems so they can be addressed in a timely manner. The proposed monitoring program for the CRRRC is summarized in Section 14.0 of the EASR and details are provided in the D&O Report, Volume IV.

As described above, the proposed program for monitoring of environmental Site performance includes groundwater, leachate, surface water (including the proposed stormwater management system), geotechnical, noise, dust and biological (benthics). These monitoring programs will continue throughout the period of Site operation and post-closure as appropriate in consultation with the MOECC. There will also be ongoing Site operational and maintenance programs, a number of which will continue for those control systems that remain operational post-closure.

In the event that the monitoring programs detect unexpected problems or show that assumptions used in the assessment are incorrect, it may be necessary to implement contingency measures to further reduce the potential for any adverse environmental effects associated with the CRRRC. An overview of proposed contingency measures, with further details on these conceptual contingency measures, is provided in the D&O Report, Volume IV.

Summary of Commitments

Section 15.0 of the EASR lists the commitments made by Taggart Miller during the TOR process, how they have been considered in the preparation of the EA and their current status. Generally, these commitments relate to property value protection and community benefit plans, building the resource recovery and diversion facilities when the CRRRC starts operation, completing a cumulative effects assessment, preparing a draft EA for public review and ensuring public consultation events and the draft and final main body of the EA are available in English and French, interacting with local community associations, holding workshops based on interest indicated by stakeholders, holding Open House #3 in two communities, communicating draft material at key EA milestones on the CRRRC website, engaging with Aboriginal communities, developing a conceptual monitoring framework, refining the purpose statement (if required) and assessing the effects of the CRRRC on the Mer Bleue Bog.

Commitments made by Taggart Miller during the EA study process are also listed in Section 15.0. Taggart Miller will report on the status of these commitments via compliance monitoring to the MOECC annually until such time as all commitments are completed or addressed/superseded in EPA/OWRA conditions of approval. Generally, these commitments relate to effects monitoring requirements, in-design mitigation measures and best management practices.

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APPENDICES

APPENDIX A
Approved TOR

TECHNICAL SUPPORT DOCUMENTS

TSD #1 – Comparison of Alternative Sites

TSD #2 – Atmosphere - Noise

TSD #3 – Atmosphere – Air

TSD #4 – Biology

TSD #5 – Land Use & Socio-Economic

TSD #6 – Archaeological Assessment

TSD #7 – Cultural Heritage Evaluation Report

TSD #8 – Agriculture

TSD #9 – Traffic Impact Study

TSD #10 – Leachate Management

VOLUMES

Volume II Consultation Record

Volume III Geology, Hydrogeology & Geotechnical Report

Volume IV Design and Operations Report

ACRONYMS, UNITS AND GLOSSARY OF TERMS

Definition of Acronyms	
Acronym	**Definition**
AAQC	Ambient Air Quality Criteria
AERMOD	Atmospheric Dispersion Model
ANSI	Areas of Natural and Scientific Interest
ARA	*Aggregate Resources Act*
AOO	Algonquins of Ontario
AS	Activated Sludge
BOD	Biochemical Oxygen Demand
BP	Before Present
CAZ	Contaminant Attenuation Zone
CEA Agency	Canadian Environmental Assessment Agency
C&D	Construction & Demolition
CIA	Cumulative Impact Assessment
CLI	Canada Lands Inventory
CNR	Canadian National Railway
C of A	Certificate of Approval
CO	Carbon monoxide
COD	Chemical Oxygen Demand
CRRRC	Capital Region Resource Recovery Centre
D&O	Design and Operations (report)
DFO	Department of Fisheries and Oceans Canada
DOC	Dissolved Organic Carbon
EA	Environmental Assessment
EAA	*Environmental Assessment Act*
EASR	Environmental Assessment Study Report
ECA	Environmental Compliance Approval
ESA	*Endangered Species Act*
ESDM	Emission Summary and Dispersion Modelling
EPA	*Environmental Protection Act*
EPT	Ephemeroptera/Plecoptera/Trichoptera
GCL	Geosynthetic Clay Liner
GHG	Greenhouse Gas

Definition of Acronyms	
GMP	Greenbelt Master Plan
GSC	Geological Survey of Canada
GRT	Government Review Team
HVAC	Heating, Ventilation and Air Conditioning
IC&I	Industrial, Commercial & Institutional
IE	Ion Exchange
LDSCS	Leachate Detection and Secondary Containment System
LEL	Lowest Effect Level
LFG	Landfill Gas
M	Moment Magnitude
MDS	Minimum Distance Separation
MMAH	Ministry of Municipal Affairs and Housing
MNDM	Ministry of Northern Development and Mines
MNR	Ministry of Natural Resources
MNRF	Ministry of Natural Resources and Forestry
MOE	Ministry of the Environment
MOECC	Ministry of the Environment and Climate Change
MRF	Materials Recovery Facility
MSW	Municipal Solid Waste
MTCS	Ministry of Tourism, Culture and Sport
MTO	Ministry of Transportation Ontario
NCC	National Capital Commission
N.D.	No Date
NO_2	Nitrogen dioxide
NO_x	Oxides of nitrogen
O. Reg.	*Ontario Regulation*
ODWQS	Ontario Drinking Water Quality Standards
OGS	Ontario Geological Survey
OMAFRA	Ontario Ministry of Agriculture, Food and Rural Affairs
OWRA	*Ontario Water Resources Act*
PHC	Petroleum Hydrocarbon
PM_{10}	Particles nominally smaller than 10 µm in aerodynamic diameter
$PM_{2.5}$	Particles nominally smaller than 2.5 µm in aerodynamic diameter

Definition of Acronyms	
POI	Point of Impingement
POR	Point of Reception
PPS	Provincial Policy Statement
PSW	Provincially Significant Wetland
PVP	Property Value Protection
PWQO	Provincial Water Quality Objectives
RBC	Rotating Biological Contacter
RO	Reverse Osmosis
ROPEC	Robert O. Pickard Environmental Centre
RQD	Rock Quality Designation
SAR	Species at Risk
SARA	*Species at Risk Act*
SBR	Sequencing Batch Reactor
SEL	Severe Effect Level
SNC	South Nation Conservation
SO_2	Sulphur dioxide
SPM	Suspended Particulate Matter
SWM	Stormwater Management
Taggart Miller	Taggart Miller Environmental Services
TDS	Total Dissolved Solids
TKN	Total Kjeldahl Nitrogen
TOR	Terms of Reference
TSD	Technical Support Document
TSS	Total Suspended Solids
VEC	Valued Ecosystem Components
WEPP	Water Environment Protection Program
WQSZ	Western Quebec Seismic Zone
WWIS	Water Well Information System

Definition of Units	
dBa	Decibel
ha	Hectare
Hz	Hertz
km	Kilometre
km/h	kilometres per hour
m	Metre
m^3	Cubic metres
m^3/s	Cubic metres per second
m/s	Metres per second
masl	Metres above sea level (Geodetic datum)
mbgs	Metres below ground surface
µ	Micro
µg/g	Micrograms per gram
yr	Year

1.0 INTRODUCTION

1.1 Purpose of this Document

This report (Environmental Assessment Study Report (EASR)) documents the Environmental Assessment (EA) of a new proposed integrated waste management facility, known as the Capital Region Resource Recovery Centre (CRRRC), which is proposed to be located in the east end of Ottawa, Ontario. If approved, the CRRRC would provide facilities and capacity for recovery of resources and diversion of materials from disposal for solid non-hazardous wastes that are generated by the Industrial, Commercial and Institutional (IC&I) and Construction and Demolition (C&D) and soils sectors primarily in Ottawa and secondarily eastern Ontario. It would also provide landfill disposal capacity on the same Site for diversion residuals and materials that are not diverted.

1.2 Identification of the Proponent

Taggart Miller Environmental Services (Taggart Miller), a joint venture of Taggart Investments Inc. and Miller Waste Systems Inc., is the proponent for the proposed CRRRC. The contact for the purposes of this EA is as follows:

Mr. Hubert Bourque
Project Manager/Directeur de projet
Taggart Miller Environmental Services
c/o 225 Metcalfe Street, Suite 708
Ottawa, Ontario K2P 1P9
Tel: 613-454-5580
Fax: 613-454-5581
Email: hjbourque@crrrc.ca

1.3 Background

The Taggart group of companies is an Ottawa-based, Canadian family-owned business specializing in civil infrastructure construction with other operating companies providing general contracting/construction management services, housing developments from single family to high rise condominiums and the acquisition, development and management of industrial sites, commercial office and retail space. Taggart Investments Inc. is part of the Taggart group of companies.

Miller Waste Systems Inc. is also a family-owned Canadian company providing waste management services in Ontario, Manitoba and the Maritimes. Miller Waste Systems Inc. designs, builds and operates facilities to provide long term, economically viable waste management solutions (collection, recycling, diversion, transfer) for municipalities and private sector customers. In 2012, Miller Waste Systems Inc. secured collection contracts for a portion of Ottawa's residential waste. It is noted that Ottawa's residential waste is disposed at the City of Ottawa's (City's) Trail Road Waste Facility and would not go to the proposed CRRRC.

The Province of Ontario and the City of Ottawa have clearly stated objectives to significantly increase the diversion of IC&I and C&D waste materials from disposal. These objectives were recently reinforced with the introduction of Bill 91. Current diversion rates in the Capital Region (and the province) are considerably below City and provincial targets. Taggart Miller believes it can assist in achieving City and provincial IC&I/C&D diversion objectives by developing and operating a new integrated waste management facility. The facility would primarily serve Ottawa and secondarily portions of eastern Ontario for waste materials generated by the IC&I and C&D sectors. Since it is currently not (and may never be) technically or economically, possible to divert all materials from disposal, there will be a continuing need for disposal of materials that cannot reasonably be recovered/recycled from the IC&I/C&D waste stream.

1.4 Location of Proposed CRRRC Facility

Taggart Miller identified and secured two potential Sites for development of the proposed CRRRC. The locations of the two alternative Sites are shown on Figure 1.4-1.

One site - the North Russell Road Site - is located in the northwest part of the Township of Russell about three kilometres east of the boundary with the City of Ottawa, about five kilometres south of Provincial Highway 417 between the Boundary Road and Vars exits, and approximately three kilometres north of the Village of Russell boundary, and approximately four kilometres north of the centre of the Village of Russell.

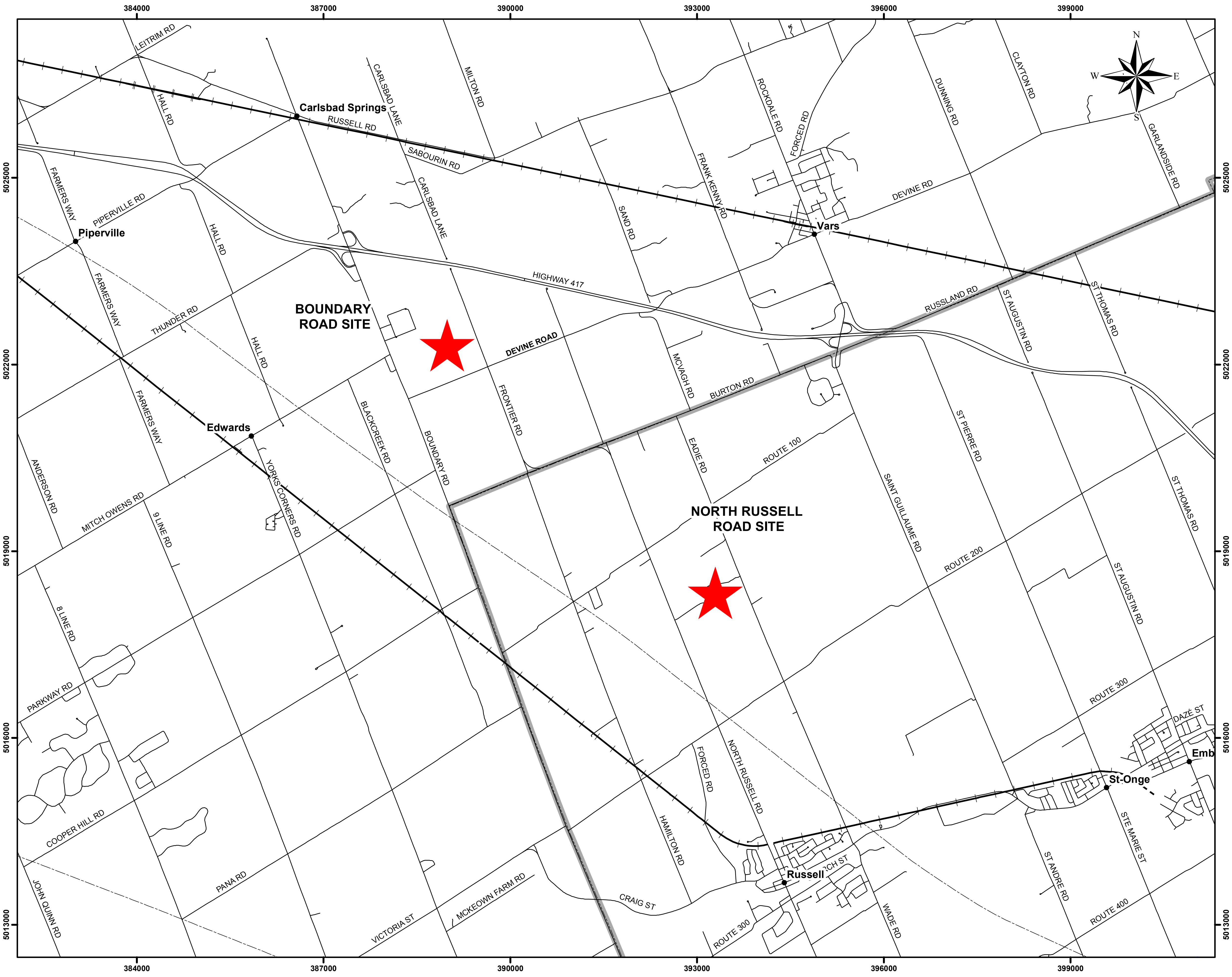
The second site - the Boundary Road Site - is located in the east part of the City of Ottawa just southeast of the Highway 417/Boundary Road interchange. The property is located on the east side of Boundary Road, north of Devine Road and west of Frontier Road, and east of an existing industrial park on Lots 22 to 25, Concession XI, Township of Cumberland.

As a result of the comparative evaluation of the two Sites as described in Section 7.0, the Boundary Road Site has been identified as the preferred Site and the North Russell Road Site is no longer under consideration.

1.5 Development of the Terms of Reference

The approved Terms of Reference (TOR) (Appendix A) provided the framework for conducting the EA.

As noted in the TOR, Taggart Miller is proceeding under subsection 6(1) and 6.1(3) of the *Environmental Assessment Act* (EAA). As contemplated by subsection 6(2)(c) of the EAA, the proposed TOR set out in detail the requirements for the preparation of the EA.



LEGEND

●	POPULATED PLACE NAME
—	ROADWAY
┼	RAIL
-·-	UTILITY
⬚	TOWNSHIP OF RUSSELL BOUNDARY
▭	CITY OF OTTAWA BOUNDARY

1 0.5 0 1 2 3

SCALE 1:60,000 KILOMETRES

NOTE

THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT.

REFERENCE

DIGITAL NRVIS MNR DATA PRODUCED BY GOLDER ASSOCIATES LTD.,
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PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83
COORDINATE SYSTEM: UTM ZONE 18

PROJECT

ENVIRONMENTAL ASSESSMENT OF THE
CAPITAL REGION RESOURCE RECOVERY CENTRE

TITLE

ALTERNATIVE SITE LOCATION PLAN

Golder Associates
Ottawa, Ontario

PROJECT No. 12-1125-0045			SCALE AS SHOWN	REV. 0
DESIGN	PLE	DEC. 2013	**FIGURE 1.4-1**	
GIS	BR	DEC. 2013		
CHECK	PLE	AUG. 2014		
REVIEW	PAS	AUG. 2014		

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1.6 Purpose of the CRRRC

The purpose of the proposed CRRRC is:

To provide facilities and capacity for recovery of resources and diversion of materials from disposal for solid non-hazardous wastes and soils that are generated by the Industrial, Commercial and Institutional (IC&I) and Construction and Demolition (C&D) sectors in Ottawa and eastern Ontario. It would also provide landfill disposal capacity on the same site for post-diversion residuals and materials that are not diverted.

The proposed service area is shown on Figure 1.6-1 and consists of the City of Ottawa, and the Counties of Prescott-Russell; Stormont, Dundas and Glengarry; Lanark; Leeds & Grenville; Frontenac; Lennox and Addington; and Prince Edward. It is anticipated however that the CRRRC would receive waste and soils primarily from the City of Ottawa.

Since development of the TOR for this EA, provincial goals and policies have been updated in 2013, which further support the rationale for the proposed CRRRC. Data from Statistics Canada released in August 2013 indicate that the Province of Ontario has not improved IC&I/C&D waste diversion rates since 2008 (Statistics Canada, 2013a). This information is further described in Section 4.0 of this EA.

1.7 Scope of Approvals Being Sought

The proposed CRRRC requires approval under the EAA, the *Environmental Protection Act* (EPA) Part V and the *Ontario Water Resources Act* (OWRA) Section 53. Taggart Miller is submitting the documentation to support EA and EPA/OWRA requirements jointly in one submission. The EPA/OWRA applications (Environmental Compliance Approval (ECA)) will however only be submitted once EAA approval is received.

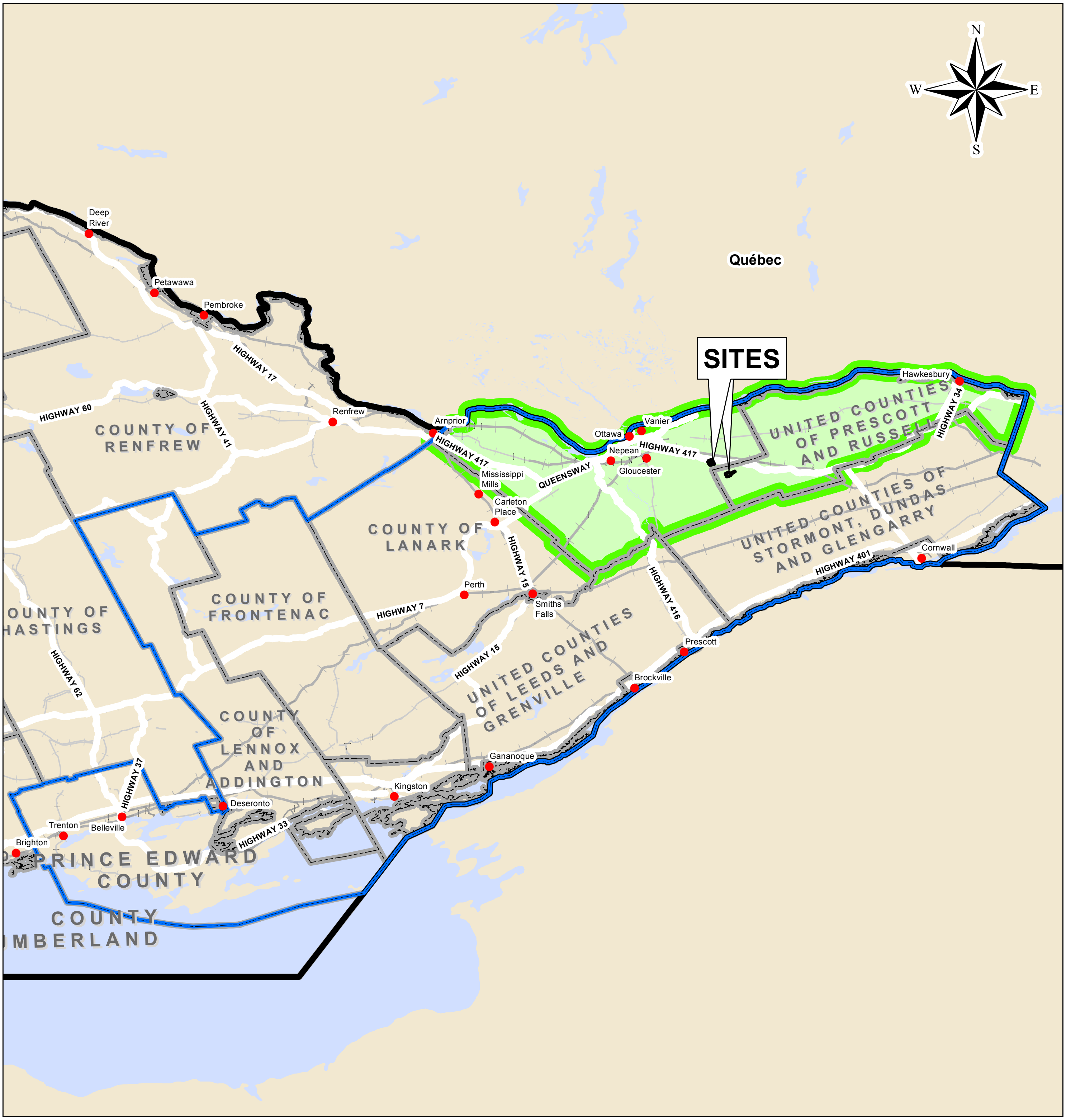
Other approvals that will or may be required for the CRRRC are summarized below.

Ontario Heritage Act – The development of the CRRRC will require a letter of concurrence from the Ministry of Culture, Tourism and Sport to demonstrate to the MOECC for the EA and the City of Ottawa for OPA and ZBA's that potential archeological and heritage resources have been appropriately considered and development of the Site is allowable from the perspective of the Ministry of Culture, Tourism and Sport.

***Planning Act*, Official Plan Amendment (OPA) and Zoning By-Law Amendments (ZBA)** – The implementation of the CRRRC will require approvals under the *Planning Act* (OPA and ZBA) since the proposed CRRRC is not recognized in the present Official Plan and parts of the Boundary Road Site are not currently zoned for the activities contemplated by the CRRRC. *Planning Act* approvals would be sought after EA approval is received for the CRRRC.

Conservation Authority Approvals – The South Nation Conservation Authority is responsible for issuing permits for any construction in or alternation of water courses under *The Conservation Authorities Act, Ontario Regulation* (O. Reg.) 170/06 (MNR, 2006). It is anticipated that approval from South Nation Conservation will be required to implement the Site development plan due to the required drainage alterations associated with construction of the development.

Drainage Act – Due to the presence of a municipal drain within the proposed Site development area, approval under the provincial *Drainage Act* will be required. This approval would be sought after EA approval is received for the CRRRC.



0 10 20 40 60 80

SCALE 1:2,000,000 KILOMETRES

LEGEND

- ● PLACE NAME
- ▭ PROVINCIAL BOUNDARY
- ▭ UPPER TIER MUNICIPALITY
- ▭ PROPOSED SERVICE AREA
- 🟩 EXPECTED PRIMARY SERVICE AREA

NOTE

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REFERENCE

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PROJECTION: MODIFIED TRANSVERSE MERCATOR DATUM: NAD 83
COORDINATE SYSTEM: MTM ZONE 9

PROJECT
ENVIRONMENTAL ASSESSMENT OF THE
CAPITAL REGION RESOURCE RECOVERY CENTRE

TITLE
PROPOSED SERVICE AREA

Golder Associates
Ottawa, Ontario

PROJECT No. 12-1125-0045		
DESIGN	PLE	DEC. 2013
GIS	BR	DEC. 2013
CHECK	PLE	AUG. 2014
REVIEW	PAS	AUG. 2014

SCALE AS SHOWN REV. 0

FIGURE 1.6-1

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1.8 Concordance of TOR and EASR Documentation

This EASR (Volumes I and II) and accompanying Technical Support Documents (TSD) and Volumes III and IV address the requirements of the TOR.

The EA was carried out in accordance with the framework provided by approved TOR and the requirements of the EA Act and O.Reg. 334 and taking into account applicable MOECC guidance documents, e.g., Codes of Practice for Preparing and Reviewing EAs in Ontario and Consultation in Ontario's EA Process.

Table 1.8-1 provides the concordance between these documents. The requirements listed in the TOR are provided in the left column, while the right column provides the location where the requirement is addressed in the EASR and/or accompanying documents.

Table 1.8-1: Concordance Table

TOR Requirements	Section of the Documentation
A description of the purpose of the undertaking	Section 1.6 of the EASR
A description of and a statement of the rationale for the undertaking	Section 4.0 of the EASR
A description of and a statement of the rationale for the alternative methods of carrying out the undertaking	Sections 7.0, 9.0 and 12.0 of the EASR
A description of and a statement of the rationale for the alternatives to the undertaking	Section 5.0 of the EASR
A description of the environment that will be affected or that might reasonably be expected to be affected, directly or indirectly	Section 8.0 of the EASR; TSD #2 to #9; Volume III
A description of the effects that will be caused or that might reasonably be expected to be caused to the environment	Section 11.0 of the EASR; TSD #2 to #9; Volume III
A description of the actions necessary or that may reasonably be expected to be necessary to prevent, change, mitigate or remedy the effects upon or the effects that might reasonably be expected upon the environment, by the undertaking, the alternative methods of carrying out the undertaking and the alternatives to the undertaking**	Sections 7.0, 9.0, 10,0, 12.0 and Appendix A of the EASR; TSD #2 to #9
An evaluation of the advantages and disadvantages to the environment of the undertaking, the alternative methods of carrying out the undertaking and the alternatives to the undertaking**	Sections 7.0, 9.0 and 12.0 and Appendix A of the EASR; TSD #10
A description of any consultation about the undertaking by the proponent and the results of the consultation	Section 3.0 of the EASR and Volume II

Note: ** The assessment of Alternatives To was completed in the TOR.

1.9 Organization of the EASR Documentation

This EASR is presented in four volumes. Volume I (this volume or the Main EASR report) describes the EA studies, consultation results, assessment of alternatives, identification of a preferred alternative and effects assessment of the preferred alternative. TSDs to Volume I contain additional details for each of the technical assessments. Volume II contains the Consultation Record for the EASR. Volume III contains the Geology, Hydrogeology & Geotechnical Report and Volume IV contains the Design and Operations (D&O) Report.

Volume I of the EASR contains 15 sections as follows:

- Section 1.0 – Provides an introduction to the EA and relevant background information;
- Section 2.0 – Presents the methodology used for the EA;
- Section 3.0 – Presents the consultation methods, activities and events and a summary of each event;
- Section 4.0 – Summarizes the rationale for the proposed CRRRC;
- Section 5.0 – Summarizes the assessment of 'Alternatives To' the proposed CRRRC (Supporting Document #1 of the approved TOR);
- Section 6.0 – Presents an initial conceptual description of the proposed CRRRC for the purpose of comparing the alternative Sites, including overviews of the waste stream and the function of each of the major facilities and associated project works for both the diversion facilities and the landfill component;
- Section 7.0 – Summarizes comparative evaluation that resulted in the identification of the Boundary Road Site for the CRRRC facility;
- Section 8.0 – Describes the existing environmental conditions at and in the vicinity of the Boundary Road Site;
- Section 9.0 – Summarizes the identification of the preferred Site development concept;
- Section 10.0 – Presents a detailed description of the proposed CRRRC facility;
- Section 11.0 – Summarizes the predicted net environmental effects of the proposed CRRRC in accordance with the approved evaluation framework;
- Section 12.0 – Presents the evaluation of leachate treatment alternatives and the identification of a preferred alternative;
- Section 13.0 – Describes the predicted cumulative impacts of this proposal and other known or probable projects;
- Section 14.0 – Describes the follow-up monitoring programs to confirm that the CRRRC is performing as expected. It also presents conceptual contingency measures that would be implemented should the proposed CRRRC not perform as expected and remedial measures are required; and
- Section 15.0 – Lists the commitments made during the TOR and EA process.

The following appendix is part of Volume I:

- Appendix A – Proposed TOR for Environmental Assessment of the Proposed Capital Region Resource Recovery Centre (Volume 1 excluding Appendix C work plans for the North Russell Road Site).

The following TSDs are part of Volume I:

- TSD #1 – Comparison of Alternative Sites
- TSD #2 – Atmosphere – Noise
- TSD #3 – Atmosphere – Air
- TSD #4 – Biology
- TSD #5 – Land Use & Socio-Economic
- TSD #6 – Archaeological Assessment
- TSD #7 – Cultural Heritage Evaluation Report
- TSD #8 – Agriculture
- TSD #9 – Traffic Impact Study
- TSD #10 – Leachate Management

Volume II contains the Consultation Record.

Volume III contains the Geology, Hydrogeology & Geotechnical Report.

Volume IV contains the Design and Operations Report.

2.0 OVERVIEW OF METHODOLOGY

This section of the EASR provides an overview of the approach used in the EA. More detailed descriptions are provided in the approved TOR work plans and in Sections 7.0 to 13.0 of this EASR below.

The EA included evaluation of alternative Sites and identification of a preferred Site; development of Site development concepts and identification of the preferred concept; evaluation of leachate treatment and disposal options; characterization of the existing environment and assessment of environmental effects of the preferred Site development concept; evaluation of Site-related traffic and completion of EPA and OWRA technical supporting work.

2.1 Assessment Methodology

Taggart Miller undertook the EA in accordance with the approved TOR. The approach generally was to complete the EA studies using an EPA/OWRA level of detail in accordance with the TOR – approved work plans. While the EPA/OWRA application for the CRRRC will be submitted only after an EA approval is received, the information necessary to support the EPA/OWRA applications has been prepared and is submitted with this EA documentation to support the EA.

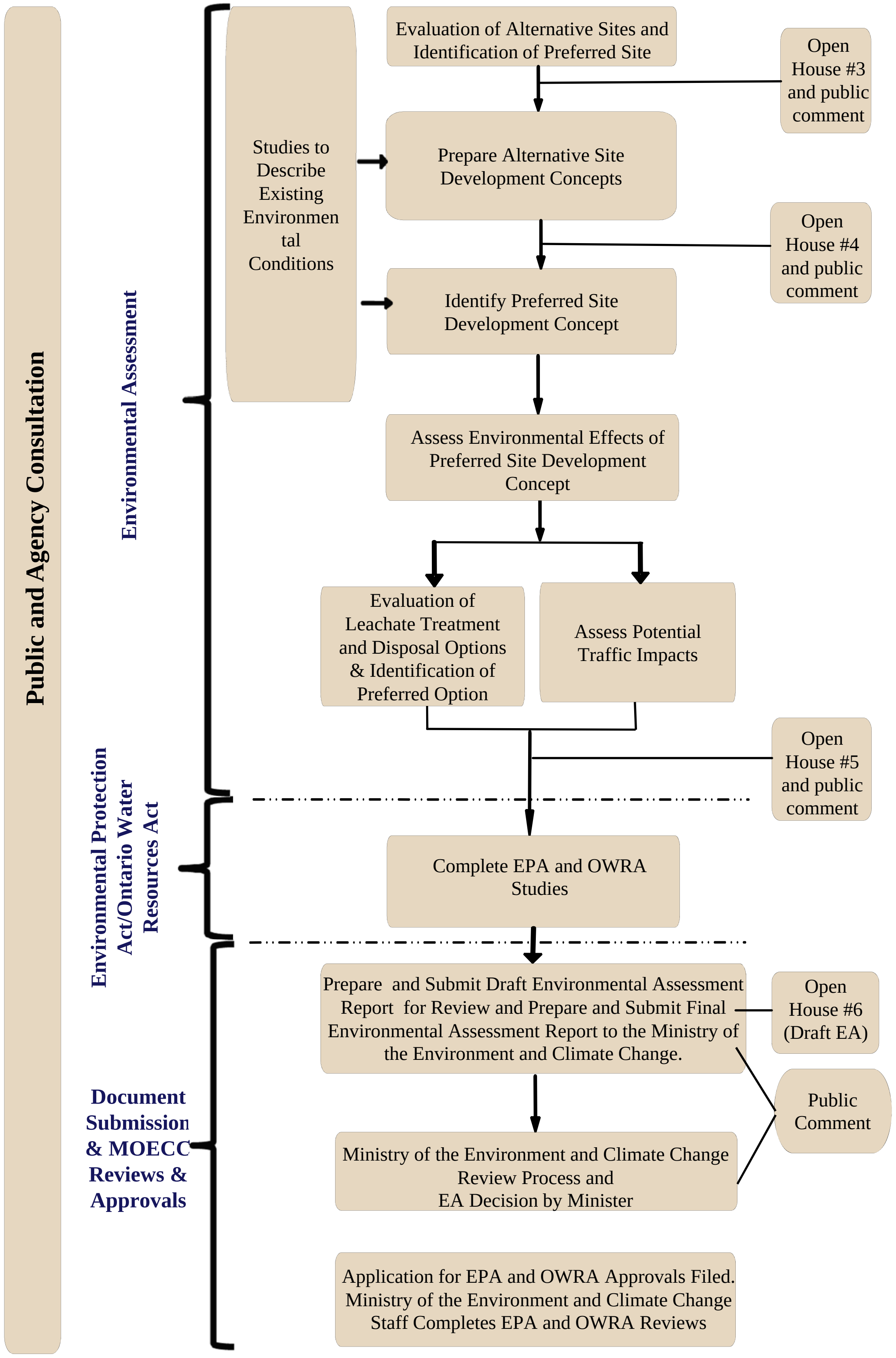
The overall EA/EPA/OWRA process is illustrated in Figure 2.1-1. The first step in the process was to undertake a comparative evaluation of the two alternative Sites and identify a preferred Site. The methods used to complete this step are described in Section 2.2.

Following identification of the Boundary Road Site as preferred, the EA studies and EPA/OWRA studies were then completed for the Boundary Road Site in three phases, as follows:

- Phase 1 was the completion of EA level assessments (using EPA level of detail where appropriate);
- Phase 2 was completion of EPA level activities; and
- Phase 3 was completion of the EA application and documentation package, including the supporting EPA/OWRA level information.

The tasks and methods used to complete this work are summarized in Sections 2.3 to 2.5.

Work plans for the individual environmental components/technical disciplines for the Boundary Road Site are contained in the approved TOR (Appendix A). The approved work plans were used to define baseline conditions and for the assessment of impacts/effects from the preferred Site development concept for the Boundary Road Site. The work plans are provided in the approved TOR (Appendix A).



NOTE

THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT

PROJECT

ENVIRONMENTAL ASSESSMENT OF THE
CAPITAL REGION RESOURCE RECOVERY CENTRE

TITLE

EA/EPA PROCESS FLOW CHART

Golder Associates

PROJECT No. 12-1125-0045			PHASE No. 4500	
DESIGN	PLE	Nov. 2013	SCALE AS SHOWN	REV.0
GIS	--	--	FIGURE 2.1-1	
CHECK	PLE	Aug. 2014		
REVIEW	PAS	Aug. 2014		

2.2 Comparative Evaluation of Alternative Sites and Identification of Preferred Site

The first step in the process was to undertake a comparative evaluation of the two alternative Sites and identify a preferred Site. This step consisted of three tasks:

- Task 1: describe the alternative Sites;
- Task 2: describe existing conditions through published information and field investigations/assessments for both Sites; and
- Task 3: conduct a comparative evaluation of the two Sites and select a preferred Site.

Taggart Miller secured two potential Sites for development of the proposed CRRRC. These are shown in Figure 1.4-1. The first Site is referred to as the North Russell Road Site. It is located in the northwest part of the Township of Russell, about five kilometres south of Provincial Highway 417 between Boundary Road and the Vars exits. The second Site is referred to as the Boundary Road Site. It is located in the east part of the City of Ottawa just southeast of the Highway 417/Boundary Road interchange.

In the second task, existing conditions for each Site and environmental component were described using published information and preliminary field investigations/assessments on and in the vicinity of each of the Sites. In the third and final task the alternative Sites were compared using the components, criteria, indicators and data sources presented in Appendix A of the approved TOR (Appendix A).

Section 7.0 of this report summarizes the results of the comparative evaluation of alternative Sites, which identified the Boundary Road Site as the preferred Site. Consequently, only the Boundary Road Site assessment work is summarized in the following sections.

2.3 Phase 1 – Boundary Road Site Assessment – Identify Preferred Site Development Concept and Assess Predicted Effects

Taggart Miller completed EA studies on the Boundary Road Site using the environmental components and the study areas described below.

Environmental components were evaluated for the preferred Site development concept at the Boundary Road Site, as specified in the approved TOR:

- Atmosphere (air quality/odour and noise)
- Geology, Hydrogeology & Geotechnical
- Surface Water
- Biology
- Land Use & Socio-economic (including visual)
- Cultural & Heritage Resources (including archaeology)
- Agriculture
- Traffic

The environmental components listed above were assessed using three (3) generic study areas as follows:

- Site – the lands secured by Taggart Miller for the proposed CRRRC at the Boundary Road Site ("the Site");
- Site-vicinity – the lands in the vicinity of the Site (generally 500 metres of the Site boundaries, but modified as determined appropriate for specific environmental components); and
- Haul Routes – the main haul/access route(s) to the Site from Highway 417.

Table 2.3-1 provides a summary of the study area boundaries for each environmental component.

Table 2.3-1: Summary of Environmental Component Study Areas

Environmental Component	On-Site	Site-vicinity	Haul Routes	Modification	Rationale
Atmosphere – Air Quality	✓	✓			
Atmosphere – Noise	✓	✓	✓		
Geology, Hydrogeology & Geotechnical *	✓	✓			
Surface Water	✓	✓		Sub-watershed	To capture the regional context
Biology	✓	✓			
Land Use	✓	✓	✓		
Socio-economic	✓	✓		Ottawa	To capture additional characteristics and census area
Visual	✓	✓			
Cultural Heritage Resources	✓	✓		250 metres	As generally accepted by the Ministry of Tourism, Culture and Sport (MTCS)
Archaeology	✓	✓		3 kilometres	In accordance with Standards and Guidelines for Consulting Archaeologists (MTCS, 2011)
Agriculture	✓	✓		2 kilometres	To capture additional characteristics
Traffic			✓		

Note: * A Regional geology assessment was completed over a 15 by 20 kilometre area.

The assessment of the net impacts at the Boundary Road Site was completed via six tasks as follows and described below:

- Task 1: Complete Assessment of Existing Environment (see Section 8.0 of this EASR);
- Task 2: Identify Preferred Site Development Concept (see Sections 9.0 and 10.0);
- Task 3: Assess Environmental Effects of Preferred Site Development Concept (see Section 11.0);
- Task 4: Assess Haul Route/Traffic (see Section 11.0);
- Task 5: Evaluate Leachate Management Options and Identify Preferred Option (see Section 12.0); and
- Task 6: Cumulative Impact Assessment (see Section 13.0).

The methods used to complete each task are described in the following sections.

2.3.1 Task 1: Complete Assessment of Existing Environment

An initial overview of existing conditions had been developed during the site comparison exercise that led to the identification of the Boundary Road Site as preferred. In this task the existing environment that could potentially be affected by the CRRRC at the Boundary Road Site was further described by the study team within study areas for each of the environmental components listed in Section 2.3. The methods used to complete the assessment of the existing environment are contained in Appendix C-2 (Boundary Road Work Plans) of the approved TOR (Appendix A).

The Atmospheric component was comprised of two subcomponents for the purposes of the Boundary Road Site EA assessment: air quality and noise. Information on existing conditions was obtained from existing data sources, including information available from Environment Canada and the Ontario Ministry of the Environment and Climate Change (MOECC) air quality monitoring data from local stations. Site reconnaissance was conducted to confirm Site conditions. Noise measurement surveys were conducted to determine baseline noise levels at potentially sensitive Points of Reception (PORs).

The Geology, Hydrogeology & Geotechnical component included consideration of groundwater quality, groundwater quantity, seismic and geotechnical conditions. Existing conditions data was updated by compiling and interpreting regional geological information to assess the bedrock structure and the potential for major faults, and conducting a review of information and features in relation to the potential for activity/movement along bedrock faults or in response to seismic events. Subsurface investigations were undertaken to characterize the overburden, geology and physical properties at the Site. Reconnaissance surveys were conducted to document the location and nature of significant subsurface features. Hydraulic conductivity was characterized, seasonal variations in groundwater levels were measured and groundwater samples were collected and analyzed to characterize groundwater quality. A conceptual model of geologic and hydrogeological conditions in the area was prepared.

The Surface Water component included consideration of existing surface water quantity and surface water quality. Surface water quality samples were collected at selected locations and analyzed for a suite of chemical and metal parameters. Surface water flow data upstream and downstream of the Site were summarized. An event based hydrologic model was used to calculate surface water runoff peak flow rates in the area of the proposed facilities for a range of design storms as set out in O. Reg. 232/98 (MOE, 1998a).

The Biology component consisted of an evaluation of existing terrestrial ecosystems and aquatic ecosystems. Readily available literature, data and agency material were identified, obtained and used to assist in describing natural features in the area including past natural feature surveys for the Site and Site-vicinity. A number of Site visits were conducted to verify and assess published information. Several terrestrial surveys were conducted including avian (breeding raptor, owl, breeding birds, eastern Whip-poor-will, Common Nighthawk and Chimney Swift); mammals/deer yard usage; amphibian; reptile; butterfly and dragonfly; and Species at Risk (SAR). Aquatic surveys included fish and benthic community surveys in appropriate seasons.

The Land Use and Socio-economic component considered land uses, employment and economics and visual aesthetics. The study team conducted field reconnaissance to describe the existing visual conditions of the Site from various off-Site viewpoints, reviewed the conceptual Site grading plan, aerial mapping and published information, including Statistics Canada census data. Existing environment information related to current and future land uses was collected during the comparison of alternative Sites and was re-confirmed during this task.

The Cultural & Heritage Resources component considered the cultural landscape and built heritage, and archaeological resources subcomponents. The study team completed an archaeological assessment and cultural heritage evaluation report on-Site and in the vicinity of the Boundary Road Site. An evaluation of properties was completed based on O. Reg. 9/06 (MTCS, 2006) of the *Ontario Heritage Act*.

The Agriculture component considered agricultural land and agricultural operations. The study team completed reconnaissance and Site-specific field studies to confirm data from available information sources. An agricultural capability evaluation was also completed. Cropping patterns and agricultural operations on the Site and adjacent lands were documented. Farm buildings were assessed with respect to current use and potential (original) use. Meetings were held with farmers and local municipal officials to obtain information about agricultural operations.

The Traffic component included consideration of traffic volume and the roadway network. A detailed study of the existing traffic and roadway network was completed, including identifying municipal and provincial design criteria and standards.

2.3.2 Task 2: Identify Preferred Site Development Concept

Two Site development concepts were prepared for the Boundary Road Site. Preparation of the Site development concepts considered many factors including: approximate area required for each facility component, alternative footprints/layouts, Site drainage, maximum landfill elevation and possible airspace requirements, leachate management requirements, Site roads and internal Site traffic flow and geotechnical characteristics.

As described in Section 9.0 of this EASR, input was sought from the public, the MOECC and Aboriginal communities on the alternate Site development concepts. Using the input received and the professional judgement of the study team, the concepts were compared and a preferred Site development alternative – Alternative A – was selected as described in Section 9.0 of this report.

2.3.3 Task 3: Assess Environmental Effects of Preferred Site Development Concept

In this task the EA study team predicted and assessed the net effects of the preferred Site development concept on the existing environment taking into account in-design and other mitigation measures as appropriate. Following are summaries of the methods used. The methods used to assess the effects of each environmental component are described in more detail in Appendix C-2 (Boundary Road Work Plans) of the approved TOR (Appendix A).

The Atmospheric team predicted and assessed air quality and odour emissions from the preferred Site development concept in relation to MOECC standards and criteria. Air emissions including landfill gas (LFG) collection and energy production, on-Site haul roads, excavation operations, waste processing equipment, composting, etc. were estimated. An atmospheric dispersion model (AERMOD) (US EPA, 2013) was used for the predictions and assessment. Noise emissions from equipment, haul roads, excavation operations, etc. were predicted (for worst case scenarios at sensitive PORs) using an ISO 9613 prediction model (ISO, 1993 and 1996).

The Geology, Hydrogeology & Geotechnical team used predictive models to assess the performance of the landfill component as per O. Reg. 232/98 (MOE, 1998a). The potential for change to recharging groundwater conditions and off-Site groundwater resources was evaluated using a flow model. In terms of seismicity, probabilistic seismic hazard models were used to provide estimates of the severity of earthquake shaking and assess the landfill stability. Consideration of seismic hazards for proposed structures at the CRRRC is accounted for in the building code.

The Surface Water team predicted and assessed future surface water runoff, peak flow and water quality conditions for a range of design storm events such as the 2, 5, 25 and 100 year storms. These predictions were compared to existing pre-development conditions to assess surface water quality and quantity impacts from the CRRRC.

Using impact predictions provided by study teams assessing other environmental components, the Biology study team assessed potential effects using both quantitative and qualitative methods.

Similarly, the Land Use and Socio-economic study team assessed potential effects on existing and proposed future land use in the area based on the preferred Site development concept and impact predictions from other study teams. Employment and economic data related to the proposed CRRRC were predicted and assessed, including employment, tax revenue, business impacts and value of goods and services to be generated. A visual assessment was completed using a 3D model of the proposed Site.

The Cultural & Heritage Resources team undertook an archaeological assessment and cultural heritage evaluation in relation to the Boundary Road Site.

The Agriculture study team assessed the potential impact of the CRRRC in relation to on-Site and off-Site agricultural land use. Using the results of predictive assessments carried out by the Atmospheric, Groundwater and Surface Water study teams, the potential effects on agricultural uses was assessed. Potential impacts considered included compatibility of land use, constraints on types of crops, crop yields and limitations on livestock facilities, location and type.

The traffic impact assessment is described below under Task 4: Assess Haul Route/Traffic.

2.3.4 Task 4: Assess Haul Route/Traffic

As a result of the comparative evaluation of the two Sites as described in Section 7.0, the Boundary Road Site was identified as the preferred Site. As such, and in accordance with the approved TOR, the Traffic study team assessed the effects of truck traffic to the Boundary Road Site from Highway 417 and at local intersections. The expected volume and distribution of Site generated trips were estimated. Road improvements or new construction requirements were identified. Potential effects on farm related traffic were also assessed.

2.3.5 Task 5: Evaluate Leachate Management Options and Identify Preferred Option

The evaluation of leachate management options was conducted by the Design and Operations and Surface Water teams. The Surface Water team provided effluent discharge criteria for on-Site treatment alternatives. The D&O team identified options and evaluated them. A number of on-Site leachate treatment technologies were screened and a preferred on-Site treatment option was selected based on demonstrated performance and cost-effectiveness. Off-Site treatment options were then evaluated and alternatives to convey leachate to available off-Site leachate treatment alternatives were considered. A comparison of the preferred on-Site and potential off-Site leachate management options was completed using the criteria provided in Appendix B of the TOR (Appendix A) and the preferred option – trucking to ROPEC – was identified.

2.3.6 Task 6: Cumulative Impact Assessment

The EA team identified one additional certain or probable project/development in the area of the Site. The predicted effect of this project/development was estimated based on publically available information. In addition, existing neighbouring land uses were considered. Each environmental component study team contributed to the assessment. The predicted net effects of the proposed CRRRC project were considered together with the likely overlapping effects of the other identified projects/developments in the area of the Site.

2.4 Phase 2 – EPA Studies

EPA studies and information are reported in two volumes (III and IV). This following section presents an overview of methods used for Task 7: Complete EPA Level Activities for Proposed CRRRC.

2.4.1 Hydrogeology Study Report

Additional analysis was completed as required to address specific approval requirements under the EPA and OWRA. The applications for EPA/OWRA approval for the CRRRC will be submitted following approval of the EA. These applications must be accompanied by a report describing the existing geological, hydrogeological, hydrological and geotechnical conditions of the proposed CRRRC, and the detailed prediction of impacts associated with the preferred Site development concept. This report includes an assessment of the service lives of the engineered components of the disposal component of the CRRRC as compared to its predicted contaminating lifespan and also includes a detailed monitoring program, trigger mechanism and conceptual contingency plans. This report, which is commonly referred to as the ‘Hydrogeology Study Report’, has been prepared and is being submitted as a supporting document to this EASR and is included in Volume III.

2.4.2 Design and Operations Report

A D&O Report is also required to support the EPA/OWRA applications, specifically under Sections 9 and 27 of the EPA and Section 53 of the OWRA. The D&O Report is also being submitted as a supporting document to this EASR and is contained in Volume IV. It contains the following assessments, designs and components:

- Stormwater management (SWM);
- Leachate management;
- Acoustic management;
- Air quality and odour assessment; and
- Site design and operations.

2.5 Phase 3 – Completion of EA Documentation Package

This EASR, together with the reports necessary for the applications for approval under the EPA and OWRA, are being submitted to the MOECC as a single package (contained in four individual volumes). This combined submission is intended to meet the requirements of all of the MOECC approval processes for the proposed CRRRC (overall Site development, residuals disposal component, diversion components and ancillary operational features). The formal EPA/OWRA applications including the required details on financial assurance, will be submitted only once the EA is approved. Depending on the EA conditions of approval or comments received on the EA, it may be necessary to supplement the EPA/OWRA reports already submitted as part of this EASR package. It is anticipated that this will be done in the form of addenda.

3.0 CONSULTATION ACTIVITIES

The consultation program for the EA was carried out in accordance with the approved TOR. The results of the program and supporting documents, including copies of notices, presentation materials, comments and correspondence are contained in the Consultation Record, which is Volume II of the EASR.

3.1 Overview

Prior to commencing the TOR development process, Taggart Miller developed a list of potentially interested persons, which included identified members of the public, local governments, interest groups, government agencies and Aboriginal communities. As the TOR development process and subsequently the EA progressed, Taggart Miller continually updated the consultation list to reflect additional parties interested in the CRRRC. This consultation list was used to communicate directly with stakeholders throughout the EA process.

In addition, the project website was regularly updated and there have been a number of public open houses, newsletters, workshops, meetings, site tours and tours of Miller facilities in the Greater Toronto Area as part of the TOR/EA consultation process.

3.2 Overview of Consultation during Development of the TOR

During the development of the TOR, consultation with interested parties occurred in a number of ways. A primary mechanism for sharing information was via public open houses of which there were two. The first open house occurred on November 25, 2010 and was organized to discuss the proposed CRRRC and the North Russell Road Site, the TOR and the EA processes. The second open house had two sessions that were held on June 20 and 25, 2012. The purpose of the open houses was to again provide an overview of the proposed CRRRC and its components, to present the second alternative Site – the Boundary Road Site – to be considered for the CRRRC, and to describe the proposed EA methodology and an overview of the contents of the TOR. Both open houses provided bilingual presentation boards and staff to assist interested persons in the language of their choice.

During development of the TOR a workshop on groundwater was also held on April 9, 2011 to assist residents and interested individuals to learn more about groundwater issues in relation to an integrated waste management facility at the North Russell Road Site. French speaking presenters were available at the workshop to discuss any of the concepts or materials in French as required (there was no request for French assistance during the workshop). The workshop material was subsequently posted on the CRRRC website in English and French.

In addition to these more formal events there were also tours of Miller diversion facilities in the Toronto area for interested parties, meetings with MOECC technical reviewers and others and release of draft workplans and project description for Government Review Team (GRT) and public comment, all of which are documented in more detail in the TOR (Appendix A).

3.3 Overview of Consultation during EA Studies

A variety of consultation events and activities were used during the EA study process. The consultation program for the EA was presented in the approved TOR. All Open Houses were fully bilingual. French speaking staff were also on hand during the groundwater workshop. An overview of the consultation program used during the EA is as follows:

- **Open House #3** was held in both Russell and Notre Dames des Champs. A more detailed description of the proposed CRRRC diversion and landfill components was presented as well as the results of the comparative evaluation of the alternative Sites and the rationale for identification of the preferred Site for the CRRRC;
- **Open House #4** was held in Carlsbad Springs only and presented the existing environmental conditions and preliminary findings for select disciplines at the Boundary Site and the alternative Site development concepts to be considered for this Site;
- **Open House #5** was held in Carlsbad Springs only and presented information on the assessment of environmental effects associated with the preferred Site development concept together with proposed mitigation measures, monitoring and contingency measures; the results of the alternative haul routes/Site access assessment; the results of the leachate treatment assessment; the results of the cumulative impact assessment; an outline of the proposed EA/EPA documentation package; and an overview of the proposed schedule for submissions and the MOECC decision making process. Participants at this Open House were also informed of the plans regarding distribution of the draft EA for review;
- **Open House #6** was held during the GRT and public review period for the draft EA. An overview of the draft EA was provided for public feedback;
- **A meeting and Site tour was** held with the Carlsbad Springs Community Association executive;
- **A Workshop/Technical Session** was held to discuss groundwater and groundwater protection in relation to the Boundary Road Site. The public was made aware of the upcoming workshop by soliciting interest at Open House #4 and via advertisements in the local papers;
- **Project Website** (www.crrrc.ca) was maintained to inform the public on the EA process and public consultation activities. Taggart Miller made materials available on the website at key EA milestones; and
- **The Draft EA** was made available for GRT and public comment prior to finalization and submission to the MOECC. There was a seven week review period provided for the draft EA.

3.4 Aboriginal Communities

A list of potentially affected Aboriginal groups/organizations was identified in consultation with the MOECC, Ontario Ministry of Aboriginal Affairs and Aboriginal Affairs and Northern Development Canada. The following Aboriginal groups/organizations were consulted during the progress of the EA as further discussed below:

- Métis Nation of Ontario
- Ottawa Métis Nation Council
- Algonquins of Ontario Consultation Office
- Algonquins of Ottawa
- Algonquins of Pikwakanagan First Nation
- Mohawks of Akwesasne

The Algonquins of Ottawa were added to the list during Open House #3; otherwise the list of groups/organizations consulted remains the same as during development of the TOR.

3.5 Government Review Team

The following federal, provincial, municipal and local government departments/ministries/agencies, health units, school boards and private corporations comprise the GRT for this EA. All of them received notice of the public consultation events during the EA. In addition, consultation occurred with several of these departments/ministries/ agencies on specific items during the progress of the EA studies.

Federal Government

- National Capital Commission (NCC)
- Transport Canada
- Environment Canada

Provincial Government

- Ministry of Agriculture, Food and Rural Affairs (OMAFRA)
- Ministry of Tourism, Culture and Sport (MTCS)
- Ministry of Energy
- Ministry of Health and Long-Term Care
- Ministry of Municipal Affairs and Housing (MMAH)
- South Nation Conservation (SNC)
- Ministry of Natural Resources and Forestry (MNRF)
- MOECC

- Ministry of Transportation (MTO)
- Ministry of Northern Development and Mines (MNDM)
- Ontario Provincial Police

Other

- Catholic District School Board of Eastern Ontario
- Conseil des écoles publiques de l'Est de l'Ontario
- Upper Canada District School Board
- Ottawa-Carleton District School Board
- Conseil des écoles catholiques du Centre-Est
- Eastern Ontario Health Unit Russell Fire Department
- Ottawa Public Health
- Ottawa Fire Services
- City of Ottawa

Health Canada, Ministry of Citizenship, Immigration, Tourism, Culture and Sport, Ministry of Industry and Energy and Ministry of Health and Long Term Care were removed from further consultation during the Notice of Commencement or following distribution of key draft documents as documented in the TOR. The Canadian Environmental Assessment Agency and Conseil scolaire de district catholique de l'Est ontarien indicated they had no comments on the TOR and did not require any further involvement with this proposal. The Department of Fisheries and Oceans was removed from further consultation following submission of the TOR as they requested a self-assessment be completed and the proposed CRRRC did not fall within their mandate. The Ministry of Education was removed from further consultation following approval of the TOR as the project is not directly related to schools or school boards and all appropriate school boards have been contacted.

3.6 Summary of Consultation Events

The following is a summary of the principal consultation events that occurred during the EA study process. Note that Appendices referred to in Section 3.6 refer to Volume II of this EASR – the Consultation Record.

3.6.1 Open House #3 – February 25 and 27, 2013

Commencement of EA Study Process and Consultation materials relating to Open House #3 are contained in Volume II, Appendix A. On February 7, 2013 Taggart Miller issued a bilingual media release announcing the commencement of the EA study process and upcoming Open House #3 (Volume II, Appendix A-1). This media release also included a brief overview of the CRRRC, information on the proponent, the location of the undertaking, the purpose of Open House #3, upcoming consultation events and how to contact the proponent with comments and questions.

Notification of the preferred Site and Open House #3 was published by paid advertisements between February 11 and February 14, 2013 in the following newspapers:

- Le Reflet/The News (French) (Volume II, Appendix A-2);
- The Villager (English) (Volume II, Appendix A-3);
- Le Droit (French) (Volume II, Appendix A-4); and
- Ottawa Citizen (English) (Volume II, Appendix A-5).

The notice was also posted in English and French on the CRRRC website and the Carlsbad Springs Community Association website and facebook page on February 7, 2013 and February 11, 2013, respectively. In addition, a bilingual e-mail was sent to approximately 430 stakeholders on the project mailing list on February 8, 2013 (Volume II, Appendix A-6). The notice was also mailed on February 7, 2013 to eight addresses for members of the community who only provided their mailing address. The representatives of the Aboriginal communities identified in Section 3.4 were contacted by e-mail and by phone on February 7, 2013 (emails and record of telephone conversations are provided in Volume II, Appendix A-7). Additional e-mails were also sent to local politicians, municipal staff and local media on February 7, 2013. On February 7, 2013 emails were also sent to all members of the GRT with e-mail addresses (Volume II, Appendix A-8). Those members of the GRT who had not provided an e-mail address were mailed a bilingual hard copy of the e-mailed information on February 8, 2013.

Open House #3 was organized into two identical sessions. The first session of Open House #3 occurred on February 25, 2013 from 4 p.m. to 9 p.m., at the Carlsbad Springs Community Centre in the City of Ottawa. The second session of Open House #3 occurred on February 27, 2013 from 4 p.m. to 9 p.m., at the Russell Arena in the Village of Russell.

The purpose of Open House #3 was to announce the preferred Site and provide information about the rationale for selection of the preferred Site, the proposed CRRRC facility and the next steps in the environmental assessment process.

This event was designed to provide opportunities for attendees to speak directly with Taggart Miller representatives and their EA consulting team in English or French. Attendees were asked to sign in at the entrance and were encouraged to fill out comment sheets in order to provide feedback and recommendations.

Seven representatives of Taggart Miller and 17 consultants attended Open House #3 on February 25, of which nine were fluently bilingual and wore clear identification that they were available for discussions in French. Seven representatives of Taggart Miller and 14 consultants attended Open House #3 on February 27, of whom nine were fluently bilingual.

A total of 28 display boards in English and French were featured at Open House #3 (Volume II, Appendix A-9). A bilingual comment sheet was provided requesting feedback on the comparative evaluation of the two Sites (Volume II, Appendix A-10). In addition to the comment sheet, attendees were provided with a copy of the Summary Report of the Comparative Evaluation of Alternative Sites in English or French (Volume II, Appendix A-11). The Summary Report, display boards and comment sheets were posted on the CRRRC project website in advance of the Open House sessions. Attendees could complete the comment sheet at the Open House or send it back via regular mail or e-mail.

The Dump this Dump 2 opposition group advised attendees not to fill in comment sheets or to sign in. However the bilingual front desk staff was instructed to keep a count of attendees.

A total of approximately 245 people were in attendance at the first session of Open House #3 on February 25, 2013 in Carlsbad Springs. A total of 26 comment sheets were completed at the first session of Open House #3 (Volume II, Appendix A-12).

A total of approximately 61 people were in attendance at the second session of Open House #3 on February 27, 2013 in Russell. A total of two comment sheets were completed at the second session of Open House #3 (Volume II, Appendix A-13).

The comments are discussed in Section 3.7.1 of this EASR.

3.6.2 Open House #4 – June 5, 2013

Open House #4 occurred on June 5, 2013 from 4 p.m. to 9 p.m., at the Carlsbad Springs Community Centre in the City of Ottawa.

Consultation materials relating to Open House #4 are contained in Volume II, Appendix B of this EASR.

Bilingual advertising and notification for Open House #4 occurred between May 21 and May 23, 2013 in the following newspapers:

- Le Reflet/The News (French) (Volume II, Appendix B-1);
- The Villager (English) (Volume II, Appendix B-2);
- Le Droit (French) (Volume II, Appendix B-3); and
- Ottawa Citizen (English) (Volume II, Appendix B-4).

The advertising included a brief overview of the CRRRC, information on the proponent, the location of the undertaking, the EA process, the purpose of Open House #4, upcoming consultation events and how to contact the CRRRC with comments and questions.

The bilingual notification of Open House #4 was also posted on the CRRRC website and the Carlsbad Springs Community Association website. In addition, a bilingual e-mail was sent to approximately 430 members of the community on May 21, 2013 (Volume II, Appendix B-5). The notice was also mailed to eight addresses for members of the community who only provided their mailing address on May 22, 2013. The representatives of the Aboriginal communities identified in Section 3.4 were contacted by e-mail and/or by phone on May 28, 2013 (Volume II, Appendix B-6). On May 24, 2013 emails were also sent to all members of the GRT with e-mail addresses (Volume II, Appendix B-7). Those members of the GRT who had not provided an e-mail address were mailed a bilingual hard copy of the e-mailed information on May 24, 2013. Additional e-mails were also sent to local politicians and municipal staff on May 21, 2013.

The purpose of Open House #4 was to present and obtain comments from the public on possible alternative Site development concepts and to provide an update on assessment work related to the geology, hydrogeology & geotechnical, visual (socio-economic) and traffic disciplines at the Boundary Road Site, which had been identified as the preferred Site for the project at Open House #3.

This event was designed to provide opportunities for attendees to speak directly with Taggart Miller representatives and their EA consulting team. Attendees were asked to sign in at the entrance and were encouraged to fill out comment sheets in order to provide feedback and recommendations. A French area was designated and identified at the entrance to the venue to provide information in French by a bilingual member of the project team, and to provide additional background material and insight about the project and the Open House to Francophone residents. Project team members at the Open House who were bilingual were clearly identified with different name badges.

Eight representatives of Taggart Miller and 15 consultants attended Open House #4 on June 5, of which eight were fluently bilingual and wore clear identification that they were available for discussions in English or French.

A total of 27 display boards in English and French were featured at Open House #4 (Volume II, Appendix B-8). A bilingual comment sheet was provided requesting feedback on the alternative Site development concepts (Volume II, Appendix B-9). In addition to the comment sheet requesting comments on the alternative Site development concepts, attendees were provided with a bilingual groundwater workshop registration sheet asking for interest in a workshop to be held on June 22, and a bilingual backgrounder on a proposed Property Value Protection Plan (PVPP) (Volume II, Appendices B-10 and B-11, respectively). The handouts, display boards and comment sheets were posted on the CRRRC project website in advance of the Open House. Attendees could complete the comment sheet at the Open House or send it back via regular mail or e-mail.

The bilingual front desk staff was instructed to keep a count of attendees. A total of approximately 52 people were in attendance at Open House #4. As people passed by the alternative Site development concept presentation boards, they were asked if they had a preference and why. Only one comment sheet was completed on the alternative Site development concepts at Open House #4 (Volume II, Appendix B-12). A total of six workshop registration forms were completed and submitted at the Open House indicating an interest in attending the June 22, 2013 workshop on groundwater. Approximately four to five dozen people attended a presentation by the Capital Region Citizens' Coalition for Protection of the Environment (Dump the Dump2 group) in the parking lot during the Open House.

Comments received are discussed in Section 3.7.2 of this EASR.

Further comments on the alternative Site development concepts were solicited from the MOECC and the Aboriginal communities and are discussed in Sections 3.6.6 and 3.6.7 of this EASR, respectively.

3.6.3 Workshop #2 – June 22, 2013

During Open House #4, held on June 5, 2013, attendees were asked to indicate their interest in attending a groundwater workshop. In addition to the registration forms available at Open House #4, forms were also available on the EA website. A bilingual e-mail encouraging participation at the workshop was sent on June 12, 2013 to approximately 430 individuals from Taggart Miller's project mailing list (Volume II, Appendix C-1). In total, 19 individuals registered for the event.

The groundwater workshop was held at the Carlsbad Springs Community Centre in the City of Ottawa on June 22, 2013 between 1 p.m. and 5 p.m. Thirteen people attended the session. The workshop was led by Professor Kerry Rowe from Queen's University, with assistance from Golder Associates Ltd. Professor Rowe is a world-recognized expert in groundwater protection in relation to waste management facilities. Participants were seated in a classroom fashion to allow all participants to easily see the PowerPoint presentation prepared and presented by Golder Associates Ltd. and Dr. Kerry Rowe. Each attendee was given a hard copy of the presentation material and was encouraged to comment and ask questions throughout the presentation. A copy of the presentation material is provided in English and French in Volume II, Appendix C-2.

Prior to starting the workshop, a bilingual hydrogeologist from Golder Associates Ltd. spoke to the attendees in French to let them know that any part of the presentation could be translated into French to ensure that everyone clearly understood the topic.

There were five EA consultants in attendance at the groundwater workshop as well as Dr. Rowe. One of the consultants was fully bilingual.

The workshop material was posted on the CRRRC project website approximately one week following the workshop.

The representatives of the Aboriginal communities identified in Section 3.4 were contacted by e-mail on July 8 and 9, 2013 and provided the workshop material and invited to meet to discuss the material (Volume II, Appendix C-3). Additional e-mails were also sent to local politicians and municipal staff on June 28, 2013 advising them that the workshop occurred and providing the workshop material.

3.6.4 Newsletter – October 31, 2013

In the fall of 2013 Taggart Miller prepared a bilingual newsletter for distribution to the Carlsbad Springs and Edwards areas (Volume II, Appendix D). The newsletter outlined possible community benefits such as a community fund and property value protection, and provided information on the proposed facility and the EA process. Approximately 650 copies of the newsletter were dropped off at Canada Post locations on October 31, 2013 for distribution within mailboxes in these locations. The bilingual newsletter was posted on the project website on October 31, 2013.

3.6.5 Open House #5 – December 5, 2013

Consultation materials relating to Open House #5 are contained in Volume II, Appendix E.

Bilingual advertising and notification for Open House #5 occurred between November 20 and 21, 2013 in the following newspapers:

- Le Reflet/The News (French) (Volume II, Appendix E-1);
- The Villager (English) (Volume II, Appendix E-2);
- Le Droit (French) (Volume II, Appendix E-3); and
- Ottawa Citizen (English) (Volume II, Appendix E-4).

The advertising included a brief overview of the CRRRC, information on the proponent, the location of the undertaking, the EA process, the purpose of Open House #5, upcoming consultation events and how to contact the CRRRC with comments and questions.

The bilingual notification of Open House #5 was also posted on the CRRRC website and the Vars Community Association website. In addition, a bilingual e-mail was sent to approximately 470 stakeholders on November 21, 2013 (Volume II, Appendix E-5). The notice was also mailed on November 19, 2013 to eight addresses for members of the community who only provided their mailing address. The representatives of the Aboriginal communities identified in Section 3.4 were contacted by e-mail and/or by phone on November 22 and November 26, 2013 (Volume II, Appendix E-6). On November 22, 2013 emails were also sent to all members of the GRT with e-mail addresses (Volume II, Appendix E-7). Those members of the GRT who had not provided an e-mail address were mailed a bilingual hard copy of the e-mailed information on November 20, 2013. Additional e-mails were also sent to local politicians and municipal staff on November 21, 2013.

Open House #5 occurred on December 5, 2013 from 4 p.m. to 9 p.m., at the Carlsbad Springs Community Centre in the City of Ottawa.

The purpose of Open House #5 was to present and obtain comments from the public concerning the preferred Site development concept; the assessment of environmental effects associated with the project together with proposed mitigation measures, monitoring and contingency measures; the results of the leachate treatment, haul route and cumulative impact assessments; an outline of the proposed EA/EPA document package; and an overview of the proposed schedule for submissions and the Ministry decision making process. Participants at this Open House were also informed of the plans regarding distribution of the draft EA for review.

This event was designed to provide opportunities for attendees to speak directly with Taggart Miller representatives and their EA consulting team. Attendees were asked to sign in at the entrance and were encouraged to fill out comment sheets in order to provide feedback and recommendations.

Nine representatives of Taggart Miller and 16 consultants attended Open House #5 on December 5, of which seven were fluently bilingual and wore clear identification that they were available for discussions in English or French.

A total of 41 display boards in English and French were featured at Open House #5 (Volume II, Appendix E-8). A bilingual comment sheet was provided requesting general feedback (Volume II, Appendix E-9). In addition to the comment sheet, attendees were provided with a bilingual handout outlining the EA/EPA study report format (Volume II, Appendix E-10). The handout, display boards and comment sheet were posted on the CRRRC project website in advance of the Open House. Attendees could complete the comment sheet at the Open House or send it back via regular mail or e-mail.

The bilingual front desk staff was instructed to keep a count of attendees. A total of approximately 61 people were in attendance at Open House #5. A total of eight comment sheets were submitted at the Open House and one additional comment sheet was received by email (Volume II, Appendix E-11).

All comments received are discussed in Section 3.7.3 of this EASR.

3.6.6 Meetings with GRT Technical Reviewers during the EA

During the course of the EA, the consulting team consulted with and spoke to members of the GRT on several occasions. The more formal of these interactions are summarized below.

On May 23, 2013 the consulting team and a Taggart Miller representative had a pre-consultation meeting with the City of Ottawa and South Nation Conservation to review requirements for official plan and zoning amendments and to identify, where possible, any City requirements or studies needed beyond the EA studies that were already being completed.

On June 19, 2013 the consulting team had a conference call with members of the MOECC regarding alternative Site development concepts (Volume II, Appendix F-1). Specifically the consulting team was seeking some opinion from the MOECC regarding a preference between the two alternative Site development concepts. Overall no opinion on the alternative Site develop concepts was provided other than, a landfill component further from the eastern property boundary was considered preferable that could best be achieved with Alternative Concept A.

During development of the TOR and from July to October of 2013 the consulting team had several discussions with the City of Ottawa to confirm what may be required related to possible approvals under the *Drainage Act* for the CRRRC project on the Boundary Road Site.

Between July 23 and September 12, 2013 the consulting team and a Taggart Miller representative had several meetings and calls with the City of Ottawa to assess City requirements for sending CRRRC wastewater to the City of Ottawa's wastewater treatment facility, the Robert O Pickard Environmental Centre (ROPEC).

During the EA the consulting team had several discussions with the MNRF regarding one recording of little brown myotis on the Boundary Road Site. These discussions occurred between August 27 and October 10, 2013.

The consulting team had a conference call with the MOECC groundwater technical reviewers from Kingston on September 12, 2013 to discuss how the potential impacts on groundwater associated with the CRRRC landfill component would be modelled and what parameters to consider (Volume II, Appendix F-2).

On October 9, 2013 the consulting team had a conference call with the MOECC air quality reviewers from Kingston and Toronto to discuss how landfill gas emissions for the proposed CRRRC landfill component would be estimated.

On April 16, 2014 the consulting team and a Taggart Miller representative met with the NCC to review the project, the perceived interests of the NCC based on comments received on the TOR and the findings of the EA studies related to their identified areas of interest. A record of the meeting is summarized in an e-mail (Volume II, Appendix F-3).

The MNRF met with the consulting team on May 13, 2014. During the meeting, time was spent reviewing the history of the project, the TOR and EA process. As described, the EA compared two sites, the Boundary Road Site and the North Russell Road Site. The North Russell Road Site had an active mineral aggregate extraction license, which is an area of interest to the MNRF. As the comparison of the two sites identified that the Boundary Road Site was preferred, and there are no aggregate resources on or in the area of the Boundary Road Site, the issue of aggregate resources is no longer a matter to be addressed for the approval or development of the proposed CRRRC. Detail on the natural environment surveys conducted and how and when MNRF biological staff was engaged during the EA study process was described. It was discussed that the surveys were extensive.

3.6.7 Meetings and Liaison with Aboriginal Communities

The following details are provided in chronological order.

The Chief of the Algonquins of Ottawa attended Open House #3 in February 2013 and indicated he was satisfied that the sites were on private land and with the information presented. The Chief has been alerted to all subsequent Open Houses but has not attended.

The consulting team met with the Algonquins of Ontario (AOO) on two separate occasions. The first meeting with the AOO occurred on April 9, 2013. During this meeting the consulting team and the AOO shared information, which is outlined in the meeting summary (Volume II, Appendix G-1). Specifically the consulting team gained an appreciation of who is represented by AOO and their interest in the CRRRC.

The representatives of the Aboriginal communities identified in Section 3.4 were all contacted by e-mail on June 11 and 12, 2013 requesting feedback on the Site development concepts (Volume II, Appendix G-4). No written feedback was received.

The AOO was provided the draft Stage 1 archaeological assessment report, as requested, on July 9, 2013. On February 20, 2014 the AOO provided comments on the draft report (Volume II, Appendix G-3). The edit requested by the AOO was made to the Stage 1 report, the archaeology TSD #6 and the EASR.

The second meeting with the AOO occurred on October 8, 2013 and was requested by the AOO during followup regarding their review of the draft Stage 1 archaeological assessment. During this meeting the AOO indicated that they were working on gathering information on the 200+ properties that may come to the AOO as per their land claim, and prioritizing them in terms of potential development. The CRRRC is in the vicinity of two Boundary Road properties earmarked for the Algonquins; the AOO requested information from Taggart Miller to hand out at an upcoming AOO meeting as a CRRRC project status report update. This information was provided on October 30, 2013 and included the alternative Site development concepts and a summary document (Volume II, Appendix G-2).

At the meeting with the AOO on October 8, 2013 they were again asked for their opinion on the Site development concepts, but they indicated that they did not have a preference for one over the other.

On July 3, 2014 the consulting team and Taggart Miller representatives met with representatives of the Mohawk Council of Akwesasne at the request of the Council following receipt of the draft EA. A brief presentation was provided outlining the proponent, the project and its evolution, presenting the layout and structure of the Draft Environmental Study Report, reviewing some results of the environmental assessment and summarizing aboriginal outreach to date. The meeting was well received and a subsequent meeting to discuss opportunities to work together took place on October 16, 2014.

3.6.8 Open House #6 – June 25, 2014

Consultation materials relating to Open House #6 are contained in Volume II, Appendix H.

Bilingual advertising and notification for Open House #6 occurred on June 11, 2014 in the following newspapers:

- Le Reflet/The News (French) (Volume II, Appendix H-1);
- The Villager (English) (Volume II, Appendix H-2);
- Le Droit (French) (Volume II, Appendix H-3); and
- Ottawa Citizen (English) (Volume II, Appendix H-4).

The advertising included a brief overview of the CRRRC, information on the proponent, the location of the undertaking, the EA process, the purpose of Open House #6, information on how and when to review the draft EA and how to contact the CRRRC with comments and questions.

The bilingual notification of Open House #6 was also posted on the CRRRC website, the Carlsbad Springs Community Association website and the Vars Community Association website. In addition, a bilingual e-mail was sent to approximately 470 stakeholders on June 10, 2014 (Volume II, Appendix H-5). The notice was also mailed on June 10, 2014 to one address for a member of the community who only provided their mailing address. The representatives of the Aboriginal communities identified in Section 3.4 were contacted by e-mail and/or by phone on June 16 and 17, 2014 (Volume II, Appendix H-6). On June 16, 2014 emails were also sent to all members of the GRT with e-mail addresses (Volume II, Appendix H-7). Additional e-mails were also sent to local politicians and municipal staff on June 10, 2014.

Open House #6 occurred on June 25, 2014 from 4 p.m. to 9 p.m., at the Carlsbad Springs Community Centre in the City of Ottawa.

The purpose of Open House #6 was to present the draft EA and obtain comments from the public.

This event was designed to provide opportunities for attendees to speak directly with Taggart Miller representatives and their EA consulting team. Attendees were asked to sign in at the entrance and were encouraged to fill out comment sheets in order to provide feedback and recommendations.

Eight representatives of Taggart Miller and 16 consultants attended Open House #6 on June 25, of which six were fluently bilingual and wore clear identification that they were available for discussions in French.

A total of 26 display boards in English and French were featured at Open House #6 (Volume II, Appendix H-8). In addition, 3 hard copies of the complete draft EA were available for reference and review during Open House #6. A bilingual comment sheet was provided requesting general feedback (Volume II, Appendix H-9). The display boards and comment sheet were posted on the CRRRC project website immediately following the Open House. Attendees could complete the comment sheet at the Open House or send it back via regular mail or e-mail.

The bilingual front desk staff was instructed to keep a count of attendees. A total of approximately 275 people were in attendance at Open House #6. A total of five comment sheets were submitted at the Open House (Volume II, Appendix H-10).

All comments received are discussed in Section 3.7.4 of this EASR.

3.6.9 Draft Environmental Assessment

The draft environmental assessment was released on June 11 for public comment to July 31, 2014. The advertisements and notices indicating the availability of the draft environmental assessment for comment were included within the advertisements for Open House #6. Details of how and where notices of the availability of the draft Environmental Assessment was available have been discussed in Section 3.6.8.

All members of the GRT and aboriginal communities were contacted in advance of release of the draft Environmental Assessment to confirm their on-going desire to be consulted about the project, confirm their address and determine whether they required hard copies or CD's for their review and how many copies. The draft EA was distributed on June 6 and 9, 2014 following these requirements. The GRT and aboriginal communities were invited to contact Taggart Miller if they had questions or wanted to discuss the draft EA.

Members of the public whom requested copies of the draft EA specifically or previously received a copy of the TOR were sent the draft EA on June 9 or 10, 2014.

Following distribution of the draft EA, the City of Ottawa contacted Taggart Miller on June 17, 2014 and requested a meeting to assist with their review of the draft EA. On June 24, 2014 the consulting team met about 15 individuals from various City departments to go over the project and its evolution, to present the layout and structure of the draft EA, to review some of the results from the EA and to provide an opportunity for questions and answers. A copy of the presentation material is provided in Volume II, Appendix F-4.

A summary of comments received on the draft EA are discussed in Section 3.7.7.

Following receipt of the comments from the MOECC, several conference calls were organized to assist the project team in understanding some of the requests and comments provided. Calls occurred on September 26, 2014 and October 21 and 30, 2014.

3.7 Summary of Concerns Raised during Consultation

Comments and questions were welcomed from attendees by Taggart Miller during each of the consultation events described in Sections 3.6.1, 3.6.2, 3.6.5, 3.6.8 and 3.6.9 (Open House #3, Open House #4, Open House #5, Open House #6 and Submission of Draft EASR , respectively). As is the nature of Open Houses, there were literally hundreds of individual discussions during these Open Houses, which are impossible to fully document.

3.7.1 Open House #3 – February 25 and 27, 2013

Oral comments received during Open House #3 varied widely. Concerns expressed were similar to those at previous consultation events; that is in regard to protection of groundwater, surface water and air quality, nuisance effects such as noise and need for the project. There was also interest in the property value protection plan.

A total of 26 and two comment sheets were completed at the first and second sessions of Open House #3, respectively (Volume II, Appendix A-12 and Appendix A-13, respectively). A summary of the key comments (commenting on specific aspects of the project relevant to the EA) received are listed below in Table 3.7.1-1 along with how they were addressed in the EA. There were also comments which expressed general opposition to the project or a preference for a different location. Note that the comments received do not necessarily address the question asked regarding the comparison of alternative Site development concepts. Further, for convenience some comments have been merged together to cover a particular topic. In general, the attendees were concerned about the impact of the Site on the area (including the environmental performance of the landfill) and questioned the choice/need of the Site and what would happen to the North Russell Road Site. The concerns were generally addressed within the EA through evaluations and mitigation/engineered controls.

Table 3.7.1-1: Comments from Open House #3

Key Comment	Action/Response
Concerned about groundwater contamination. Concerned about liners, their longevity, leak detection and what happens if leaks occur.	A full description of how impact to groundwater was evaluated and its predicted compliance with provincial requirements is provided in Volume III of the EASR. This Volume also considered what engineered controls are proposed to protect groundwater, how long they can reasonably be assumed to last, monitoring and contingency plans.
Concerned about traffic on the north end of Boundary Road. Concerned about traffic from the south. Concerned about traffic in general. Noted that the exit off Highway 417 is already congested.	The complete evaluation of traffic, including its expected distribution, is provided in TSD #9.
Concerned about property values.	A proposed PVPP is generally described in Section 15.0 of the EASR.
Concerned about development on leda clay.	A full description of the geotechnical investigation and analysis is provided in Volume III.
Concerned about odour.	A full description of how odour was evaluated and its predicted compliance with provincial requirements is provided in TSD #3.
Noted that they found it unusual that the Boundary Road Site was found preferable for every component.	The Boundary Road Site was preferable for each component as is documented in Section 7.0 of the EASR.
Noted Taggart Miller should set the standard for diversion achieved.	Section 4.0 of the EASR describes the provincial average for diversion is about 13%. Taggart Miller are predicting ultimate diversion rates significantly above that (>40%) at the CRRRC.
Noted that species at risk were only identified in higher form.	As this was a summary of information at an Open House, it was only possible to list the species at risk in higher form. A complete description of species observed at the Boundary Road Site, including species at risk, is provided in TSD #4.
Expressed dissatisfaction with the format of the Open House rather than a public meeting.	There is no one consultation method that is likely to satisfy all participants. An open house format with display boards, as used throughout the consultation process, allows for more complete sharing of information on multiple topics at the same time and for the most people to have their questions responded to and is typical in EA processes.
Stated that the project is not needed.	Taggart Miller's opportunity assessment for this proposal was provided in Supporting Document #1 to the approved TOR.
Requested that turtles, bats and endangered tree species be studied.	These were considered and results are presented in TSD #4.

Key Comment	Action/Response
Inquired about re-planting after trees are removed from the Site. Requested that any re-planting be done with native species. Inquired about a plan to deal with invasive species once the land is cleared.	Comment noted. A landscape plan will be required as part of City of Ottawa approvals for development of the Boundary Road Site. Taggart Miller will consider using native species. As only land that will be used actively will be cleared as part of this project, invasive species will be removed should they advance following land clearing.
Concerned that risks identified by the Township of Russell Environmental Sub-Committee have not been considered.	Taggart Miller considered the matters identified by the Township of Russell Environmental Sub-Committee and the work plans in the approved TOR considered these matters as deemed appropriate.
Inquired about what will happen to the North Russell Road Site.	Taggart Miller does not need two Sites for the integrated waste management facility. The North Russell Site will be sold, however the timing of that has not been decided. The timing of any sale will depend on interest and market conditions.
Inquired about the health of residents.	The CRRRC will be designed and operated to meet MOECC requirements and standards that are intended to be protective of health and the environment.
Requested a Site plan.	At the time of Open House #3, the project team did not yet have a detailed Site plan. Site development concepts were presented at Open House #4.
Requested the North Russell Road Site should be donated to the conservation authority or Township.	Acknowledged.

3.7.2 Open House #4 – June 5, 2013

During Open House #4, concerns similar to those heard previously continued to be expressed regarding protection of groundwater, surface water and air quality, nuisance effects such as noise and the overall need for the project. There was also continued interest in the property value protection plan.

Only one comment sheet was completed at Open House #4 (Volume II, Appendix B-12). The respondent suggested that there was insufficient information to comment on the alternative Site development concepts.

Taggart Miller solicited additional input on which Site development concept was preferred by the public by: 1) asking the public verbally of their preference at Open House #4 and 2) by posting the two concepts on the CRRRC website. Verbally, no attendees at Open House #4 indicated a preference for Alternative B; to the extent feedback was provided it was all in favour of Alternative A.

3.7.3 Workshop #2 – June 22, 2013

During the presentations, attendees asked questions generally relating to groundwater flow in the area, potential contaminant migration, and MOECC regulations as they related to landfills. Attendees were also very interested in the interpreted hydrogeological and geological setting of the Site, and asked about groundwater supply from dug wells in the area of the Site.

Following the discussions on groundwater, and both the regional and site-specific hydrogeology and geology, Dr. Kerry Rowe presented landfill design considerations as set out in the Ontario Landfill Standards and O. Reg. 232/98, and a discussion on leachate. Attendees asked about the safety of liners and impacts of earthquakes. Dr. Rowe explained his research (and that of others) to date regarding liner safety and service life, and the contaminating lifespan of various contaminants commonly found in landfill leachate.

There was discussion on seismic considerations and the possibility of an escape of leachate from the landfill associated with a large earthquake. It was explained that earthquake shaking is being considered as part of the study and seismic analysis is required for assessment and design of the CRRRC project as set out in the approved TOR.

At the end of the session, two attendees thanked Taggart Miller for providing a very informative session. They stated that while they did not always agree with the interpretation, they were both satisfied that Golder was investigating important issues of hydrogeology, geological setting and seismic movement on both a regional and project site-specific scale.

One participant complained that the session did not have the information expected and did not answer her questions. This participant however did not arrive at the session until well over half of the presentations had already been made.

3.7.4 Open House #5 – December 5, 2013

Oral comments received during this Open House varied widely. Concerns were expressed about groundwater and surface water protection, nuisance effects and need for the project. There was interest in the property value protection plan.

A total of nine comment sheets were received following Open House #5 (Volume II, Appendix E-11). A summary of the comments received are listed below in Table 3.7.4-1 along with how they were addressed in the EA. For convenience some comments have been merged together to cover a particular topic. In general, the commenters were concerned about the impact of the Site on the surrounding area and suggested looking into alternatives to landfills. There were also comments expressing opposition to the project.

Table 3.7.4-1: Comments from Open House #5

Key Comment	Action/Response
Requested Taggart Miller look at alternative technologies to landfilling.	Taggart Miller's opportunity assessment for this proposal was provided in Supporting Document #1 to the TOR.
Concerned about noise and odour.	A full description of how noise and odour were evaluated and their predicted compliance with provincial requirements are provided in TSD #2 and TSD #3, respectively.
Concerned about property values.	A proposed PVPP is generally described in Section 15.0 of the EASR.
Concerned about biology assessment and effect of gas release on bees and ultimately crops.	The biology assessment was done in accordance with the approved TOR and is described in TSD #4. There appears to be limited, if any, scientific research on the question asked.
Appreciated that the proposed CRRRC may bring community funds to the area.	Acknowledged. A community benefit fund has been discussed with a local community association and is described in Section 15.0 of the EASR.

3.7.5 Open House #6 – June 25, 2014

During Open House #6, a number of attendees indicated they did not want the CRRRC at this location.

A total of five comment sheets were received following Open House #6 (Volume II, Appendix H-10). A summary of the comments received are listed below in Table 3.7.5-1 along with how they were already addressed in the EA. For convenience some comments have been merged together to cover a particular topic. There were also comments expressing opposition to the project.

Table 3.7.5-1: Comments from Open House #6

Key Comment	Action/Response
Noted that groundwater protection is most important and as such recommended that a charcoal protective layer be added to the design and that earthquake contingencies are required.	Taggart Miller's engineering and hydrogeology team has considered groundwater protection requirements during the EA. A charcoal protective layer is not required based on the results of the assessment, which indicate the landfill component will meet all MOECC requirements during its contaminating lifespan. The geotechnical engineers have carefully evaluated the potential for ground movement of the landfill associated with earthquakes and included this within the factors of safety for the landfill physical design.
Inquired about how much the project biologist knows about the Site being an important wildlife corridor.	The biology team has considered the potential for the Site to be a wildlife corridor. This was discussed within the EASR in Section 11.5.2.
Noted that it seems the environmental assessments are overly optimistic.	Each discipline has completed the environmental assessment using the appropriate due diligence, conservatism and factors of safety necessary for the individual discipline, and in accordance with the approved TOR.
Noted that from their experience there will be odours, sick carrion birds and contaminated groundwater.	Every waste management site is different. The CRRRC has been designed to meet the MOECC strict groundwater and odour requirements.

3.7.6 Summary of Comments Received Outside Consultation Events

Comments and questions were received from interested persons by Taggart Miller outside of consultation events through a variety of means, including by mail, phone and e-mail correspondence. For the most part these comments were information inquiries and were responded to directly. Summary tables related to these comments are provided in Volume II, Appendix I. Within these summary tables the issue/concern/question is summarized, and Taggart Miller's response is provided. The tables also contain cross reference information such that the original comment provided by the interested person and any original response from Taggart Miller can be observed within sub-sections of Volume II, Appendix I and Appendix J, respectively.

Table I-1 in Volume II, Appendix I summarizes the comments received at the commencement of the EA studies. Generally, the two individuals who inquired were requesting information about the drilling program and about the timing of decisions related to deciding on a preferred site. The full details of the drilling program are provided in Volume III.

Table I-2 in Volume II, Appendix I summarizes the comments received following the notice of Open House #3. Generally, the seven individuals who commented were mostly concerned with property value around the North Russell Road Site, and potential impacts to the surrounding environment.. A response was provided indicating that the North Russell Road Site cannot be “released” until the EA is completed. With regard to potential impacts to the surrounding environment, the impact assessments completed were documented in Section 11.0 of the EASR Volume I, the TSD’s and Volume III.

Table I-3 in Volume II, Appendix I summarizes the comments received following the notice of Open House #4. Generally, the five individuals who commented noted that the project was not needed/should be discontinued or requested information/ indicated concern related to geological impacts. The opportunity for the project was discussed in Supporting Document #1 to the TOR. Geology, seismicity and groundwater impacts are discussed in Section 11.3 of the EASR Volume I and in Volume III.

Table I-4 in Volume II, Appendix I summarizes the comments received following the notice of Workshop #2. Generally, the seven individuals who commented inquired about the information provided at the workshop, indicated concerns about geology/groundwater or recommended moving the project. Geology, hydrogeology and geotechnical impacts are discussed in Section 11.3 of the EASR Volume I and in Volume III.

Table I-5 in Volume II, Appendix I summarizes the comments received following the distribution of the newsletter, which were about requesting or providing property value protection information. A conceptual property value protection plan is described in Section 15.0 of the EASR Volume I.

Table I-6 in Volume II, Appendix I summarizes the comments received following the notice of Open House #5. Generally, the twelve individuals who commented wanted copies of documents, had questions about the EA process, wanted status updates on the decision of the preferred Site and noted geological concerns. Individuals who requested documents were provided copies. Geology, hydrogeology and geotechnical impacts are discussed in Section 11.3 of the EASR Volume I and in Volume III.

3.7.7 Comments on the Draft Environmental Assessment

Comments and questions on the draft EA were received from members of the public and the GRT. No comments were received from Aboriginal communities or stakeholders. Summary tables related to these comments are provided in Volume II, Appendix K. Within these summary tables the issue/concern/question is summarized and Taggart Miller’s response is provided. The public comment table contains cross reference information such that the original comment provided by the interested person can be observed within sub-sections of Volume II, Appendix K.

Overall, the public asked questions about the EA process and structure of the report, and expressed concerns about the assessments of impacts to biology, visual and groundwater and potential for seismic events. Taggart Miller added a seismic reference to the EA and modified the text in response to these comments to add clarity.

GRT agencies (excluding the MOECC) who provided comments on the draft EA included the MTCS, City of Ottawa, SNC and the Conseil des écoles catholiques du Centre-Est. Comments from the GRT members are summarized as follows:

- The MTCS noted that there are no cultural heritage resources in the vicinity of the Site and accepted the Report.
- The City of Ottawa commented on prioritizing diversion over landfilling, service area for the proposed facility, air quality and noise, hydrogeology and geotechnical, land use, leachate, natural environment, natural systems, public health, transportation, socio-economics and surface water/stormwater. The comments requested clarification on items and provided comments related to future approvals that will be required from the City. Some updates to the draft EASR were provided to ensure clarity around some of the City comments and the groundwater monitoring program was amended.
- SNC requested clarifications and questions geared towards understanding the monitoring program and indicated the need for future permits/plans. The monitoring programs were reviewed and modified to provide clarity and the requirements for future permits/plans were acknowledged.
- Conseil des écoles catholiques du Centre-Est reiterated its concern, as was provided during the review of the TOR, about the potential negative effects (odours, dust, environmental impacts) of the project on one of its schools. As described in Section 11.0 of Volume I, the air quality assessment for the Boundary Road Site confirms that the CRRRC will meet MOECC standards at the Site boundary and nearest residential receptors. As such there would be no adverse air quality impacts at the école élémentaire catholique Saint-Guillaume given its distance from the Boundary Road Site.

The MOECC provided comments from the Technical Support Section (hydrogeologist, air quality analyst and surface water scientist), Environmental Approvals Branch (wastewater engineer, senior review engineer, senior noise engineer and special project officer) and the Ottawa District Office. In addition, NRCan provided comments on behalf of the MOECC on seismic-related matters. The MOECC requested additional details or some reorganization within the draft reports. The MOECC also requested additional technical justification for some of the design decisions and monitoring decisions. Additional air and noise assessments were also requested. The degree of certainty in some of the concluding statements on the seismic-related aspects of the project were questioned. Changes were made to the EA in response to these comments to improve clarity. A leachate detection and secondary containment system (LDSCS), shown on Figure 10.8-2, was added to the landfill design. Monitoring programs were amended in response to some comments. The results of the noise assessment were included in the EA.

4.0 RATIONALE FOR THE PROPOSED CRRRC

Taggart Miller undertook an analysis (presented in Supporting Document #1 of the approved TOR) in order to assess the opportunity to provide an integrated waste management facility focused on resource recovery of IC&I and C&D wastes in the Capital Region and eastern Ontario. The analysis considered current market conditions and how these conditions might affect the opportunity. The study looked at established provincial and municipal programs, goals and policies, and identified existing facilities. It also considered factors affecting current and possible future diversion rates for IC&I and C&D waste materials.

Taggart Miller's analysis concluded that that there is an opportunity to provide new environmentally safe waste management services for IC&I and C&D wastes in eastern Ontario. Taggart Miller then undertook an assessment to quantify and better understand the opportunity. A potential service area was identified, consisting of the City of Ottawa and a selected area of eastern Ontario. The existing known diversion and disposal facilities for IC&I and C&D waste materials were identified. The most up-to-date data available to Taggart Miller on waste generation and diversion within the potential service area was obtained and compiled, and future IC&I and C&D waste generation and materials requiring management by diversion and disposal were estimated. A well-established approach to estimate waste generation volume (for IC&I/C&D) as a direct function of population was used.

Based on the diversion rates available at the time of the TOR development and the indicated population growth, the quantity of IC&I and C&D material requiring management over the analysis/planning period was estimated to be approximately 1,000,000 tonnes/year using 2010 as the base year, increasing gradually to approximately 1,500,000 tonnes in 2046. The assessment showed that in the absence of increased diversion capacity/rates and/or additional approved disposal capacity, there could be an IC&I and C&D waste management capacity deficit in the proposed service area of anywhere from 350,000 tonnes/year to 1,250,000 tonnes/year in the planning period of 30 years used for the CRRRC.

Waste Management's Ottawa landfill received EA approval in September 2013 for the reopening of the landfill to provide ten year disposal capacity. If the remaining required approvals are obtained by Waste Management, this would satisfy a good portion of the IC&I and C&D waste disposal need through to about year 2025. This was considered in the TOR. After approximately 2025, which is relatively short in terms of waste management planning, an IC&I and C&D waste management deficit would remain. More fundamentally and in any event, the primary focus of the proposed CRRRC, unlike the Waste Management landfill or the BFI Navan landfill, is diversion of waste from landfill. Even if there is now adequate waste disposal capacity in the Capital Region to 2025, the existing 12-13% diversion rate for IC&I waste in the Capital Region (and provincially) clearly illustrates the need for new and innovative facilities like the CRRRC to move the diversion agenda of both the City of Ottawa and the Province forward.

Based on this assessment Tagger Miller concluded that there is a clear opportunity to provide IC&I and C&D waste management services in the Capital Region and eastern Ontario over the planning period, and that it is in a good position to respond to this opportunity/need. Without the private sector taking the lead on investments in diversion and residuals disposal infrastructure of the sort envisaged by Taggart Miller with respect to the CRRRC, there is no reasonable prospect of meeting local or provincial diversion goals given the current waste management infrastructure in the proposed service area.

As noted above, it is estimated that only about 12 to 14% of IC&I and C&D waste materials in the Capital Region are currently diverted from disposal. In 2009 the City of Ottawa released a document called “Diversion 2015: An IC&I 3R Waste Diversion Strategy for Ottawa”. The strategy identifies that it is the City’s goal to increase diversion of IC&I and C&D material to 60% by 2015 (City of Ottawa, 2009). As of 2014, no significant facilities or measured changes have been put in place to make such a significant increase in diversion and reach this goal. The City can only exercise very limited control on or influence over the way IC&I and C&D waste materials are managed by the private sector. The private sector has not invested sufficiently in facilities in the Ottawa area (or indeed in the province) to process recyclables from the IC&I/C&D sector to achieve the provincial and local diversion objectives. As a result, the majority of IC&I and C&D wastes still go to disposal. The majority of participants in the City of Ottawa’s consultation process on a 30 year waste management plan felt it is important to find local waste management solutions. The City has indicated that local businesses and institutions are encumbered in their waste diversion efforts by the lack of affordable diversion services. The proposed CRRRC fully supports the City of Ottawa’s objective to increase diversion of IC&I and C&D wastes from disposal.

Since development of the TOR for this EA, provinicial goals and policies have been updated that further support and reinforce the rationale for the CRRRC. In particular, in June of 2013 the Minister of the Environment introduced Bill 91, the *Waste Reduction Act* – “…as a way forward to break Ontario’s recycling logjam, boost diversion rates and establish a system that encourages the private sector to invest in more recycling and jobs in our province.” (Minister of the Environment, 2013).

Also in 2013 Statistics Canada released the most recent waste management industry survey, which indicated that while IC&I and C&D waste in Ontario remains at about 65% of the waste generated in the province, the diversion rate for these waste streams remains around 12% (Statistics Canada, 2013a). The proposed CRRRC fully supports the provincial policy, reinforced recently by the Liberal government with the introduction of Bill 91, to increase diversion of IC&I and C&D wastes from disposal.

5.0 ASSESSMENT OF ALTERNATIVES TO THE PROPOSED CRRRC

After concluding that there was a clear opportunity and need to enhance waste management and in particular waste diversion services to the IC&I and C&D sector in the Capital Region and eastern Ontario, Taggart Miller conducted an assessment to determine the best way that it could respond to this opportunity. In EA terms this is referred to as “Alternatives To” the proposed CRRRC. The assessment of Alternatives To is documented in the approved TOR, Section 4.0 of Supporting Document #1, and is summarized below.

Five alternatives were identified as follows:

Alternative 1 – Do Nothing.

Alternative 2 – Establish diversion facilities on a Taggart Miller Site and transfer residuals to other existing disposal sites in Ottawa, in eastern Ontario or in New York State.

Alternative 3 – Establish diversion facilities on a Taggart Miller Site and manage residuals disposal by means of a new landfill on the same Site.

Alternative 4 – Establish diversion facilities on one of the Taggart Miller Sites and manage residuals disposal by means of a landfill located off-Site at the other Taggart Miller Site.

Alternative 5 – Establish diversion facilities on one of the Taggart Miller Sites and manage residuals disposal by means of a thermal conversion facility on the same Site.

A screening assessment of the identified alternatives was conducted by considering the following questions:

- Does the alternative realistically address the identified opportunity?
- Is the alternative financially realistic and viable for Taggart Miller in terms of economic risks and benefits?
- Is the alternative within Taggart Miller’s ability to implement?

Taggart Miller also considered if the alternatives were likely to be approvable and likely to use proven technology. The advantages and disadvantages of the alternatives were also considered.

Based on the results of the screening assessment, Taggart Miller concluded that Alternative 3 – establish diversion facilities on a Taggart Miller Site and manage residuals disposal by means of a landfill for residuals and material not diverted on the same Site - was the only reasonable and economically feasible alternative for Taggart Miller to pursue.

6.0 CONCEPTUAL LEVEL DESCRIPTION OF THE PROPOSED CRRRC

The following conceptual description of what each component of the CRRRC will do was used to complete a comparison of the alternative Sites. A more detailed description was subsequently used to prepare the alternative Site development concepts for the Boundary Road Site and select the preferred alternative concept. This more detailed description is contained in Section 9.0. Additional refinement including stormwater management ponds and geotechnical considerations is provided in Section 10.0 to arrive at the detailed project description, which was then used as the basis for the impact assessment.

6.1 Overview

A conceptual description of the following components of the proposed CRRRC as used in the comparison of alternative Sites is provided below:

- Materials Recovery Facility (MRF);
- C&D processing;
- Organics processing;
- Petroleum hydrocarbon (PHC) contaminated soil treatment;
- Surplus soil management;
- Drop-off for separated materials or for separation of materials;
- Leaf and yard materials composting (if there is enough material available); and
- Landfill for disposal of residuals and material not diverted.

6.2 Waste Stream

The CRRRC was assumed, and approval is being sought, to accept solid, non-hazardous IC&I and C&D waste and soils at a rate of approximately 1,000 to 1,500 tonnes per day. With a facility open 300 days per year, this is equivalent to annual waste receipts of the order of 300,000 to 450,000 tonnes/year. The maximum assumed receipts of 450,000 tonnes/year was subsequently used for the purpose of the impact assessment.

6.3 CRRRC Components

6.3.1 Diversion Facilities

6.3.1.1 Materials Recovery Facility

The MRF will process and recover IC&I materials and be designed to handle both mixed materials and source separated loads. The MRF operation will take place within a specifically designed building and will involve removal of loads from the haulage vehicles onto a tipping floor and then placing the materials onto equipment that uses a combination of both automated and manual sorting processes to separate out and recover designated materials according to their composition (plastic, metal, glass, paper, cardboard), with the remainder going to disposal.

6.3.1.2 Construction & Demolition Processing Facility

C&D Processing Facility will be carried out to recover waste materials received from construction and demolition projects, which will typically be received at the Site in roll-off bins. Incoming loads would be segregated initially according to their main material components (mostly concrete, mostly wood (clean or dirty), mostly asphalt, etc.), which can then be further sorted for appropriate processing. For example, metal is recovered directly; wood is often chipped or shredded for composting or made into mulch; asphalt is ground for re-use; and concrete is crushed. The C&D processing will take place within a building. Materials that cannot be recovered will go to disposal.

6.3.1.3 Organics Processing

An organics processing facility will be constructed to remove the organics component from those portions of the IC&I waste stream that contain a sufficient amount of organics. Taggart Miller is proposing the implementation of a unique anaerobic digestion process that takes place within a covered facility and is specifically designed to process the organics contained within the highly variable mixed IC&I waste stream.

The organics processing facility at the CRRRC will also include a compost pad, to be used for composting of leaf and yard waste and for curing of the product from the anaerobic digestion process.

6.3.1.4 Petroleum Hydrocarbon Contaminated Soil Treatment

Treatment of PHC contaminated soils at the CRRRC would occur using lined and covered treatment cells.

6.3.1.5 Surplus Soil Management

The management of surplus uncontaminated soils (or rock) received from construction projects would involve stockpiling of these materials for re-use as daily cover for the landfill component of the CRRRC or for other on-Site uses. There is a need for uncontaminated soils in excess of the excavated soil on-Site to meet the requirements for construction of berms, grade raises, temporary roads, daily and final landfill cover, etc. Uncontaminated soil or rock is comprised of native (undisturbed) earth materials (from undeveloped land) or native earth materials/fill materials that are unimpacted by development or human activity, or altered earth/fill material whose quality meets the applicable table in O. Reg. 153/04 (MOE, 2004). The stockpiling could occur in a designated area and in other unoccupied areas of the Site to suit Site operations.

In addition to PHC contaminated soils, the CRRRC will also receive other types of non-hazardous contaminated soil (or rock). Contaminated soil, with the exception of PHC contaminated soil directed to treatment, will be managed within the landfill, either disposed of as waste or re-used as daily cover.

6.3.1.6 Small Load Drop-Off Area

A typical grade-separated drop-off area to receive recoverable materials for small IC&I and C&D waste generators would be provided.

6.3.1.7 Leaf and Yard Waste

Provision would be made for the acceptance of source separated leaf and yard waste materials, e.g., from landscaping and property maintenance contractors, which could either be co-processed with the organics in the anaerobic digestion process or in an open windrow composting operation.

6.3.2 Landfill

Assuming an average annual diversion rate for the CRRRC of between 30 to 40% of the incoming material from disposal, a typical waste density (0.8 tonnes per cubic metre) and a 4:1 waste to cover ratio, the corresponding landfill air space requirement to support the diversion facilities for a 30 year operating period was initially determined to range from about 8 to 14 million cubic metres. The disposal airspace requirements were progressively refined through the preparation of the alternative Site development concepts (Section 9.0), and finalized during the preparation of the Site development plan in Section 10.0. Through a refinement of the diversion facilities' design and operations as subsequently described in Section 9.0, it was subsequently estimated that a diversion rate of between 43 to 57% may ultimately be achievable.

The landfill will undergo development in phases as described below in project activities.

6.3.3 Leachate Management

Leachate is the liquid that is produced as precipitation enters waste and dissolves constituents from the waste as it passes through it. Management and treatment of leachate generated from the landfill, as well as excess liquor generated from the organics processing, will be required. Leachate management can be accomplished by an on-Site treatment facility for discharge on-Site, an on-Site treatment facility for pre-treatment and discharge off-Site for final treatment, or transportation of leachate off-Site for final treatment.

6.3.4 Gas Management

The proposed CRRRC will require a gas management system for the landfill and organics processing components. These components will require equipment to collect and distribute the gas to an on-Site flare. When in sufficient quantity, it would be sent to a power generation area where the electricity may be used on-Site or connected to the grid if possible.

6.3.5 Remaining Site Infrastructure

The remaining Site infrastructure consists of the Site entrance, weigh scale(s), administration and scale buildings, a maintenance garage, SWM facilities, tire wash station and internal access roads.

6.4 Further Details

Following the assessment of alternative Sites and the selection of the preferred Site for the proposed CRRRC (Section 7.0), the project description for the CRRRC was further refined. These refinements are provided in Section 9.0 for preparation of the alternative Site development concepts. These refinements are provided in Section 9.0, and include details such as expected quantities of materials to be handled at each facility. This enabled building sizes and the landfill capacity to be confirmed. Additional refinement is provided in Section 10.0 to prepare the detailed project description of the preferred Site development concept for use in the impact assessment, which included adding the final details utilizing Site specific information and further analyses (such as geotechnical) and stormwater management requirements.

7.0 COMPARATIVE EVALUATION OF ALTERNATIVE SITES AND IDENTIFICATION OF PREFERRED SITE

As an initial step during the EA, Taggart Miller undertook a comparative Site selection assessment to identify a preferred Site for the CRRRC. The results of the comparative assessment are presented in TSD #1 to this EASR and summarized in this section.

7.1 Site Alternatives and Comparative Methodology

Taggart Miller identified and secured two potential Sites for development of the proposed CRRRC, as described in Section 1.4 and shown in Figure 1.4-1.

The first step in the EA was a comparative evaluation of the two alternative Sites to identify the preferred Site for the CRRRC. The evaluation was carried out using the methodology set out in the approved TOR and summarized in Section 2.2. The comparison considered nine environmental components, each having indicators and a set of data sources.

7.2 Description of Existing Environmental Conditions

Table 7.2-1 presents an overview of existing environmental conditions based on published information and preliminary investigations/assessments at the two alternative Sites that were considered for each of the environmental components. The work completed to describe the existing conditions followed the work plans for each environmental component presented in Appendix C-2 of the approved TOR. Further details are provided in TSD #1.

7.3 Comparative Evaluation of Sites

Table 7.3-1 presents an overview of the comparative evaluation of the two alternative Sites, compiled from the individual component assessments within TSD #1. The comparison was undertaken using the framework in the approved TOR and on the basis that the potential for impacts from the proposed CRRRC at each Site is net of standard in-design mitigation measures. The table lists the approved criteria and indicators for each of the nine environmental components considered in the assessment and discusses the advantages and disadvantages of each alternative. The preferred Site for each component is illustrated in the table by green highlights.

Table 7.2-1: Existing Conditions of the Alternative Sites

	North Russell Road Site	**Boundary Road Site**
Location & Description	North Russell Road Site - is located in the northwest part of the Township of Russell, about five kilometres south of Provincial Highway 417 between the Boundary Road and Vars exits.	Boundary Road Site - is in the east part of the City of Ottawa just southeast of the Highway 417/Boundary Road interchange.
Overview of Existing Environment Conditions		
Atmosphere	The air quality in the North Russell Road Site-vicinity is typical of air quality of rural eastern Ontario and background air quality levels are below current Ambient Air Quality Criteria (AAQC) limits. Agricultural activities on the Site and in the Site-vicinity, as well as road traffic, contribute to baseline air quality/odour levels and occurrences, and noise levels. During operations, quarry activities on the Site also contributed to the background air (i.e., dust) and noise levels in the Site- vicinity. The existing noise levels are consistent with a Class 3 area as defined by the MOECC in NPC-232 (i.e., 45 decibels (dBA) daytime and 40 dBA nighttime) (MOE, 1995a) [1].	The air quality in the Boundary Road Site-vicinity is typical of air quality in rural eastern Ontario and background air quality levels are below current AAQC limits. The baseline air quality, noise and odours are primarily the result of a combination of the adjacent Highway 417 and Boundary Road traffic, the activities in the industrial park immediately to the west, and agricultural operations located in the area of the Site. The existing noise levels are expected to be consistent with Class 2 (closer to Highway 417) and Class 3 areas as defined by the MOECC in NPC-205 and NPC-232, respectively (i.e., 50 dBA daytime / 45 dBA nighttime and 45 dBA daytime/40 dBA nighttime) (MOE, 1995b and MOE, 1995a) (Subsequently determined to be Class 1 by field monitoring as described in Section 8.4.1) [1].
Geology & Hydrogeology	The North Russell Road Site is located on a local bedrock high with the bedrock surface declining in elevation and the overburden thickness overlying the bedrock increasing in all directions away from the Site. The overburden is typically less than 2 metres thick consisting mainly of completely weathered shale overlying the shale bedrock or glacial till. On the eastern half of the Concession IV portion of the property, the bedrock surface is deeper resulting in significant thicknesses of overlying silty clay and glacial till. The majority of the North Russell Road Site is underlain by a variable thickness of Queenston Formation shale bedrock followed by the Carlsbad Formation limestone and shale. Overall, the majority of the Queenston Formation and the Carlsbad Formation at the North Russell Road Site have a low hydraulic conductivity (low ability to transmit water) (i.e., less than 2.5 x 10^{-8} metres per second, m/s); however, at some locations there is enhanced permeability in the upper portion of the Queenston Formation (10^{-8} m/s to 10^{-2}m/s). Bedrock groundwater flow direction is predominantly easterly. Off-Site groundwater users mainly use drilled wells completed in the bedrock. The on-Site shallow bedrock groundwater is indicated to be relatively fresh; with depth, in both the Queenston and Carlsbad Formations, the groundwater quality deteriorates with elevated concentrations of chloride, sodium, iron and manganese. The results of a limited residential water supply sampling program indicate that all parameters analyzed met the respective health based and aesthetic MOECC standards, except for total dissolved solids (TDS), nitrate and sodium at specific water supply wells sampled. Groundwater quality at the private well locations is generally consistent with the groundwater quality observed at on-Site monitoring wells at the North Russell Road Site.	The Boundary Road Site has a variable thickness of surficial silty sand up to 1.5 metres thick overlying about 30 metres of silty clay, followed by glacial till and Carlsbad Formation bedrock. Silty sand and silt seams are variably present within the upper portion of the silty clay, encountered at depths between about 1.8 and 6.6 metres and interpreted to vary in thickness from about 0.1 to 0.3 metres. The groundwater flow direction in all units is interpreted to be towards the east (i.e., away from nearby off-Site groundwater users). Off-Site groundwater users typically obtain water from dug wells completed in the upper 3 to 7 metres of overburden. Groundwater quality at the Boundary Road Site varies from fresh to brackish and deteriorates with depth, where elevated concentrations of barium, chloride, sodium and TDS are observed in the shallow bedrock and glacial till. Groundwater from the shallow bedrock also contains dissolved methane. The results of the limited well water supply sampling program indicate that water met the MOECC standards with exceptions of dissolved organic carbon (DOC), manganese, TDS and iron. In the surficial sand layer, the moderate horizontal hydraulic conductivity and low hydraulic gradient result in a relatively slow groundwater flow velocity through this unit. The presence of the thick silty clay unit restricts the downward migration of leachate-impacted groundwater regardless of the vertical gradients.
Surface Water	The North Russell Road Site lies within the Castor River watershed, which is managed by South Nation Conservation (SNC). Drainage in the area is mainly by a network of agricultural ditches, municipal drains and small creeks. The Fournier Municipal Drain runs through and along the north side and through the east portion of the Concession IV part of the Site. On-Site there are three lower lying areas where intermittent watercourses originate on the property and provide the current drainage. There is also standing water present within the existing quarry and there is no drainage outlet for the quarry. The local drainage networks in the area eventually flow south to the Castor River, located about 4.5 kilometres south of the Site. The Castor River enters the South Nation River about 20 kilometres downstream of Russell, which in turn eventually discharges to the Ottawa River. The Castor River is a relatively small river with quite low flows during the summer period and at other times of year. The Castor River meets water quality targets for phosphorus in 0% to 44% of samples, Escherichia coli (*E.coli)* in 45% to 64% of samples, copper and zinc in 80% to 100% of samples. The average flow is 5.48 cubic metres per second (m^3/s). Three communities discharge wastewater into the Castor River, one community draws surface water from the confluence of the Castor and South Nation Rivers. Water in ditches at or near the North Russell Road Site exhibit exceedances of Provincial Water Quality Objectives (PWQO) for pH, total phosphorus, boron and iron.	The Boundary Road Site drains northward into the Bear Brook Subwatershed, which is managed by SNC. Drains that cross the Site, consisting of old farm field drainage that has not been maintained and a municipal drain, flow to the east and eventually combine and discharge to Shaw's Creek just to the west of Vars. Shaw's Creek flows northward about 5 kilometres and enters Bear Brook, which flows east about 30 kilometres to eventually enter the South Nation River. At present, drainage on the Site is not well established and the land is poorly drained. The water quality in Bear Brook meets water quality targets for phosphorus in 0% to 44% of samples, *E.coli* in 45% to 64% of samples, copper and zinc in 45% to 94% of samples. The average flow is 7.42 m^3/s. Water in ditches or municipal drains at or near the Boundary Road Site exhibit exceedances of PWQOs for total phosphorus, copper and iron and were below the PWQO limit for dissolved oxygen.

	North Russell Road Site	Boundary Road Site
Biology[2]	The North Russell Road Site contains a mosaic of agricultural croplands and pasture, interspersed with cultural meadows (e.g., fallow fields) treed and shrubby hedgerows, scattered small woodlots and low-lying swamp areas. The plant communities on the Site are primarily those that are typical of an agricultural landscape and are common in the Ottawa area. A good proportion of the plants found on the Site are early succession species that thrive in recently disturbed sites such as old gravel lots, roadside, etc. The habitats and species observed on the Site are typical of agricultural landscapes in the region. There are no Provincially Significant Wetlands (PSW) (Class 1-3 Wetlands) on the North Russell Road Site, or in the Site-vicinity. There are no Life Science Areas of Natural and Scientific Interest (ANSIs) on the North Russell Road Site, or in the Site-vicinity. Although not officially designated, there is a woodlot on the east corner of the North Russell Road Site that meets the Natural Heritage Reference Manual criteria for a significant woodland. The North Russell Road Site contains deciduous and swamp wooded areas. There are five seasonal surface water features and two drainage ditches on the North Russell Road Site and in the Site-vicinity. Two dug agricultural ponds and a flooded quarry exist on the North Russell Road Site. The surface water features on the North Russell Road Site and in the Site-vicinity are not coldwater, so not as sensitive as coldwater systems. No fish were observed in any of the on-Site watercourses for the investigations completed. The potential for nine SAR and/or habitat was identified at the North Russell Road Site.	The Boundary Road Site consists of a mosaic of immature forest re-establishing on land previously used for farming and deciduous thickets. There is also an area of naturalized white spruce plantation. In the northwest corner is a woodlot dominated by immature white birch, with agricultural crop fields in much of the remainder of the northern portion of the Site. Former agricultural drainage ditches are heavily vegetated with thickets and are functioning poorly, resulting in wet conditions across much of the Site. There are no PSWs (Class 1-3 Wetlands) on the Boundary Road Site, or in the Site-vicinity. There are no Life Science ANSIs on the Boundary Road Site, or in the Site-vicinity. There is a potentially significant woodland in the Site-vicinity, to the south of the Boundary Road Site, south of Devine Road. The Boundary Road Site contains deciduous and swamp wooded areas. At the time of the comparison there were three surface features on the Boundary Road Site – a Municipal Drain and two drainage ditches. A large proportion of the Boundary Road Site is mineral thicket swamp. The surface water features on the Boundary Road Site and in the Site-vicinity are not coldwater, so not as sensitive as coldwater systems. The potential for six SAR and/or habitat was identified at the Boundary Road Site.
Land Use & Socio-economic	The North Russell Road Site is located within the Township of Russell, which has a significant rural agricultural community and some rural residential development, with local commercial and institutional development within the Villages of Russell and Embrun. Land use for the area is subject to the United Counties of Prescott-Russell Official Plan. The portion of the Site licensed for quarry operations is designated as Aggregate Extraction; the remainder of the Site is designated as Agricultural Resource. The surrounding lands are also designated as Agricultural Resource. A single institutional land use exists within 1,000 metres of the North Russell Road Site. From a visual perspective, the Site is situated on a local rise in what is otherwise fairly flat terrain. Much of the area has been historically cleared for agricultural purposes, with some natural features remaining in the form of local woodlots and treed fence lines. The United Counties of Prescott and Russell indicate no significant designation changes expected surrounding the North Russell Road Site during the Official Plan five-year review commencing in 2013. No zoning or site plan applications had been applied for, or were active in January of 2013, with the Township in the Site-vicinity of the North Russell Road Site.	The Boundary Road Site is located within the east end of the City of Ottawa. There is a provincial highway corridor, a partially developed rural industrial park and a combination of general rural and agricultural uses in the Site-vicinity. The closest developed area is the hamlet of Edwards about 2 kilometres to the west; separated from the Site by the Highway 417 corridor are the Village of Vars about 5.5 kilometres to the east and the Village of Carlsbad Springs about 3 kilometres to the north. A 43 rural lot subdivision is located within the Township of Russell along Route 100 about 4 kilometres to the south of the Boundary Road Site. A golf course is located north of the Site across the Highway 417 corridor. The land use and zoning to the west of the Site fronting on Boundary Road is Rural Heavy Industrial (RH), as is a limited portion of the Site. The Site itself is otherwise zoned General Rural, as is the land to the south and west. Lands to the east are mainly zoned Agricultural Resource and are used for this purpose. From a visual perspective, the Site is situated in flat terrain and is generally well screened from Boundary Road by trees. As of January 2013, there were no Official Plan Amendments applied for with the City of Ottawa in the Site-vicinity of the Boundary Road Site.
Cultural & Heritage Resources	There are no registered heritage buildings or archaeological Sites in the Site-vicinity or within a three kilometre radius of the North Russell Road Site. Based on preliminary work and guidance provided by the MTCS, due to the presence of wet low lying lands in the Site-Vicinity, the lands are categorized as having a moderate potential for pre-contact archaeological resources. There is historical data that indicates that the properties were used for agriculture as early as the beginning of the nineteenth century. The North Russell Road Site-vicinity was found to have 29 identified and potential cultural heritage resources, including 20 potential cultural heritage landscapes, a potential industrial heritage site (the quarry), a cemetery, a former school and a former church.	There are no registered archaeological sites on the Boundary Road Site or within a three kilometre radius. Due to the flat topography and poorly drained soils, guidance provided by the MTCS and regional assessment carried out by the City of Ottawa, the majority of the Site is indicated to have low archaeological potential. The Boundary Road Site-vicinity was found to have four potential cultural heritage resources (identified as pre-1973 structures as per MTCS guidelines).

	North Russell Road Site	Boundary Road Site
Agricultural Environment	The majority of the land area in the North Russell Road Site-vicinity is agricultural croplands and pasture, interspersed with cultural meadows (e.g., fallow fields), treed and shrubby hedgerows, scattered small woodlots and some low lying poorly drained areas. The County Official Plan identifies the western portion of the North Russell Road Site as having a Class 1 agricultural capability and the eastern portion as Class 2; this is based on the Canada Land Inventory for Soils mapping. Only a small area is indicated to be Class 3 and the remainder is considered to be Class 4. Based on Site investigation, 20.9% of the land zoned agriculture between North Russell Road and Eadie Road is Class 1-3 agriculture lands. At present, the on-Site lands are not cultivated except for a few fields in the south part of the property that represent 12.6% of the North Russell Road Site lands. The remainder are used for a variety of uses including pasture/hay, forested areas and the shale quarry. The presence of agricultural improvements such as tile drainage in the fields is not apparent.	The majority of the Boundary Road Site was historically cleared for farming, however those efforts were discontinued and the Site has been allowed to re-vegetate. Site investigation indicated 0% of the Site is Class 1-3 agricultural land. There have been no on-Site agricultural improvements. Only the very northern part of the Site is now used for row crops, which represents 16.3% of the Site. The Site lands are zoned General Rural or Rural Industrial, rather than Agricultural.
Traffic	The closest major provincial highway to the North Russell Road Site is provincial Highway 417, located approximately 5 kilometres north of the Site. Highway 417 interchanges are located at Boundary Road (exit 96) and Vars/St. Guillaume Road (exit 88), some 9 kilometres northwest and 5 kilometres northeast, respectively, of the Site. Based on the proposed service area for the proposed CRRRC, it is expected that the majority of Site-related traffic would use the Vars and/or the Boundary Road exits should the North Russell Road Site be preferred. The road network between the interchanges and the Site consists of rural collector and rural arterial roads owned by the City of Ottawa or the Township of Russell. On the west side of the Site is North Russell Road, a two lane rural road that runs north-south from Burton Road to the Village of Russell approximately 3 kilometres to the south of the south boundary of the Site. Eadie Road, a secondary rural road, divides the western and eastern portions of the Site lands.	The closest major provincial highway to the Boundary Road Site is provincial Highway 417, located along the north boundary of the Site. The closest Highway 417 interchange is just northwest of the Site at Boundary Road (exit 96), with the Vars/St. Guillaume Road (exit 88) some 6 kilometres to the east. Based on the proposed service area for the proposed CRRRC, it is expected that the most of Site-related traffic would use the Boundary Road exit. The road network between this interchange and the Site consists of an arterial road - Boundary Road, Devine Road (Regional Road 8) to the south of the Site is also an arterial road.

Notes:

[1] The Alternative Site Comparison presented in Table 7.2-1 was performed in January 2013, prior to MOECC Publication NPC-300, “Environmental Noise Guideline, Stationary and Transportation Sources – Approval and Planning” (MOE, 2013b), taking effect. As such, earlier MOECC Publications NPC-205 and NPC-232 (MOE, 1995b and MOE, 1995a), which have since been replaced by MOECC Publication NPC-300, were consulted at the time of the Site comparison. The subsequent impact assessment presented in Section 11.2 referenced MOECC Publication NPC-300.

[2] The Alternative Site Comparison for Biology considered potential for SAR on or within 120 metres of the Site boundary.

Table 7.3-1: Comparative Evaluation of Alternative Sites

Component	Criterion and Indicators	North Russell Road Site	Boundary Road Site
Atmosphere	<u>Criterion:</u> Which Site is preferred regarding potential effects due to air quality and noise? <u>Indicator:</u> The number, type and location of off-Site receptors in the Site-vicinity (within 500 metres of the Site boundary).	Twenty-five (25) sensitive receptors were identified within the North Russell Road Site-vicinity. Of these, 13 are located adjacent to the property line. A single institutional land use exists within 500 metres of the North Russell Road Site. <u>Disadvantages</u>: The North Russell Road Site has more sensitive receptors in total and more sensitive receptors closer to the Site boundary, including one institutional land use.	Four sensitive receptors were identified within the Boundary Road Site-vicinity based on the property limits at the time of the assessment. <u>Advantages:</u> The Boundary Road Site has far fewer sensitive receptors in total and less sensitive receptors closer to the Site boundary.
Geology, Hydrogeology & Geotechnical	<u>Criterion:</u> Which Site is preferred for protection of groundwater? <u>Indicators:</u> geologic setting, type and thickness of any natural on-Site attenuation layer; and interpreted direction of vertical groundwater flow on-Site and in Site-vicinity.	The portion of the North Russell Road Site west of Eadie Road is located on a local bedrock high with a soil cover of completely weathered shale or glacial till typically less than 2 metres thick, underlain by a variable thickness of Queenston Formation shale bedrock. To the east of Eadie Road, the bedrock surface declines and the soil cover increases to a significant thickness of silty clay and glacial till soil. Also, about half way across the part of the Site east of Eadie Road the shale was not encountered and the bedrock consists of Carlsbad Formation limestone and shale. The vertical groundwater gradients are indicated to be generally downward or absent; the North Russell Road Site is located within a large regional groundwater recharge area. The on-Site natural attenuation (or containment) layer for vertical groundwater flow is the shallow portion of the Queenston shale bedrock. The shale is indicated to have an overall low hydraulic conductivity; however there are higher permeability zones in some areas of the upper shale due to fracturing and weathering. In the unlikely event of an unmitigated leachate release from the CRRRC's landfill component, the leachate-impacted groundwater would enter the bedrock and migrate downward and then easterly. <u>Disadvantages</u>: The North Russell Road Site has a less favourable natural containment mechanism. It has favourable groundwater quality on-Site and in the Site-vicinity in the hydrogeological zones where drinking water is obtained that could be impacted in the unlikely event of an unmitigated leachate release from the CRRRC's landfill component. The North Russell Road Site is interpreted to be located within a large regional groundwater recharge area, however only forms a small part of the recharge area.	The Boundary Site is underlain by a variable thickness of silty sand up to about 1.5 metres thick, followed by an extensive, about 30 metres thick deposit of silty clay soil. A variable presence of silty sand and silt seams have been noted within the upper 5 metres of the clay deposit. The clay is underlain by glacial till and then shale and limestone bedrock of the Carlsbad Formation. The direction of horizontal groundwater flow in all soil types and the upper bedrock is towards the east. The vertical groundwater gradients are weakly downward to absent; the silty clay deposit restricts downward water movement. The Boundary Road Site is not part of a regional groundwater recharge system to the basal glacial till and bedrock. The on-Site natural attenuation layer for vertical groundwater movement is the thick, low permeability silty clay deposit. In the unlikely event of an unmitigated leachate release from the CRRRC's landfill component, the leachate-impacted groundwater would migrate primarily through the surficial silty sand layer towards the east. <u>Advantages</u>: The Boundary Road Site and its associated natural silty clay attenuation layer offers more favourable natural containment properties compared to the North Russell Road Site.
Surface Water	<u>Criterion:</u> Which Site is preferred for protection of surface water quality? <u>Indicators:</u> Number of existing surface water outlet points, distance to nearest continuously flowing watercourse; and characteristics of downstream surface water system and usage.	The North Russell Road Site is located within the Castor River subwatershed. Existing drainage on the Site is conveyed by ditches to four intermittently flowing Municipal Drains via six drainage outlet points from the Site. The closest continuously flowing watercourse that receives drainage from the North Russell Road Site is the Marshall Seguin Municipal Drain to the east; it is located 2 kilometres map distance from the Site, but actually a streamflow distance of 4.9 kilometres from the Site via the Fournier Municipal Drain. The water quality in the Castor River and in ditches in the area of the Site is typical of eastern Ontario, with elevated phosphorus and several metals. Three communities discharge treated wastewater into the Castor River and one community, Casselman, draws surface water for water supply just downstream of the confluence of the Castor and South Nation Rivers. <u>Advantages:</u> Greater distance to continuously flowing watercourse that receives drainage from the North Russell Road Site. <u>Disadvantages:</u> The North Russell Road Site has more surface water outlets and the pre-existing receiver surface water quality is better.	The Boundary Road Site is located in the Bear Brook subwatershed. Existing drainage on the Site is conveyed by ditches from three outlet points to three intermittently flowing Municipal Drains that combine east of the Site at the start of Shaw's Creek. The closest continuously flowing watercourse that receives drainage from the Boundary Road Site is Shaw's Creek to the east; it is located 1.6 kilometres map distance from the Site and streamflow distances of 2.1 and 2.2 kilometres from the Site via the Frank Johnston Municipal Drain and the Simpson Municipal Drain, respectively. The water quality in Bear Brook and in ditches in the area of the Site, is typical of eastern Ontario, with elevated phosphorus and several metals. There are no communities that discharge treated wastewater to the Bear Brook. <u>Advantages:</u> The Boundary Road Site has less surface water outlets and characteristics of downstream surface water system are naturally poorer. <u>Disadvantages:</u> Less distance from the Site to a continuously flowing water course that would receive drainage from the CRRRC.

Component	Criterion and Indicators	North Russell Road Site	Boundary Road Site
Biology	Criterion: Which Site is preferred for protection of terrestrial and aquatic biological systems? Indicator: Amount of, quality of and impact on biological systems on-Site, including protected biological systems. Specifically including the total impact on: Class 1 to 3 wetlands; Life science ANSIs; Wooded areas; SAR and endangered species and associated habitat; and water bodies and water courses.	There are no PSWs or ANSI's on the North Russell Road Site. Vegetation communities on the North Russell Road Site include meadows, pasture and hayfields, forest, swamp and thicket areas. A total of 155 species of plants were observed on the North Russell Road Site during field surveys completed before this Site comparison; all vegetation communities observed on the North Russell Road Site are common and widespread in the region. Seven insect, four herpetile, 34 bird and 10 mammal species were observed during the field surveys; all species observed on the North Russell Road Site up to the time of this comparison are common and widespread in the region. SAR: Nine SAR (eight provincially listed SAR and one federally threatened species) were identified, through the desktop screening and preliminary habitat assessment, with some potential (ranging from Low-Moderate to High potential) to occur on the North Russell Road Site. None of these species were observed on the North Russell Road Site during field surveys completed to the time of this comparison. There are five seasonal surface water features and two drainage ditches (all of which have intermittent flow), two dug agricultural ponds and a flooded quarry on the Site. Advantages: No Class 1-3 wetlands or ANSIs on the Site. Disadvantages: The North Russell Road Site has more plant species and potential for SAR habitat, with some potential listed as High. No SAR were in fact observed at the Site. The Site has more diversity in vegetation cover.	There are no PSWs, ANSIs, or Significant Woodlots on the Boundary Road Site. Vegetation communities on the Boundary Road Site include immature deciduous forest and swamp, deciduous thickets and thicket swamp, plantation, agricultural fields and small residential properties. A total of 115 species of plants were observed on the Boundary Road Site during field surveys up to the time of this comparison. Flooding occurs throughout the Boundary Road Site during periods of high water (i.e., storm events and spring freshet) and the soil remains saturated in several areas for much of the year. A large proportion of the Boundary Road Site consists of mineral thicket swamp. Nine insect, two herpetile, 32 bird and 10 mammal species were observed during field surveys completed prior to this comparison. The wildlife community on the Boundary Road Site appears to be typical of the region and consistent with the observed habitats. SAR: Six SAR (five provincially listed SAR and one federally threatened species) were identified, through the desktop screening and preliminary habitat assessment, to have some potential (ranging from Low-Moderate to Moderate potential) to occur on the Boundary Road Site. None of these species were however observed on the Boundary Road Site during field surveys completed to the time of this comparison. There are three surface water features identified on the Boundary Road Site: an agricultural ditch in the northern portion, an old farm ditch in the southern portion and the Simpson Municipal Drain in the north-central portion. Advantages: No Class 1-3 wetlands, ANSIs or Significant Woodlots on the Site. The Boundary Road Site has less potential for SAR habitat and no High potential for SAR to be present and no SAR were in fact observed at the Site. The Site has less diversity in vegetation cover.
Land Use & Socio-economic	Criteria: 1 Which Site is more compatible with current and proposed future land use in the Site-vicinity? 2 Which Site is preferred for the protection of aggregate resources? Indicators: Criteria 1 - current land use within 1,000 metres of the Site and certain and probable future land use within 1,000 metres of the Site. Criteria 2 - known and probable type and quality of mineral aggregate resources on Site and within 500 metres.	The North Russell Road Site is currently zoned Agricultural and Aggregate Extraction. Land use in the area is mainly various forms of agriculture with some residential lots fronting on the road system and one institutional use (cemetery). The United Counties of Prescott-Russell do not anticipate any significant designation changes in the area of the Site, nor are there any active or expected zoning or Site plan applications. There is a licenced shale quarry on a portion of the Site; it is likely this shale deposit extends beyond the licensed quarry at the North Russell Road Site limits, mainly to the north, south and west. There are no other known or probable aggregate resources on the Site or within 500 metres. Disadvantages: A greater number of sensitive land uses exist around the North Russell Road Site and the development of the CRRRC is less compatible with the existing and planned land uses. A portion of the North Russell Road Site is underlain by a licensed quarry.	The Boundary Road Site is currently zoned General Rural and Rural Heavy Industrial. Land use in the area is commercial/light industrial in the Industrial Park to the west, limited residential development, agricultural to the east and vacant lands. As of the time of the comparison, no zoning or Site plan applications had been applied for with the City in the Site-vicinity of the Boundary Road Site. There are no known or probable aggregate resources on the Site or within 500 metres. Advantages: A smaller number of sensitive land uses exist around the Boundary Road Site and the development of the CRRRC is more compatible with the existing and planned land uses in the Site vicinity. There are no known or probable aggregate resources on the Boundary Road Site or within 500 metres of the Site.
Cultural & Heritage Resources	Criterion: Which Site is preferred for the protection of archaeological and heritage resources, and cultural heritage landscapes? Indicators: Number and significance of known archaeological and heritage features, and cultural heritage landscapes on-Site; and area of on-Site lands with moderate to high potential for undiscovered archaeological Sites.	There are no registered archaeological Sites within the Site-vicinity. Based on the 2011 Standards and Guidelines for Consultant Archaeologists (MTCS, 2011), approximately 90% of on-Site lands are of medium to high archaeological potential, with the remaining 10% having low or no archaeological potential; the lands having potential will require further archaeological assessment. The North Russell Road Site-vicinity was also found to have 29 identified and potential cultural heritage resources (identified as pre-1973 structures as per MTCS guidelines), including 20 potential cultural heritage landscapes (farmsteads with multiple buildings), a potential industrial heritage Site (the quarry), a cemetery, a former school and a former church. Because of these features, further assessment is required to determine if the area as a whole is potentially a larger scale cultural heritage landscape unit. Disadvantages: The North Russell Road Site has medium to high archaeological potential. It also has more potential cultural heritage resources and cultural heritage landscapes.	There are no registered archaeological Sites within the Site-vicinity. All of the on-Site lands contain no or low archaeological potential; no additional archaeology study is required. The Boundary Road Site study area was found to have four potential cultural heritage resources (identified as pre-1973 structures as per MTCS guidelines) which includes one property on the Site. Advantages: The Boundary Road Site has low archaeological potential and therefore a much smaller possibility of impacting any undiscovered archaeological resources. It also has fewer potential cultural heritage resources and cultural heritage landscapes.

Component	Criterion and Indicators	North Russell Road Site	Boundary Road Site
Agriculture	Criterion: Which Site is preferred regarding potential for effects on agriculture? Indicators: Percentage of on-Site lands with soil capability classes 1 to 3; Amount, type(s) and quality of on-Site improvements for agricultural purposes (i.e. structures, tile drainage); Percentage of on-Site land being used for agricultural purposes; and Type(s) and extent of agricultural operations on-Site and within 500 metres of the Site boundary, i.e. organic, cash crop, livestock.	20.9% of on-Site land zoned Agricultural between North Russell Road and Eadie Road is Class 1-3 agriculture lands (Class 3), while the remaining agricultural land is considered to be Class 4. The lands east of Eadie Road are zoned Aggregate Extraction. There are no on-Site agricultural improvements. 12.6% of the lands at the North Russell Road Site are in active agricultural production (croplands). Agriculture is not the predominant use on the North Russell Road Site and cropland makes up 40.5% of the lands in the immediate area (within 500 metres). Advantages: The North Russell Road Site has slightly less land in actual agriculture production. Disadvantages: The North Russell Road Site contains some Class 3 agricultural lands. It has a higher amount of agricultural production in the Site-vicinity.	None of the land area on the Boundary Road Site is Class 1-3 land. There are no on-Site agricultural improvements on the subject lands. 16.3% of the lands at the Boundary Road Site were in active agricultural production (croplands). Agriculture is not the predominant use on the Boundary Road Site and cropland makes up only 14.5% of the lands in the immediate area (within 500 metres). Advantages: The Boundary Road Site has no Class 1-3 agricultural lands. It has a lower amount of agricultural production in the Site-vicinity. Disadvantages: The Boundary Road Site has slightly more land in actual agriculture production.
Design &Operations	Criterion: Which Site is preferred regarding the anticipated amount of engineering required to assure MOECC groundwater quality criteria are met at the property boundary? Indicator: Degree of engineered containment expected to be required for on-Site systems.	Even though the shale bedrock underlying the North Russell Road Site is indicated to generally have a relatively low hydraulic conductivity, because the Site is underlain by bedrock, the landfill portion and any leachate treatment or holding ponds is expected to require an engineered groundwater protection system (liner, leachate collection system). It is anticipated that for the landfill, the system would be similar to the "Generic Design Option II" from the MOECC Landfill Standards (MOE, 1998b) (i.e., double composite liner with primary and secondary leachate collection systems). Disadvantages: The North Russell Road Site would require a higher degree of engineered containment for the landfill and leachate treatment/holding pond components of the CRRRC.	The thick clay deposit that underlies the Boundary Road Site provides a natural low hydraulic conductivity barrier. The landfill portion and any leachate treatment or holding ponds are expected to require: a single hydraulic barrier (because of the surficial silty sand and/or upper weathered clay zone) on the excavated below-ground sideslopes (e.g., geomembrane, geosynthetic clay liner (GCL) or compacted clay) that is keyed into the underlying unweathered silty clay; a primary leachate collection system on the base and below-ground sideslopes of the waste disposal cells; and either a single liner or single composite liner on the base of the waste disposal cells or ponds, or a vertical cut-off feature around the landfill perimeter. A perimeter cut-off would also replace a liner on the below-ground sideslopes of the waste cells. Advantages: The Boundary Road Site would require a lower degree of engineered containment for the landfill and leachate treatment/holding pond components of the CRRRC.
Traffic	Criterion: Which Site is preferred regarding potential effects from Site-related truck traffic? Indicators: Proximity of Site to Highway interchange; characteristics of road network between Highway interchange and Site; and Land use from Highway interchange to Site along the main haul route(s).	Five main haul route alternatives to the North Russell Road Site were examined. Two alternatives assumed the majority of Site-related traffic to originate from the Boundary Road/Highway 417 interchange and three alternatives from the Vars/Highway 417 interchange. Four of the alternatives use existing roadways (a combination of rural arterials, rural collectors and one secondary rural road- Eadie Road); the fifth alternative involves the Vars interchange and construction of a new road for the CRRRC along an unopened road allowance. The travel distance along the road network for the first four alternative haul routes ranges from 6 to 10 kilometres, with from 10 to 30 residences, 11 to 15 commercial uses and 11 to 21 farm accesses along the routes. For two of these routes, there could also possibly be a cemetery, depending on the location of the Site access point. For the fifth alternative, the travel distance is 4.5 kilometres and there are no residential uses, no farm accesses and 11 commercial uses along the route. Advantages: The fifth alternative has the least amount of residences along the haul route. Disadvantages: The haul routes for all alternatives are longer for the North Russell Road Site. The fifth alternative would require a new road.	The roads which would form the main haul route for the Boundary Road Site-related truck traffic from Highway 417 are classified as rural arterial roads. The Site access location from Highway 417 could correspond to a travel distance of about 1.3 to 3.5 kilometres from Boundary Road Exit 96 depending on where Site access is provided (subsequently determined to be 850 metres as described in Section 8.11). Land uses along the haul route were mainly commercial/light industrial; up to nine residences are along the haul route and 14 commercial/light industrial properties. Advantages: Compared to all but one of the alternative haul routes for the North Russell Road Site the Boundary Road Site has less land uses adjacent to the haul route. The Boundary Road Site provides the shortest haul route along roads designated as arterial roads that currently carry truck traffic.

7.4 Identification of Preferred Site

The comparison summarized in Table 7.3-1 indicates that the Boundary Road Site is preferred for all nine of the environmental components considered in the comparative evaluation. During the first and second Open Houses, proposed components and criteria to assess potential effects of alternative ways that the project could be implemented were presented and the public was invited to provide input and rank their relative importance.

Table 7.4-1 lists each component, grouped by their ranking of relative importance, and the results of the comparative assessment of the alternative Sites.

Table 7.4-1: Results of Comparison of Alternative Sites

Component	Preferred Site
Most Important	
Atmospheric	Boundary Road Site
Geology, Hydrogeology & Geotechnical	Boundary Road Site
Land Use & Socio-economic	Boundary Road Site
Traffic	Boundary Road Site
Important	
Surface Water	Boundary Road Site
Biology	Boundary Road Site
Agriculture	Boundary Road Site
Design & Operations	Boundary Road Site
Less Important	
Cultural & Heritage Resources	Boundary Road Site

With or without ranking of environmental components by importance, the Boundary Road Site was identified as the overall preferred Site for the CRRRC. It was preferred in every category of the evaluation.

This conclusion was presented at Open House #3 and there was virtually no feedback from the public or other stakeholders then or subsequently suggesting that the North Russell site should have been the preferred site.

The remainder of this EASR therefore describes the assessments carried out to predict and assess the net effects of the proposed CRRRC at the Boundary Road Site.

8.0 DESCRIPTION OF THE EXISTING ENVIRONMENT

This section corresponds to Task 1 of the methodology described in Section 2.3 and provides a more detailed description of the components of the existing natural and human environments at and related to the Boundary Road Site. In general, the environment is first described in general at a regional scale and then it is described in greater detail for the two generic study areas that were used to assess the Boundary Road Site. As noted in Section 2.3, the EA study team modified the generic study areas as appropriate to meet the specific requirements of each environmental component.

Section 8.1 provides a regional overview of the Site to provide context for the assessment. Sections 8.2 and 8.3 provide an overview of the Site-vicinity and on-Site study areas, respectively. The existing conditions for each of the environmental components are then described in Sections 8.4 to 8.11.

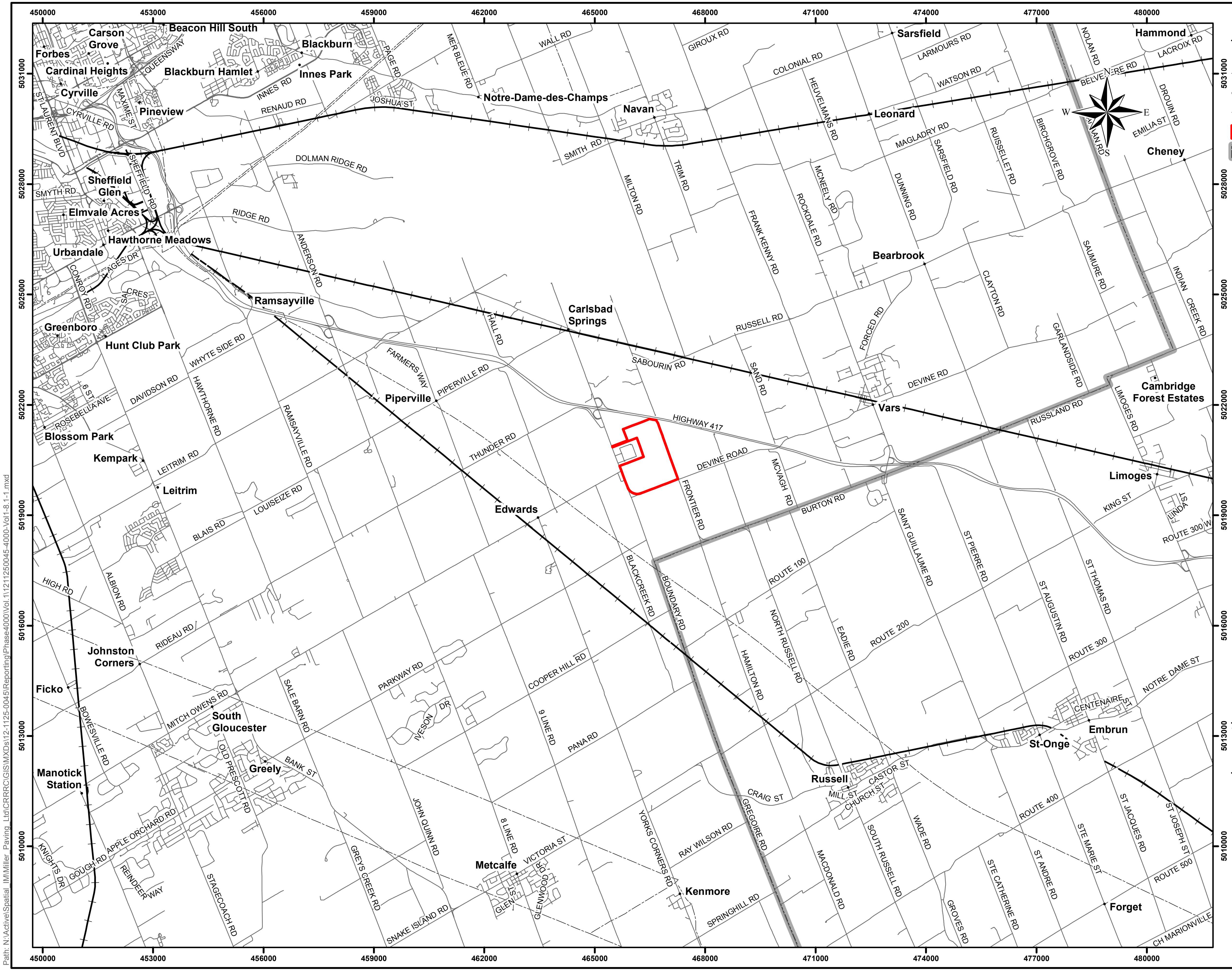
8.1 Regional Overview

The general location of the proposed CRRRC Site is shown on Figure 8.1-1. The Site is located within the City of Ottawa, in the rural portion of Cumberland ward. The City of Ottawa, with a population of 883,391 in 2011 according to Statistics Canada, represents 6.9% of the population of the Province. The estimated population of the ward of Cumberland is 44,400, including 16,300 households (City of Ottawa, 2013a). This represents 4.7% of the total population of the City of Ottawa and 4.2% of households.

The Site is located within a humid continental climate region, characterized by cold winters, warm summers and high humidity levels. On average, the coldest month of the year is January and the warmest is July. The nearest meteorological station to the Site with hourly data is at the Ottawa MacDonald Cartier International Airport, located approximately 20 kilometres west of the Site. The long-term average daily temperature at this station is 6°C, with average temperatures ranging from -10.8°C to 20.9°C throughout the year. On average, the region experiences 944 millimetres of total annual precipitation. The total average annual rainfall is 732 millimetres, with most rainfall occurring from April through November. The total average annual snowfall is 236 centimetres, with most snowfall occurring from December through March (Environment, Canada 2014).

The region within which the CRRRC Site is situated is characterized by relatively thick and extensive deposits of sensitive marine clay, silt and silty clay that were deposited within the Champlain Sea basin. These deposits overlie relatively thin, commonly reworked glacial till and glaciofluvial deposits, that in turn overlie bedrock consisting of shales, dolostones and limestones.

The Site is also located within the Mixedwood Plains Ecozone, an area underlain by Paleozoic limestones and dolostone bedrock. Within the larger Ecozones are nested Ecoregions, areas defined by characteristic climate patterns. The Site is located within the Lake Simcoe Rideau Ecoregion, which contains extensive agricultural lands, as well as deciduous and mixed forests (MNR, 2007). The Site location is within the South Nation River watershed, where land use is primarily agricultural including dairy and cash crop production (Chapman and Putnam, 1984).



Path: N:\Active\Spatial_IM\Miller_Paving_Ltd\CRRRC\GIS\MXDs\12-1125-0045\Reporting\Phase4000\Vol.1\1211250045-4000-Vol1-8.1-1.mxd

LEGEND

•	POPULATED PLACE NAME
—	ROADWAY
┼	RAILWAY
-·-	UTILITY LINE
🟥	PROPERTY BOUNDARY
▨	CITY OF OTTAWA BOUNDARY

1.5 0.75 0 1.5 3 4.5

SCALE 1:100,000 KILOMETRES

NOTE

THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT.

REFERENCE

DIGITAL NRVIS MNR DATA PRODUCED BY GOLDER ASSOCIATES LTD.,
USED UNDER LICENSE © QUEEN'S PRINTER OF ONTARIO.
PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83
COORDINATE SYSTEM: UTM ZONE 18

PROJECT

ENVIRONMENTAL ASSESSMENT OF THE
CAPITAL REGION RESOURCE RECOVERY CENTRE

TITLE

SITE CONTEXT

Golder Associates
Ottawa, Ontario

PROJECT No. 12-1125-0045			SCALE AS SHOWN	REV. 0
DESIGN	PLE	DEC. 2013	FIGURE 8.1-1	
GIS	BR	DEC. 2013		
CHECK	PLE	AUG. 2014		
REVIEW	PAS	AUG. 2014		

8.2 Site Vicinity Overview

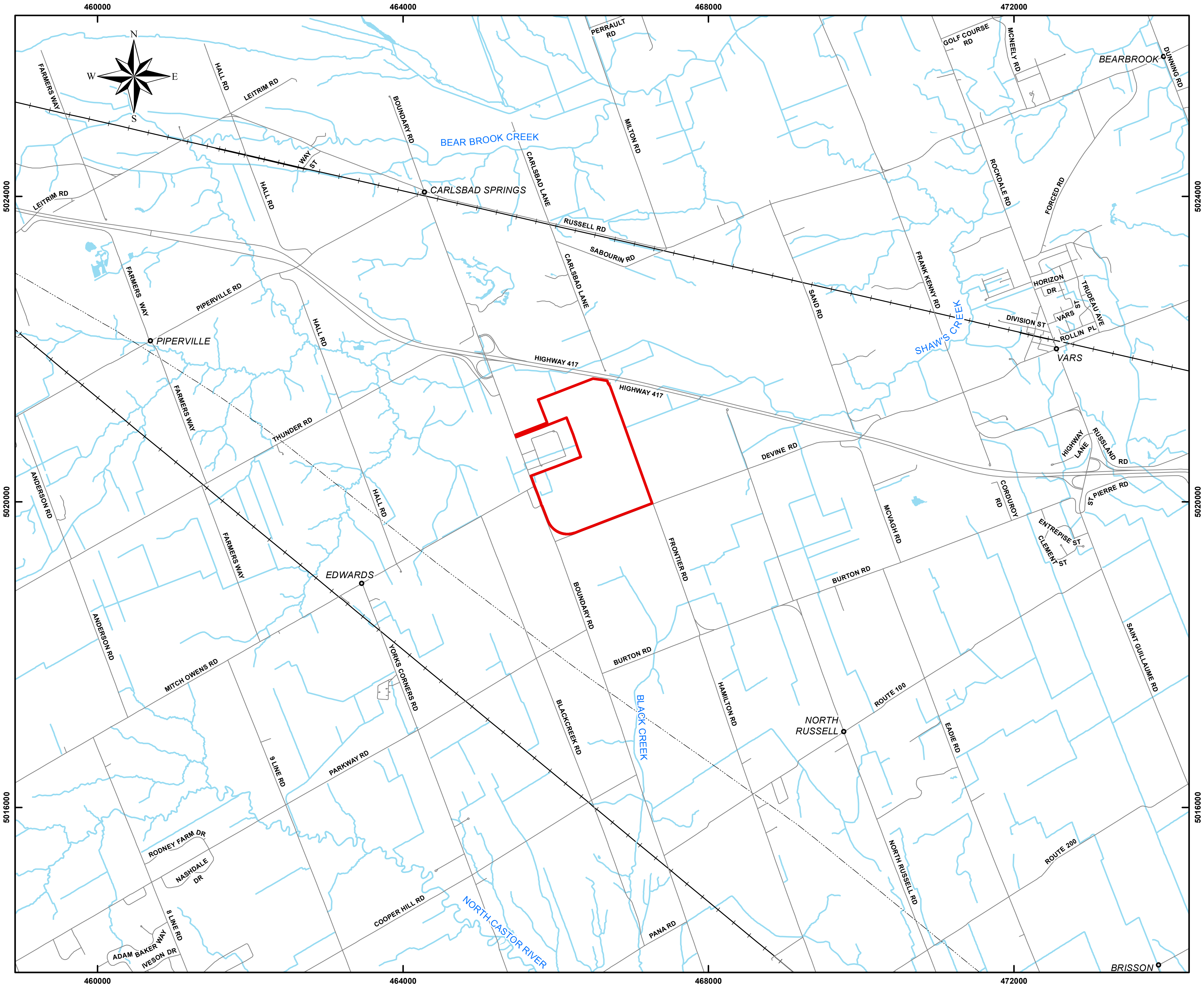
The Site is located on the east side of Boundary Road just southeast of the Highway 417/Boundary Road interchange, on Lots 22 through 25, Concession XI, in the former Township of Cumberland, as shown on Figure 8.2-1.

The land use surrounding the Site is primarily a mixture of commercial/industrial and agricultural. The agricultural land use is found immediately east of the Site, as well as to the southeast, south and southwest; however, areas of undeveloped (heavily vegetated) land generally exists between the Site and the agricultural lands in these directions.

The industrial land use is found to the west and northwest of the Site. Residential development in the vicinity of the Site is limited to some homes mixed in with the commercial/industrial uses along Boundary Road. The Site is located in an area of the City of Ottawa in which development has been somewhat constrained due to poor quality groundwater.

There are four natural watercourses within 5 kilometres of the Site. Bear Brook Creek is 3.4 kilometres to the northwest of the property boundaries and Shaw's Creek is 1.6 kilometres to the east. Bear Brook Creek is a major tributary of the South Nation River; the Site is located within the Bear Brook Creek subwatershed. The North Castor River is 4.7 kilometres to the southwest of the property, while Black Creek is approximately 2.5 kilometres to the southeast; these two watercourses are in the Castor River subwatershed and, as such, do not receive drainage from the Site.

In the general area of the Site, the topography is generally highest to the west and southwest, and lowest in the north, northeast and southeast. Overall the topography is generally flat lying. Major surface water features within the vicinity of the Site (i.e., the Castor River and Bear Brook Creek) generally drain in an easterly direction following the general topographic slope. Drainage in the vicinity of the Site is mainly by means of a network of agricultural ditches and three municipal drains. There are roadside ditches along Boundary, Devine and Frontier Roads that eventually all drain eastward.



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LEGEND

○	POPULATED PLACE NAME
—	ROADWAY
┼	RAILWAY
-··-	UTILITY LINE
—	SURFACE WATER FEATURE
🟦	WATER AREA
🟥	PROPERTY BOUNDARY

1,000 500 0 1,000

SCALE 1:50,000 METRES

NOTE

THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT.

REFERENCE

LAND INFORMATION ONTARIO (LIO) DATA PRODUCED BY GOLDER ASSOCIATES LTD. UNDER LICENCE FROM ONTARIO MINISTRY OF NATURAL RESOURCES, ©QUEENS PRINTER 2012.

PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 18

PROJECT

ENVIRONMENTAL ASSESSMENT OF THE
CAPITAL REGION RESOURCE RECOVERY CENTRE

TITLE

SITE PLAN

Golder Associates

PROJECT No. 12-1125-0045			SCALE AS SHOWN	REV. 0.0
DESIGN	JPAO	DEC. 2013		
GIS	BR	DEC. 2013		
CHECK	PLE	AUG. 2014		
REVIEW	PAS	AUG. 2014		

FIGURE 8.2-1

8.3 Site Overview

The Site totals approximately 192 hectares in area, as shown on Figure 8.2-1. It is bounded by Boundary Road to the west, Devine Road to the south and Frontier Road to the east. To the north, the Site is bounded primarily by undeveloped or industrial land, and by Highway 417 at the northeast corner.

The Site is currently vacant, with the exception of three residences and a model aircraft club along Frontier Road and one residence along Boundary Road. The residences are all owned by Taggart Miller and will be removed on construction of the CRRRC. A portion of the northern section of the Site is currently used to grow hay, but the majority of the Site is heavily vegetated and treed. Cropland reflects approximately 16% of the Site area. The Site has a generally high groundwater level and minimal relief, with a gradual slope of less than 1% draining west to east and ground surface elevations ranging from approximately 78 to 76 metres above sea level (masl).

Overall the Site is characterized by a mix of thickets, immature deciduous forests, swamps, agricultural fields and disturbed areas. Watercourses in the form of ditches and drains are present on the Site. In general, these are extensions of municipal drains in the vicinity of the property, or of municipal drains and their branches that originate from the property. All drainage discharge from the Site eventually combines in Shaw's Creek that in turn eventually discharges to Bear Brook Creek.

8.4 Atmosphere

This section presents the existing conditions related to atmosphere within the Site and Site-vicinity. This component is divided into noise and air quality/odour sub-components; the study areas for these sub-components are provided in Section 2.3. These summaries were compiled from the detailed studies of the noise environment (provided as TSD #2) and the air quality/odour environment (provided as TSD #3).

8.4.1 Noise

A field study was carried out to characterize existing noise levels, due to the lack of existing noise data in the Site-vicinity. Continuous noise monitoring was carried out at three locations within the Site-vicinity to collect the average and minimum existing noise levels for daytime (0700 to 1900), evening (1900 to 2300) and nighttime (2300 to 0700) periods at nearby sensitive PORs. The monitoring lasted from August 23, 2013 through to August 29, 2013. Noise data was logged continuously on an hourly basis for the duration of the monitoring period.

The locations where baseline noise monitoring was carried out are shown in Figure 8.4.1-1 and summarized in Table 8.4.1-1.

Table 8.4.1-1: Summary of Noise Monitoring Locations

Monitoring Location	Address	Monitor UTM Coordinates
Meas Loc #1	6150 Thunder Road	464943, 5021708
Meas Loc #2	5368 Boundary Road	465339, 5021249
Meas Loc #3	5716 Boundary Road	465969, 5019628

The existing acoustic environment in the Site-vicinity is dominated primarily by road traffic noise along Boundary Road. During nighttime hours, noise from traffic along Highway 417 can also be heard. All noise monitoring data are included in TSD #2. Table 8.4.1-2 summarizes the measured noise levels at each of the three monitoring locations.

Table 8.4.1-2: Summary of Noise Monitoring Data (dBA)

Location	Average Hourly Daytime (0700 to 1900 hours) Normal Operations		Average Hourly Evening (1900 to 2300 hours) Normal Operations		Average Hourly Nighttime (0600 to 0700 hours) Normal Operations		Average Hourly Nighttime (2300 to 0600 hours) Essential Operations		Minimum Hourly Daytime (0700 to 1900 hours) Normal Operations		Minimum Hourly Evening (1900 to 2300 hours) Normal Operations		Minimum Hourly Nighttime (0600 to 0700 hours) Normal Operations		Minimum Hourly Nighttime (2300 to 0600 hours) Essential Operations	
	L_{eq}	L_{90}*	L_{eq}	L_{90}*	L_{eq}	L_{90}*	L_{eq}	L_{90}*	L_{eq}	L_{90}*	L_{eq}	L_{90}*	L_{eq}	L_{90}*	L_{eq}	L_{90}*
Meas Loc #1	60	53	60	53	60	55	54	47	58	49	56	49	58	52	47	40
Meas Loc #2	67	52	66	51	67	54	57	45	65	45	61	45	63	50	50	34
Meas Loc #3	61	49	60	48	62	50	51	40	58	41	54	39	56	41	47	28

Note: * Sound pressure level exceeded for 90% of the measurement period.

In addition, a total of 10 PORs with existing residences were identified within the Site-vicinity study area and near the haul route as being the closest off-Site receptors (see Figure 8.4.1-1). A total of 3 vacant lots (VL) zoned to allow possible future noise sensitive land use were also identified (see Figure 8.4.1-2).

Table 8.4.1-3 provides a summary of the PORs and VLs used in this assessment. The table also indicates which baseline noise monitoring location was used to establish the existing noise levels at each POR and VL.

Table 8.4.1-3: Summary of Sensitive PORs

Receptor	UTM Coordinates	Representative Noise Monitoring Location
POR1	465558, 5020774	Meas Loc #2
POR2	465319, 5020015	Meas Loc #3
POR3	465888, 5019611	Meas Loc #3
POR4	465421, 5020818	Meas Loc #2
POR5	465428, 5021084	Meas Loc #2
POR6	465323, 5021149	Meas Loc #2
POR7	465319, 5021197	Meas Loc #2
POR8	465306, 5021229	Meas Loc #2
POR9	465318, 5021389	Meas Loc #2
POR10	464934, 5021613	Meas Loc #1
VL01	465916, 5020949[1]	Meas Loc #2
VL02	466206, 5020603[1]	Meas Loc #3
VL03	466808, 5021378[1, 2]	N/A[3]
	467094, 5020583[1, 4]	N/A[5]

Notes:

[1] UTM coordinates are for the assumed location of the future developments.

[2] Assumed location representative of worst-case noise impact for ancillary noise sources.

[3] Noise monitoring was not carried out at this location. The minimum background sound level due to road traffic was calculated using STAMSON v5.04.

[4] Assumed location representative of worst-case noise impact for landfill noise sources.

[5] MOECC exclusionary sound level limits for Class 1 areas have been used.

For the vacant lot located to the east of the Facility (VL03 – see Figure 8.4.1-2), the minimum background sound level due to road traffic was calculated using hourly traffic data for Highway 417. The sound energy exposure was determined using STAMSON v5.04 – ORNAMENT, the computerized road traffic noise prediction model provided by the MOECC. Predictions were made at two locations representing the assumed worst-case location for the ancillary and landfill operations, respectively. The minimum hourly noise level predictions for VL03 are summarized in Table 8.4.1-4.

Table 8.4.1-4: Summary of Minimum Background Sound Level (dBA) Due to Road Traffic (applicable to VL03)

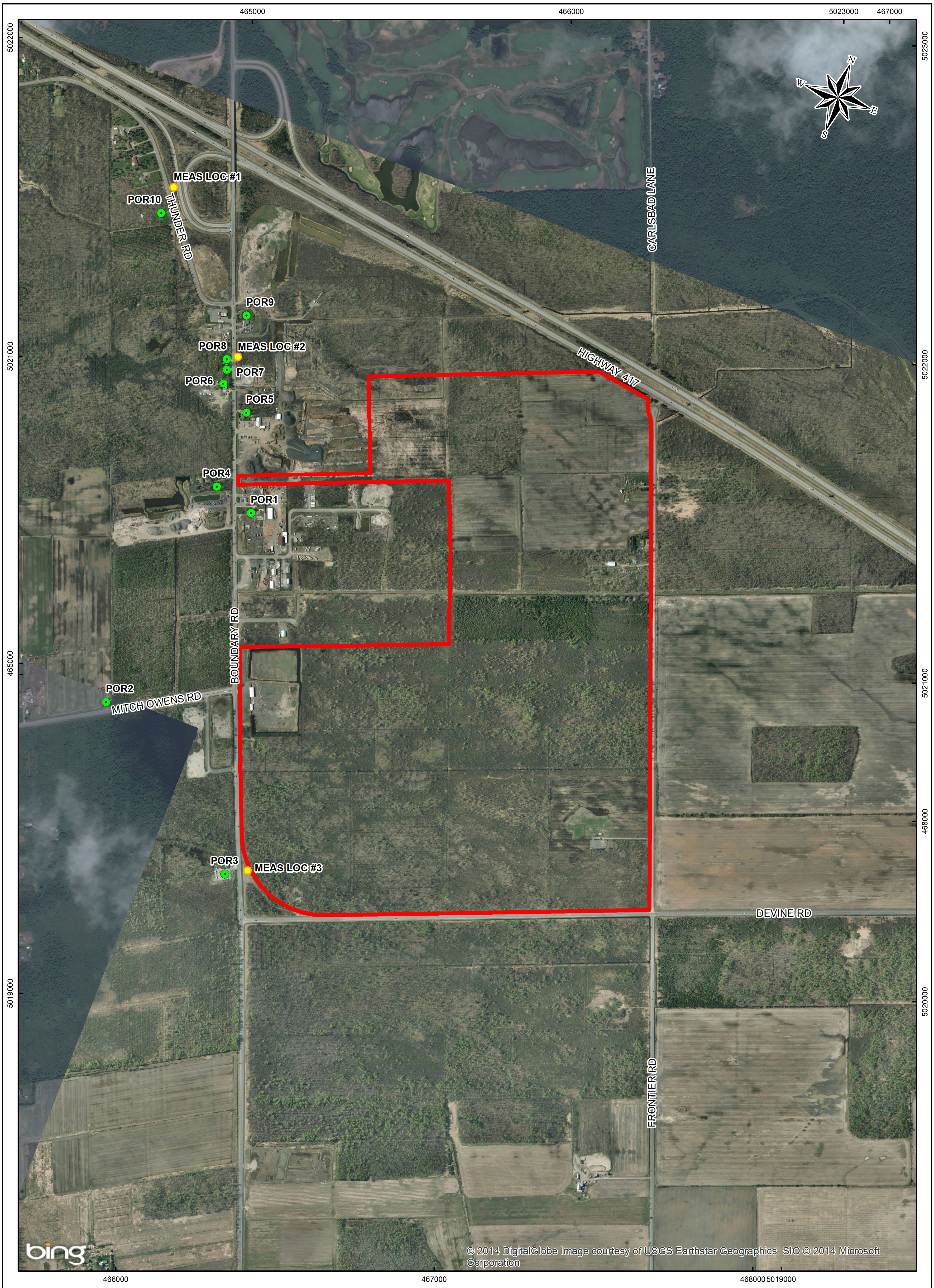
Location	Daytime (0700 to 1900 hours)	Evening (1900 to 2300 hours)	Night-time Normal Operations (0600 to 0700 hours)	Night-time Essential Operations (2300 to 0600 hours)
VL03 (Ancillary Assessment)	57 [1]	55 [1]	54 [1]	45 [2]
VL03 (Landfill Assessment)	55 [2]	N/A [3]	45 [2]	N/A [3]

Notes:

[1] Minimum background sound level due to road traffic calculated using STAMSON v5.04

[2] MOECC minimum sound level limits for landfilling operations.

[3] Proposed operating hours of the landfill are 0600 to 1900 hours.



400 200 0 400

SCALE 1:12,000 METRES

LEGEND

●	NOISE MONITORING LOCATIONS
●	POINT OF RECEPTION LOCATIONS
▭	PROPERTY BOUNDARY

NOTE

THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT.

REFERENCE

BACKGROUND IMAGERY - BING MAPS AERIAL (C) 2010 MICROSOFT CORPORATION AND ITS DATA SUPPLIERS.
AERIAL PHOTOGRAPHS PURCHASED FROM THE CITY OF OTTAWA.
LAND INFORMATION ONTARIO (LIO) DATA PRODUCED BY GOLDER ASSOCIATES LTD. UNDER LICENCE FROM ONTARIO MINISTRY OF NATURAL RESOURCES, © QUEENS PRINTER 2012.
PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 18

PROJECT

ENVIRONMENTAL ASSESSMENT OF THE
CAPITAL REGION RESOURCE RECOVERY CENTRE

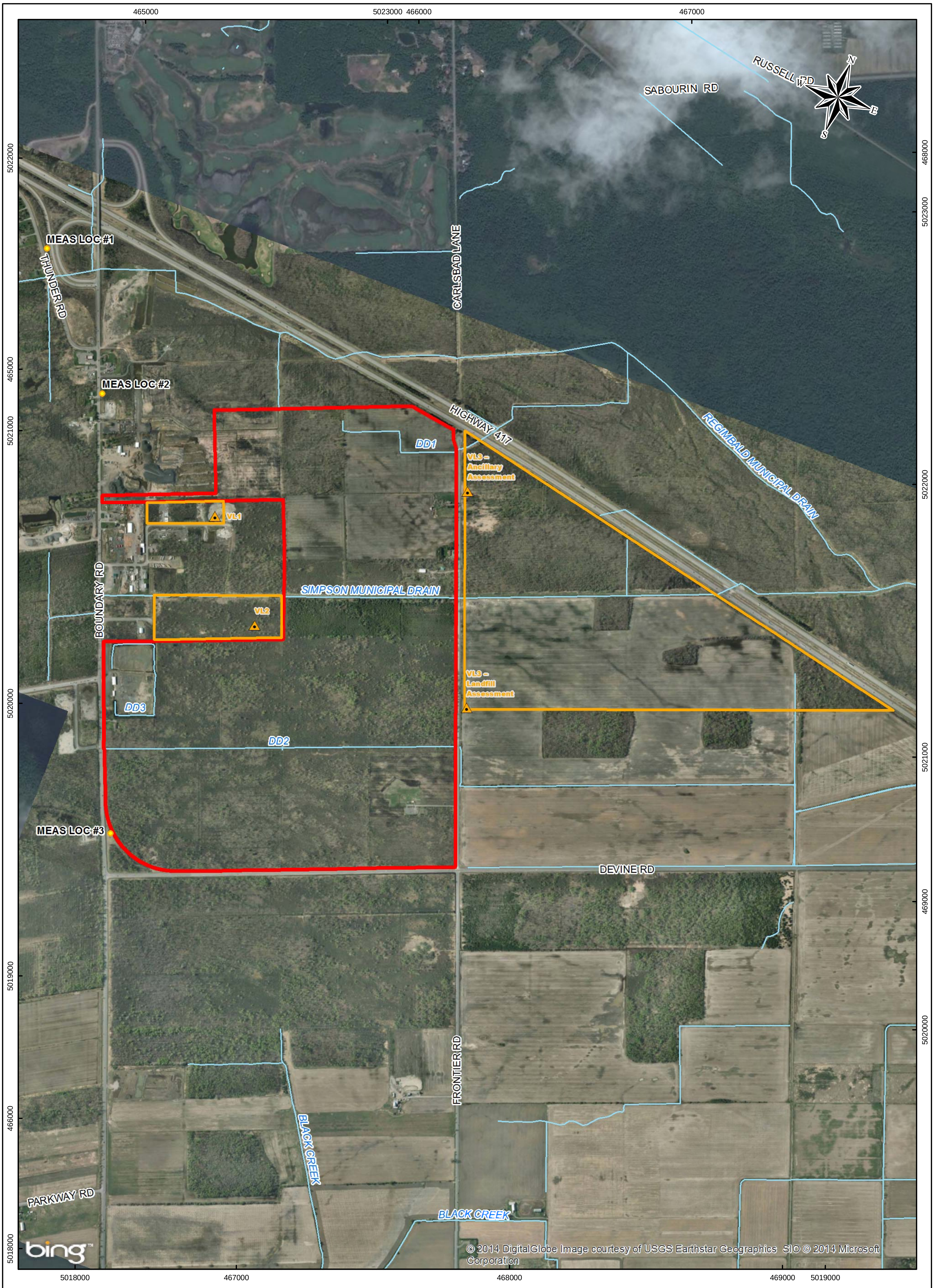
TITLE

NOISE MONITORING AND ASSESSMENT

Golder Associates
Ottawa, Ontario

PROJECT No. 12-1125-0045			SCALE AS SHOWN	REV. 0.0
DESIGN	TG	DEC. 2013	**FIGURE 8.4.1-1**	
GIS	BR	DEC. 2013		
CHECK	PLE	AUG. 2014		
REVIEW	PAS	AUG. 2014		

Path: N:\Active\Spatial_IM\Miller_Paving_Ltd\CRRRC\GIS\MXDs\12-1125-0045\Reporting\Phase4000\Vol.1\1211250045-4000-Vol1-8.4.1-1.mxd



400 200 0 400

SCALE 1:14,000 METRES

LEGEND

▲ RECEPTOR LOCATION

▭ VACANT LOT

— SURFACE WATER FEATURE

▭ PROPERTY BOUNDARY

NOTE

THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT.

REFERENCE

BACKGROUND IMAGERY - BING MAPS AERIAL (C) 2010 MICROSOFT CORPORATION AND ITS DATA SUPPLIERS.
AERIAL PHOTOGRAPHS PURCHASED FROM THE CITY OF OTTAWA.
LAND INFORMATION ONTARIO (LIO) DATA PRODUCED BY GOLDER ASSOCIATES LTD. UNDER LICENCE FROM ONTARIO MINISTRY OF NATURAL RESOURCES, © QUEENS PRINTER 2012.
PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 18

PROJECT

ENVIRONMENTAL ASSESSMENT OF THE
CAPITAL REGION RESOURCE RECOVERY CENTRE

TITLE

VACANT LOT LOCATIONS

Golder Associates
Ottawa, Ontario

PROJECT No. 12-1125-0045			SCALE AS SHOWN	REV. 0.0
DESIGN	TG	NOV. 2013	FIGURE 8.4.1-2	
GIS	BR	NOV. 2013		
CHECK	PLE	AUG. 2014		
REVIEW	PAS	AUG. 2014		

Path: N:\Active\Spatial_IM\Miller_Paving_Ltd\CRRRC\GIS\MXDs\12-1125-0045\Working\Phase2000\Task110-Atmosphere\1211250045-2000-0110-8.4.1-2_VacantLot.mxd

8.4.2 Air Quality and Odour

This section presents a characterization of existing background air quality within the Site and Site-vicinity study areas.

In Ontario, limits and guidelines for regulating air quality are established under O. Reg. 419/05 (Air Pollution – Local Air Quality) (MOE, 2013a). These include standards, point-of-impingement guidelines and AAQC for various compounds.

In characterizing the existing environment for air quality and odour, a local meteorological station was identified, the Stetson Flyer meteorological station located on the south part of the Boundary Road Site. The Stetson Flyer meteorological station's suitability as a source of weather data was assessed by examining the meteorological tower installation and its location, as well as the meteorological data. Based on this review, it was determined that the meteorological data from the Stetson Flyer station was not adequate for use in the EA, as the data was not of sufficient quality or quantity. Instead, background air quality was determined from existing MOECC monitoring stations. The closest air quality monitoring stations to the proposed CRRRC are the two stations located in Ottawa: Ottawa Downtown (Ottawa DT) and Ottawa Central (Ottawa C) (MOE, 2011). The location of each of these stations relative to the CRRRC is set out in Table 8.4.2-1.

Table 8.4.2-1: Location of Air Monitoring Stations

City	Station ID	Location	Lat/Long	Distance to Site (km)	Direction
Ottawa Downtown (Ottawa DT)	51001	Outside Site-vicinity Area	44.1502528, -77.3955	22	West-Northwest (generally upwind)
Ottawa Central (Ottawa C)	51002	Outside Site-vicinity Area	45.033333 -75.675	23	West-Northwest (generally upwind)

For compounds relevant to the CRRRC, monitoring data for sulphur dioxide ($SO_{2)}$, nitrogen dioxide ($NO_{2)}$, oxides of nitrogen ($NO_{X)}$, carbon monoxide (CO) and $PM_{2.5}$ are available. Ambient monitoring is not available directly for background SPM (Suspended Particulate Matter) and PM_{10} concentrations. However, background PM_{10} and SPM can be determined from the fine particulate ($PM_{2.5}$) monitoring results. Overall, ambient levels of $PM_{2.5}$ have been found to be about 50% of the PM_{10} concentration (Health Canada, 1998). The SPM concentrations in Canada are about twice the corresponding PM_{10} concentrations (Health Canada, 1998). These ratios were used to derive the background SPM and PM_{10} from the $PM_{2.5}$ monitoring data at each station.

Table 8.4.2-2 provides a summary of the monitoring data available from each of the air monitoring stations.

Table 8.4.2-2: Availability of Ambient Air Quality Data

Compound	Ottawa DT	Ottawa C
SPM	N/A	N/A
PM_{10}	N/A	N/A
$PM_{2.5}$	2003-2011	2007-2011
NO_x	2000-2011	2007-2011
NO_2	2000-2011	2007-2011
SO_2	2001, 2003-2011	2007-2009
CO	2001, 2003-2011	2007-2009

Note: "N/A" indicates that data for the compound were not available at that station.

The historic monitoring data for the two stations evaluated indicate that the compound levels in the area are typical when compared to other locations in Southeastern Ontario. All measured values were below their respective AAQC values. The existing values considered to be representative of background air quality are outlined in Table 8.4.2-3. Generally, the 90th percentile of measured concentration is considered representative of local background air quality.

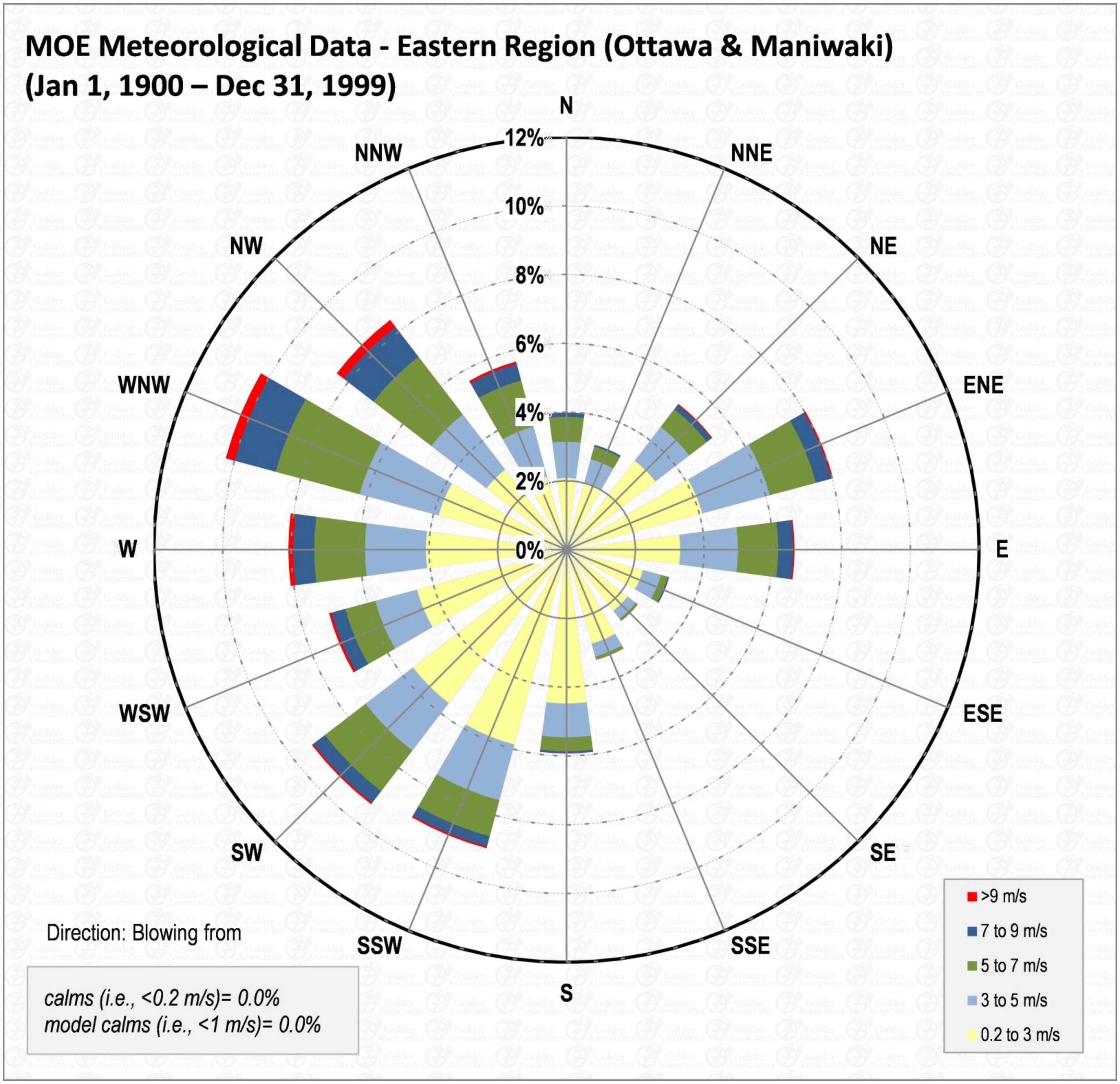
Table 8.4.2-3: Background Air Quality Concentrations (90th Percentile)

Compound	Averaging Period	Ottawa DT ($\mu g/m^3$)	Ottawa C ($\mu g/m^3$)
$PM_{2.5}$	24-hour	12.26	9.92
NO_X	1-hour	62.07	37.62
	24-hour	57.12	35.17
	Annual	28.76	16.92
NO_2	1-hour	45.14	31.98
	24-hour	38.83	26.01
	Annual	20.45	13.30
SO_2	1-hour	7.86	5.24
	24-hour	7.64	6.02
	Annual	2.94	2.52
CO	1-hour	722.65	389.38
	8-hour	827.44	449.51

Note: $\mu g/m^3$ = micrograms per cubic metre.

These stations are considered generally indicative of background air quality levels for the Site.

An important existing condition component to the assessment is wind direction. The MOECC meteorological 5-year dataset was used to generate a wind rose showing the wind direction as "blowing from" in Figure 8.4.2-1 (MOE, 2011).



NOTE

THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT

PROJECT

ENVIRONMENTAL ASSESSMENT OF THE
CAPITAL REGION RESOURCE RECOVERY CENTRE

TITLE

EASTERN REGION
WIND ROSE

Golder Associates

PROJECT No. 12-1125-0045			PHASE No. 4500	
DESIGN	CST	Dec. 2013	NOT TO SCALE	REV.0
GIS	LEB	Dec. 2013	FIGURE 8.4.2-1	
CHECK	PLE	Aug. 2014		
REVIEW	PAS	Aug. 2014		

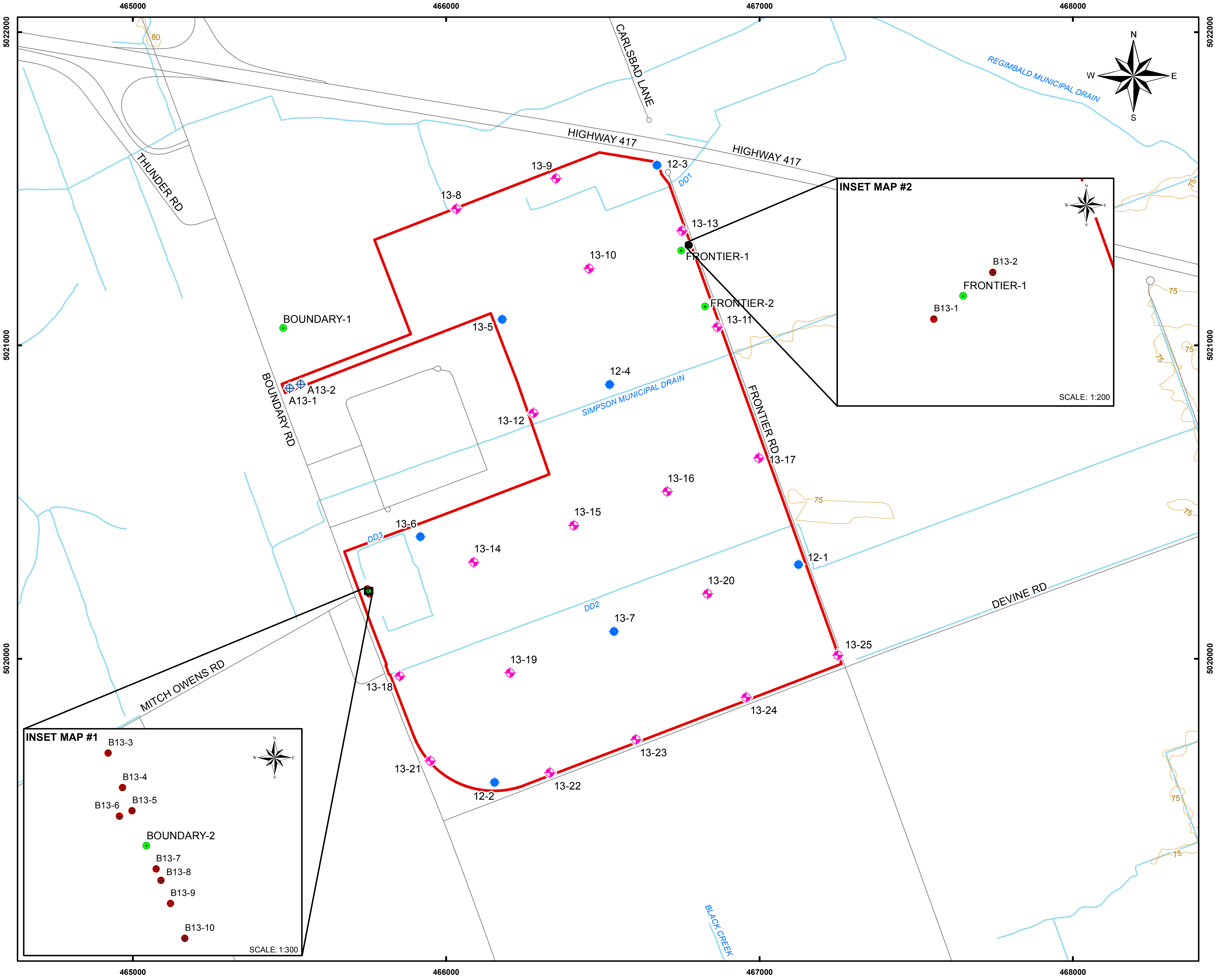
8.5 Geology, Hydrogeology & Geotechnical

This section presents the existing geological, hydrogeological and geotechnical conditions in and around the Site. The study areas for the geological, hydrogeological and geotechnical sub-components are provided in Section 2.3. The geological setting was assessed within a local study area measuring 15 by 20 kilometres. The information and assessments presented in this section have been summarized from more detailed information contained in Volume III.

To characterize the existing conditions, in addition to the Site-specific subsurface investigation program, a review of selected geological literature, geological mapping and previous Site-specific investigations was carried out. Information was obtained on deep gas exploration wells from the Ministry of Natural Resources and Forestry Oil, Gas and Salt Resource Library. The MOECC Water Well Information System (WWIS) (MOE, 2013c) was reviewed and records of cored boreholes were collected.

The Site field and laboratory investigation program included the following activities:

- Drilling of at least one borehole at 25 investigation locations across the Site. The investigation locations are identified as 12-1 through 12-4 and 13-5 through 13-25 (see locations on Figure 8.5-1). Testing and sampling techniques used at the borehole locations included Cone Penetration Tests, *in-situ* vane testing, standard penetration tests, soil sampling and bedrock coring;
- Examination and logging of the continuous soil samples collected as part of the direct push drilling program;
- Geotechnical laboratory testing of soil samples, including water content determinations, Atterberg limit testing, grain size distribution testing, hydraulic conductivity testing, oedometer consolidation testing and secondary compression testing;
- Construction of groundwater monitoring wells within selected on-Site boreholes and the subsequent measurement of groundwater levels and horizontal hydraulic conductivity in the monitoring wells;
- Collection of groundwater quality samples from the on-Site monitoring wells and residential water supply wells; and
- Geophysical testing consisting of vertical seismic profiling testing carried out within boreholes 12-2-3 and 12-3-3.



LEGEND

- ● DEEP INVESTIGATION LOCATION
- ⊕ SHALLOW INVESTIGATION LOCATION
- ⊕ GOLDER SUPPLEMENTAL MONITORING WELL LOCATION
- ⊗ GOLDER DUG WELL ASSESSMENT MONITORING LOCATION
- ● PRIVATE DUG WELL
- — ROAD
- — CONTOUR LINE, (5m)
- — SURFACE WATER FEATURE
- ▬ WATER AREA
- ▭ PROPERTY BOUNDARY

200 100 0 200

SCALE 1:12,000 METRES

NOTE

THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT.

REFERENCE

LAND INFORMATION ONTARIO (LIO) DATA PRODUCED BY GOLDER ASSOCIATES LTD. UNDER LICENCE FROM ONTARIO MINISTRY OF NATURAL RESOURCES, © QUEENS PRINTER 2012.
PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 18

PROJECT

ENVIRONMENTAL ASSESSMENT OF THE CAPITAL REGION RESOURCE RECOVERY CENTRE

TITLE

GEOLOGY, HYDROGEOLOGY AND GEOTECHNICAL INVESTIGATION LOCATIONS

Golder Associates

PROJECT No. 12-1125-0045			SCALE AS SHOWN	REV. 0
DESIGN	JPAO	DEC. 2013	FIGURE 8.5-1	
GIS	BR	DEC. 2013		
CHECK	PLE	AUG. 2014		
REVIEW	PAS	AUG. 2014		

Path: N:\Active\Spatial_IM\Miller_Paving_Ltd\CRRRC\GIS\MXDs\12-1125-0045\Reporting\Phase4000\Vol.1\1211250045-4000-Vol1-8.5-1.mxd

8.5.1 Geology

8.5.1.1 Regional Geology

The Site is located within the Ottawa Valley. Regionally, the Ottawa Valley area is located within the Ottawa Embayment, an area underlain by a Paleozoic sedimentary sequence which lies unconformably upon Precambrian basement rocks of the Grenville age and structurally bounded by Precambrian rock of the Frontenac Arch, the Laurentian Arch, the Oka-Beauharnois Arch and the Adirondack Dome (see Figure 8.5.1-1). These arches have been structurally active areas of uplift at various times during the Paleozoic and Mesozoic Eras (approximately 600 to 100 million years ago) as part of the Ottawa Valley-Nippissing Graben structure, which has affected the sedimentation and structure of the overlying Paleozoic sequences within the embayment.

The Ottawa Valley-Nippissing Graben consists of extensional block fault structures that extend from the St. Laurence River north westward through the Ottawa Valley including Lake Timiskaming and the Lake Nippissing valleys. Faulting within the graben commenced in the late Precambrian period (about 600 million years ago) and stratigraphic information indicates that it was active through the Cambrian period associated with the clastic deposition of the basal Covey Hill Formation quartz sandstone and conglomerate. Mid- to late-Ordovician limestone and shale strata were deposited in relatively quiescent environments. Formerly overlying Silurian and Devonian Era (younger) strata have been eroded from the area. The Mesozoic Era saw renewed geological activity including intrusion of alkaline dykes and the Cretaceous age Monteregian calc-alkaline igneous intrusions of the Montreal-St. Laurence valley area including the Mount Royal, Oka and Saint Andre Est igneous complexes. The major period of faulting within the Ottawa Valley culminated during the Cretaceous Period (145 to 66 million years ago) associated with the dominant period of igneous intrusive activity (Bleeker et al., 2011).

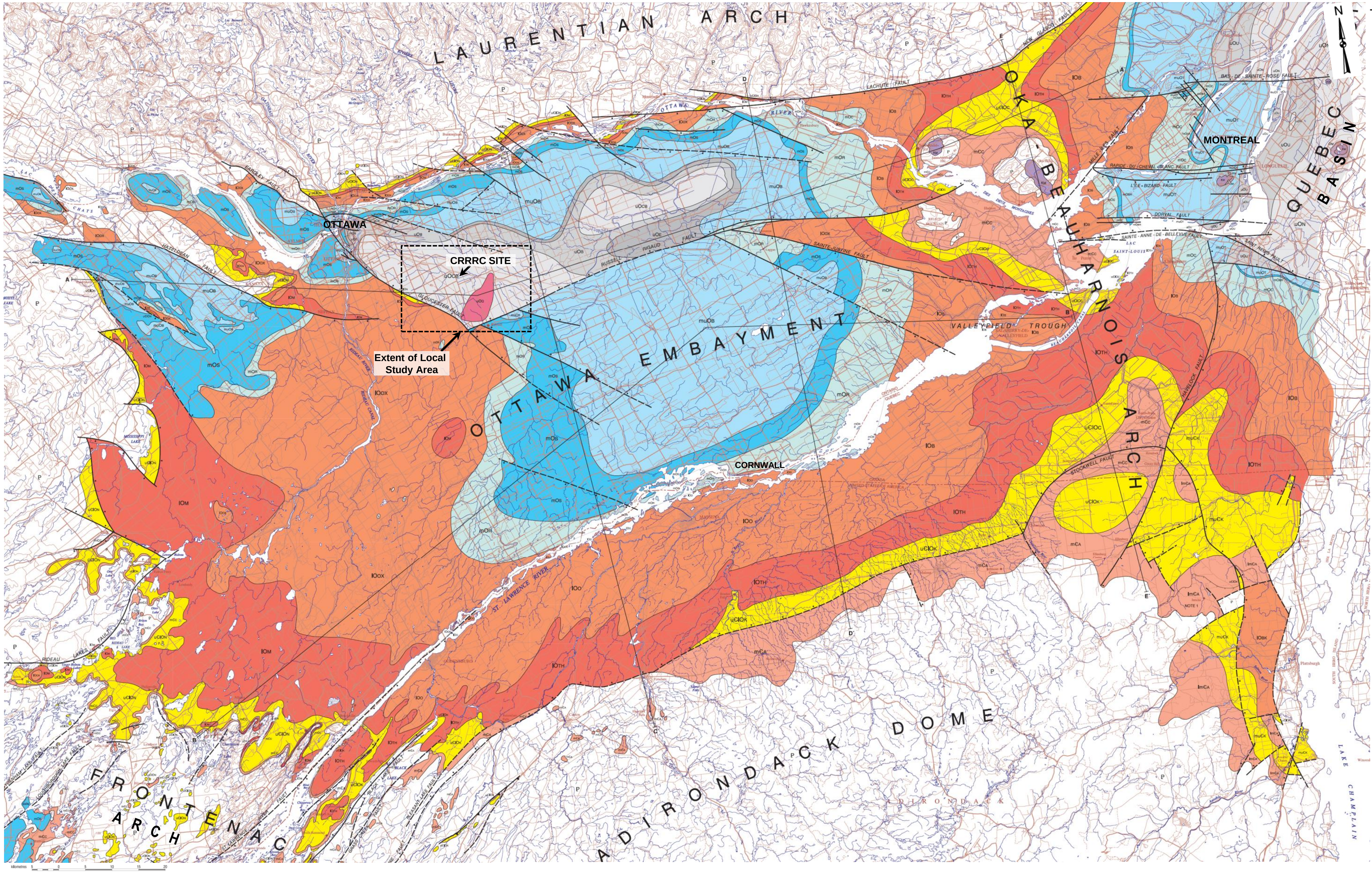
The Paleozoic carbonate and shale sedimentation occurred in near flat-lying conditions. Ottawa Valley Graben faulting and uplift associated with the Precambrian arches subsequently gently folded the Paleozoic sequence forming a broad syncline with numerous extensional fault offsets. Displacement along these normal fault structures varies from a few tens of metres to several hundreds of metres and deformational dragging along the fault contacts locally resulted in steeper fold deformation of the bedrock strata. Small scale faults associated with offsets in the range of several metres to several tens of metres are comparatively common within the intervening areas between the more dominant faults. Faults of this nature are typically encountered within the Paleozoic sequence within the Ottawa area. The encountered fault features form comparatively sharp planes, which were re-cemented with calcite and have been observed to be generally intact in nature (tight) unless opened by penetrative weathering near surface. Structural analysis (Rimando and Benn, 2005) indicates that these faults developed and underwent much of their total displacement more than about 66 million years ago, when the bedrock was in a different stress regime compared to that of the present day.

The Ottawa Valley terrain is largely flat associated with the extensive deposition of marine clay during inundation of the region by the Champlain Sea during the post-glacial period. The clay soils infilled the former glaciated topography and built up an aerially extensive deposit whose thickness presently varies from a few metres to greater than 30 to 50 metres. The clay thins or is absent within areas where the underlying glacial till deposits formed more prominent relief. The glacial till typically overlies bedrock and bedrock outcrops occur infrequently. Areas of glaciomarine sand and gravel beaches developed above the clay deposit during the retreat of the Champlain Sea from the valley and the Ottawa River cut down into the underlying clay following former meander channels in the region.

In summary, there is Precambrian bedrock that experienced faulting around 600 million years ago, with the major period of faulting occurring 145 to 66 million years ago. The deposition of the sedimentary rock overlying the Precambrian rock occurred in near flat-lying conditions. The faulting and uplift of the underlying Precambrian rock created the structure of the overlying sedimentary rocks by shifting them generally in the range of several metres to several tens of metres in the Ottawa area, or by folding them. Most of this displacement occurred more than about 66 million years ago. There are also known locations of larger fault movement displacements in the bedrock, such as the Gloucester fault that passes beneath the Village of Russell. The rock is overlain by extensive deposits of marine clay that varies from a few metres to more than 30 to 50 metres in thickness. There are some areas of bedrock outcrop and some areas of sandy soil on top of the clay. The terrain is largely flat.

8.5.1.2 Geology of the Local Study Area and Site

The following sections describe the bedrock and surficial geology of the local study area (as shown on Figure 8.5.1-1) and the Site. Generally, the study area is overburden covered and bedrock outcrop is limited to a few comparatively isolated areas of shale outcrop at the Russell Shale Quarry approximately 5 kilometres to the southeast of the Site and isolated limestone outcrops along the southern edge of the map area, typically south of the Gloucester Fault. Locally, the area surrounding the Site is underlain by shale and limestone of various sedimentary formations, followed by lower bedrock formations that lie unconformably upon the Precambrian basement.



LEGEND

MESOZOIC	
LOWER CRETACEOUS	
KM	*Monteregian intrusives*
PALEOZOIC	
ORDOVICIAN	
OM	*Metamorphosed shale, siltstone, sandstone, and limestone*
UPPER ORDOVICIAN	
uOQ	*Queenston and Russell formations: red shale, interbedded grey shale and dolostone*
uOCB	*Carlsbad Formation: grey and blue-grey shale*
uON	*Nicolet Formation: grey shale*
uOB	*Billings Formation: black shale*
uOU	*Utica Shale: dark grey to black shale*
uOE	*Eastview Formation: black petroliferous limestone*
MIDDLE AND UPPER ORDOVICIAN	
muOB	*Bobcaygeon, Verulam, and Lindsay formations (Trenton Group equivalent)*
muOT	*Trenton Group: brown and grey limestone and minor shale*
MIDDLE ORDOVICIAN	
mOS	*Shadow Lake and Gull River formations (Black River Group equivalent)*
mOBR	*Black River Group: dove-grey limestone, dolostone, and minor shale*
mOR	*Rockcliffe and St. Martin formations (Chazy Group equivalent)*
mOC	*Chazy Group: grey-green shale, siltstone, sandstone, and grey shaly limestone*
LOWER ORDOVICIAN	
lOOX	*Oxford Formation: dark grey to brown dolostone and dolomitic limestone, minor sandstone interbeds*
lOO	*Ogdensburg Formation: dark grey to brown dolostone and dolomitic limestone, minor sandstone interbeds*
lOB	*Beauharnois Formation: dark grey to brown dolostone and dolomitic limestone, minor sandstone interbeds*
lOBK	*Beekmantown Group: dark grey to brown dolostone and dolomitic limestone, minor sandstone interbeds*
lOM	*March Formation: medium to dark grey dolostone and dolomitic limestone with interbeds of light grey to white sandstone*
lOTH	*Theresa Formation: medium to dark grey dolostone and dolomitic limestone with interbeds of light grey to white sandstone*
MIDDLE AND UPPER CAMBRIAN AND LOWER ORDOVICIAN	
uЄlON	*Nepean Formation: light grey to white sandstone (quartz arenite)*
uЄlOC	*Cairnside Formation: light grey to white sandstone (quartz arenite)*
uЄlOK muЄK	*Keeseville Formation: light grey to white sandstone (quartz arenite)*
LOWER AND MIDDLE CAMBRIAN	
mЄC	*Covey Hill Formation: red, salmon-pink to light grey sandstone, and red, pink, to grey feldspathic conglomerate*
mЄA lmЄA	*Ausable Formation: red, salmon-pink to light grey sandstone, and red, pink, to grey feldspathic conglomerate, and minor carbonate*
PRECAMBRIAN	
UPPER PROTEROZOIC	
uPA	*Abbey Dawn Formation: light to dark grey quartzite-cobble and -boulder conglomerate*
PROTEROZOIC, undivided	
P	*Basement rocks to Central Division of St. Lawrence Platform*

Geological boundary (defined and approximate) . . . .

Normal fault (defined, approximate; solid circles indicate downthrown side) . . . .

Uncertain fault (defined, approximate) . . . .

Thrust fault . . . .

Approximate outcrop distribution of the Jericho Member of the Ausable Formation in northeastern New York State . . . . NOTE 1

NOTE

THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT

REFERENCE

FROM SANFORD, B.V. AND RWC ARNOT. 2010. STRATIGRAPHIC AND STRUCTURAL FRAMEWORK OF THE POTSDAM GROUP IN EASTERN ONTARIO, WESTERN QUEBEC AND NORTHERN NEW YORK STATE. GEOLOGICAL SURVEY OF CANADA BULLETIN 597, 1:250,000 SCALE, 83 PP. OTTAWA: GSC.

Location Map

PROJECT

ENVIRONMENTAL ASSESSMENT OF THE
CAPITAL REGION RESOURCE RECOVERY CENTRE

TITLE

REGIONAL BEDROCK
GEOLOGY

Golder Associates
Ottawa, Ontario

PROJECT No. 12-1125-0045			SCALE AS SHOWN	REV.0
DESIGN	NB	15 NOV 2013	**FIGURE 8.5.1-1**	
GIS	NB	15 NOV 2013		
CHECK	PLE	AUG 2014		
REVIEW	PAS	AUG 2014		

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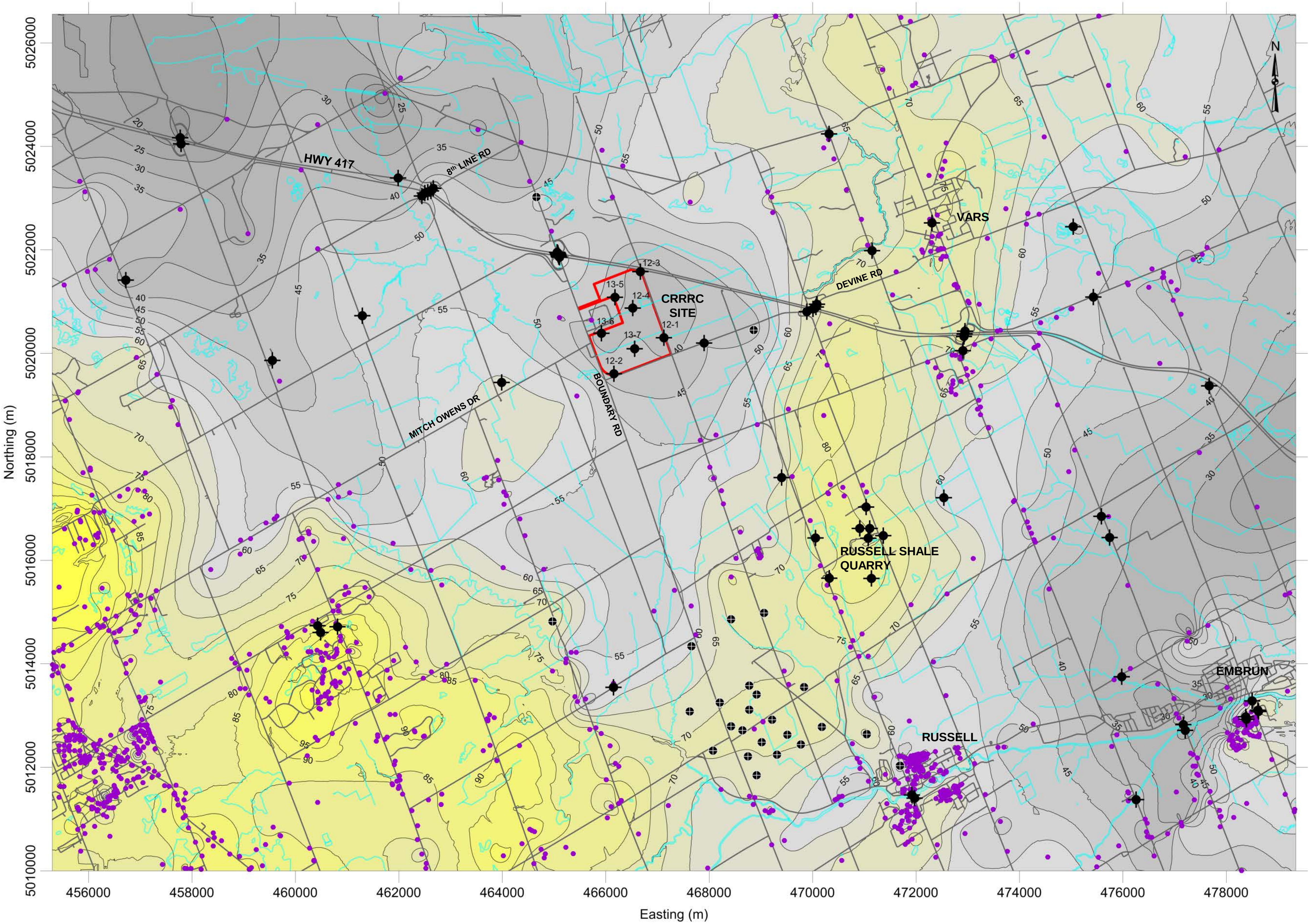
8.5.1.2.1 Bedrock Geology

The interpreted bedrock surface elevation in the study area is shown on Figure 8.5.1-2 and varies from approximately 75 to 105 masl in the southwestern corner of the area to as low as 15 to 25 masl in the northwestern corner. A buried bedrock ridge trending north-northeast occurs approximately 6 kilometres east of the Site that rises approximately 20 metres to between elevations of approximately 60 to 80 masl, which coincides with a low surface topographic ridge. Along this ridge the shale is at surface at the Russell Shale Quarry. The bedrock surface beneath the Site forms an irregular bowl shape varying in elevation between approximately 36 and 46 masl, compared to a ground surface elevation of approximately 76 to 77.5 masl.

The interpretation by Golder Associates Ltd. of the geology of the bedrock surface and locations of major faults is provided on Figure 8.5.1-3. The Gloucester Fault and Russell-Rigaud Fault systems pass through the southern portion of the local study area. These faults separate the Upper Ordovician shales of the Queenston and Carlsbad Formations to the north of the faults from the Middle and Lower Ordovician limestone of the Bobcaygeon and Gull River Formations and dolostone of the older Oxford Formation to the south. The geological interpretation has taken into consideration the Ontario Geological Survey (OGS) mapping and the available geotechnical borehole information. In addition, the MOECC WWIS (MOE, 2013c) provided well driller’s brief descriptions of the bedrock encountered. The wells/boreholes shown on Figure 8.5.1-3 are colour coded to take these bedrock descriptions into consideration. The area interpreted to be underlain by Queenston Formation shale forming the bedrock surface and the uppermost bedrock formation is shown on Figure 8.5.1-3; this area differs from that shown on the published bedrock geology map of the area (OGS Map P.2717) (OGS, 1985), by being significantly reduced in extent to the east and greater in extent to the west based upon the benefit of the additional information on bedrock from the boreholes compiled for this study. The OGS interpretation indicated that the extent of the Queenston shale was fault bounded representing a down-dropped block. However the results of work carried out for this investigation indicate that the main body of the shale occurs as a conformable sequence within a broad synclinal basin.

The subsurface geology of the study area is shown in cross-section on Figure 8.5.1-4, which has been largely developed from interpretation of the stratigraphic sequence encountered by deep gas exploration wells and cored boreholes. The section reflects the approximately 700 metres to 850 metres thick Paleozoic sequence. The section also illustrates the scale of vertical offset associated with the Gloucester Fault zone (approximately 500 metres).

The regionally consistent depths and thickness of the formations shown on Figure 8.5.1-4 indicates no large scale structural faulting north of the Gloucester Fault zone, which is comprised of a series of normal fault slices locally projected to occur within a zone approximately 0.75 kilometres in width where it passes beneath the community of Russell. However, it is likely that small scale normal faulting on the scale of several metres to several tens of metres could occur within that area. Comparatively small scale faulting of this magnitude is relatively common throughout the valley.



LEGEND

✚ CORED BOREHOLE LOCATION

● WATER WELL LOCATION

⊕ OIL AND GAS EXPLORATION WELL LOCATION

— WATERBODIES

— ROADS

— PROPERTY BOUNDARY

BEDROCK SURFACE COLOUR SCALE
(mASL)

105
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5

1000 0 1000
METRES
SCALE 1:85,000 (APPROX.)

NOTE

THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT
ELEVATION CONTOUR INTERVAL = 5m
CONTOUR DATUM IS mASL

REFERENCE

PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 18
BASE MAPPING FROM ONTARIO MINISTRY OF NATURAL RESOURCES (2010)

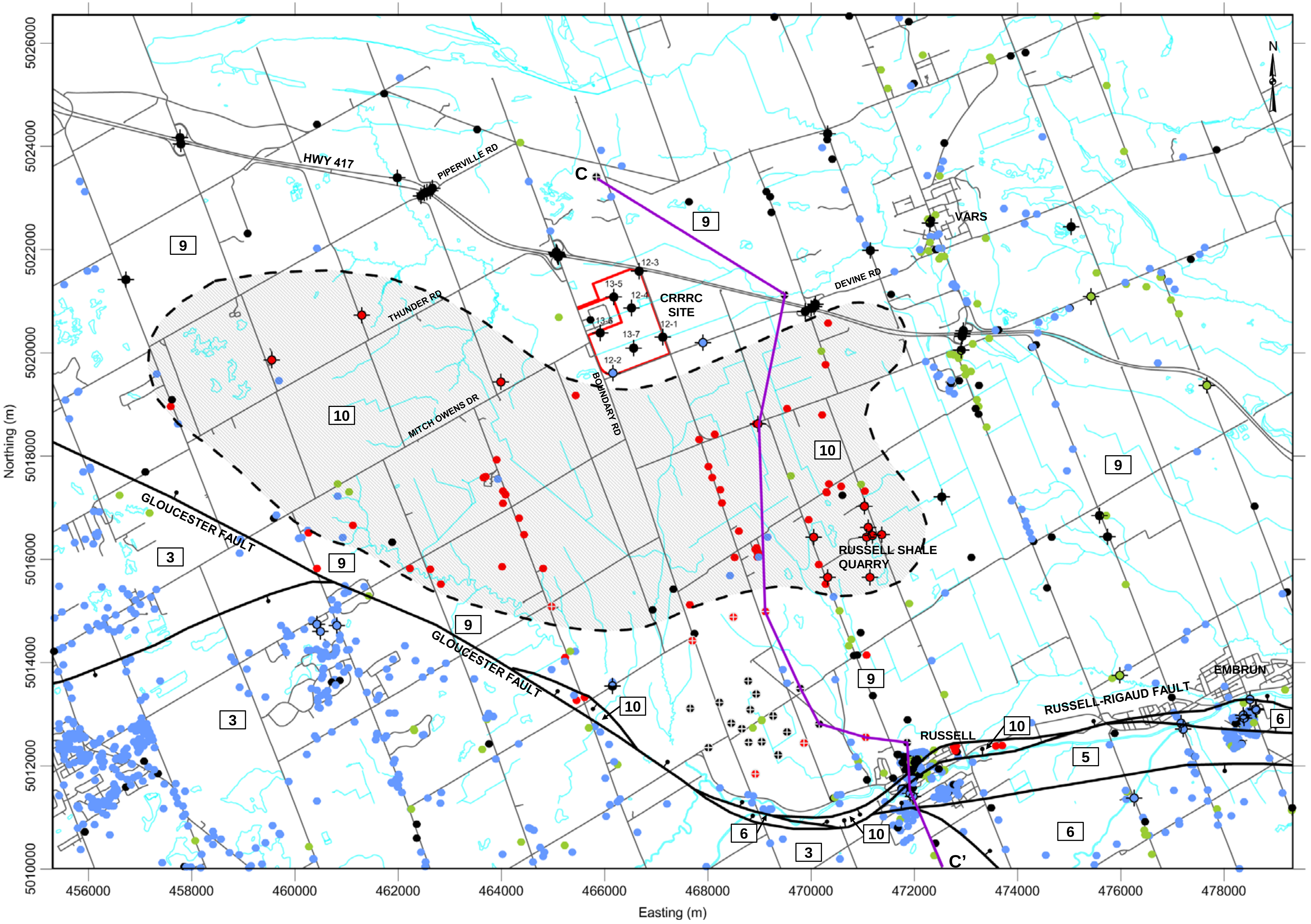
PROJECT
ENVIRONMENTAL ASSESSMENT OF THE
CAPITAL REGION RESOURCE RECOVERY CENTRE

TITLE
LOCAL BEDROCK SURFACE
ELEVATION MAP

Golder Associates
Ottawa, Ontario

PROJECT No. 12-1125-0045			SCALE AS SHOWN	REV.0
DESIGN	NB	15 NOV. 2013	FIGURE 8.5.1-2	
GIS	NB	15 NOV. 2013		
CHECK	PLE	AUG 2014		
REVIEW	PAS	AUG 2014		

N:\Active\2012\1125 - Environmental and Civil Engineering\12-1125-0045 CRRRC EA Eastern ON\Phase 4000_EA_Documentation\Vol 3 - G H&G\Geology Figures\ppt



LEGEND

UPPERMOST BEDROCK FORMATION DESCRIPTION:

- RED BEDROCK (ALL FORMATIONS)
- GREY OR BLACK SHALE
- LIMESTONE (ALL COLOURS)
- OTHER DESCRIPTIONS

- WATERBODIES
- ROADS
- INTERPRETED FAULT – DOWNTHROWN SIDE INDICATED BY STICK AND BALL
- STRATIGRAPHIC CONTACT
- INTERPRETED EXTENT OF QUEENSTON FORMATION
- PROPERTY BOUNDARY
- CORED BOREHOLE LOCATION
- WATER WELL LOCATION
- OIL AND GAS EXPLORATION WELL LOCATION
- CROSS-SECTION C-C' (FIGURE 8.5.1-4)

STRATIGRAPHY

10	QUEENSTON FORMATION RED SHALE AND MUDSTONE
9	CARLSBAD/BILLINGS FORMATION DARK GREY SHALE, MINOR LIMESTONE
6	BOBCAYGEON FORMATION BROWNISH GREY CRYSTALLINE LIMESTONE
5	GULL RIVER FORMATION LIGHT GREY VERY FINE GRAINED LIMESTONE
3	OXFORD/MARCH FORMATION GREY DOLOSTONE

1000 0 1000

METRES

SCALE 1:85,000 (APPROX.)

NOTE

THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT

REFERENCE

PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 18
BASE MAPPING FROM ONTARIO MINISTRY OF NATURAL RESOURCES (2010)

PROJECT

ENVIRONMENTAL ASSESSMENT OF THE CAPITAL REGION RESOURCE RECOVERY CENTRE

TITLE

INTERPRETED LOCAL BEDROCK GEOLOGY MAP

Golder Associates
Ottawa, Ontario

PROJECT No. 12-1125-0045			SCALE AS SHOWN	REV.0
DESIGN	NB	15 NOV. 2013	FIGURE	
GIS	NB	15 NOV. 2013	8.5.1-3	
CHECK	PLE	AUG 2014		
REVIEW	PAS	AUG 2014		

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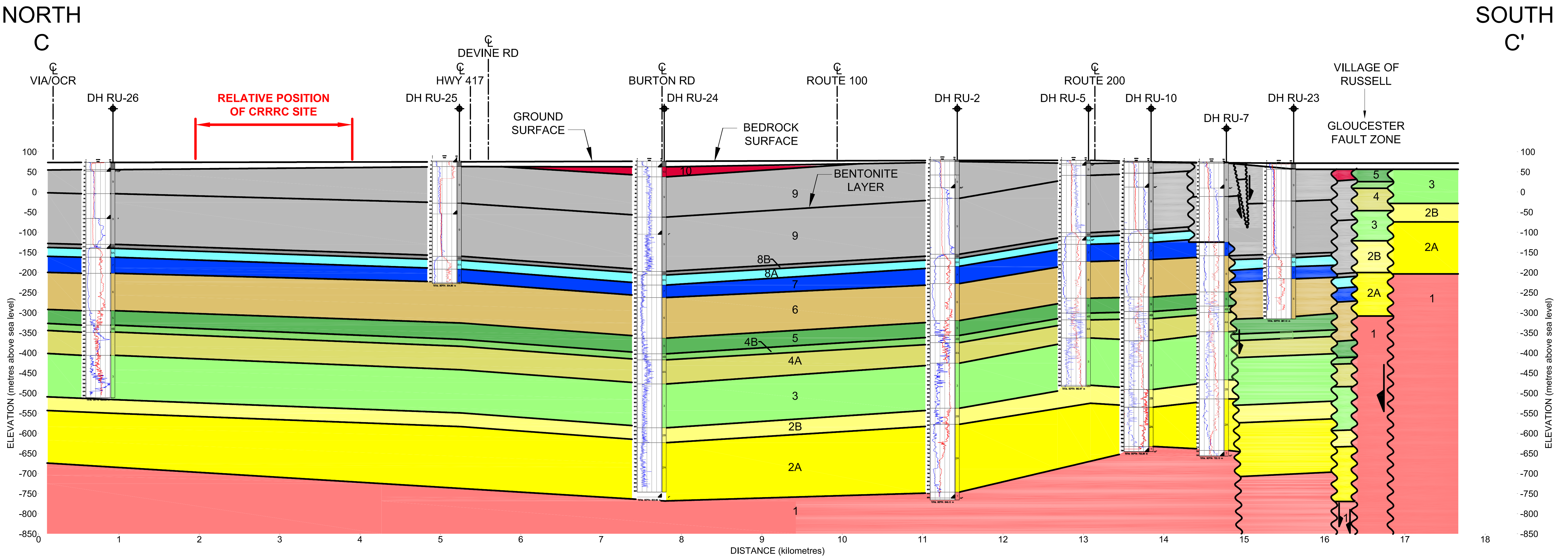


HORIZONTAL
1600 0 1600 3200
SCALE 1:50000 METRES

VERTICAL
320 0 320 640
SCALE 1:10000 METRES

NOTE:
VERTICAL SCALE EXAGGERATED 5 TIMES THE HORIZONTAL SCALE FOR PRESENTATION PURPOSES

BOREHOLE GEOPHYSICAL RECORDS

NATURAL GAMMA LOG

NEUTRON LOG

DEPTH OF DRILL CASING

BEDROCK GEOLOGY

🟥 10 **QUEENSTON FORMATION**

Dark reddish brown calcareous mudstone with interbeds of greenish grey siltstone and mudstone.

9 **CARLSBAD/BILLINGS FORMATIONS**

Dark grey shale interbedded with micritic limestone interbeds (Carlsbad Fm) grading down to dark grey to dark brownish black bituminous shale with minor laminations to very thin interbeds of calcareous siltstone and dolomitic limestone (Billings Fm).

8B **UPPER LINDSAY FORMATION (EASTVIEW MEMBER)**

Interbedded dark brownish black bituminous shale and dark brownish grey nodular micritic limestone.

8A **LOWER LINDSAY FORMATION**

Medium to dark brownish grey thickly bedded micritic to calcarenitic nodular limestone.

🟦 7 **VERULAM FORMATION**

Medium brownish grey thinly to medium bedded shaley calcarenitic limestone with interbeds of nodular limestone, minor thin lithoclastic calcarenite limestone beds and numerous dark grey to black very thin to thinly interbeds shale.

6 **BOBCAYGEON FORMATION**

Light to medium brownish grey, medium to thickly bedded calcarenitic limestone and interbedded units of argillaceous nodular limestone and shaley limestone.

🟩 5 **GULL RIVER FORMATION**

Medium grey, micritic to lithographic limestone, argillaceous to calcareous dolostone and medium to very thickly bedded dolostone, minor interbedded black shale, shaley dolostone, dolomitic siltstone and partly bioturbated quartz sandstone.

4B **UPPER ROCKCLIFFE FORMATION**

Interbedded sequence composed of medium to thick beds of dolostone and calcareous dolostone, dark grey to black shale, medium grey, argillaceous limestone, minor light grey, calcareous cemented quartz sandstone.

4A **LOWER ROCKCLIFFE FORMATION**

Light whitish grey, laminar textured to rippled and cross bedded, thin to thick bedded silica cemented quartz sandstone, minor interbeds of shale.

3 **OXFORD/MARCH FORMATIONS**

Fine grained, micritic dolostone, calcareous dolostone, argillaceous nodular dolostone, subordinate beds lithoclastic dolostone, dark grey to black shale laminations in upper half (Oxford Fm), grading down to sandy dolostone to dolomitic sandstone and carbonate cemented quartz sandstone.

🟨 2 **NEPEAN FORMATION**

Light grey, laminar to cross bedded, silica cemented quartz sandstone. Includes widely spaced interbeds of grey shale and shaley siltstone with individual beds of quartz pebbles and cobbles set in a coarse grained quartz sandstone matrix. 2A Golder pick for top contact of Nepean Fm marking transition into silica sandstone sequence, 2B MNR Well Card pick for top of Nepean Fm (possible dolomitic sandstone of March Fm). Includes un-subdivided Covey Hill Fm sandstone and conglomerate at base if present.

1 **PRECAMBRIAN BASEMENT**

Quartz feldspar biotite gneiss or dolomitic marble typically weathered near the unconformable surface with either the overlying Covey Hill Formation quartz pebble cobble conglomerate or the Nepean Formation sandstone.

LEGEND

◆ BOREHOLE LOCATION

NOTES

1. THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT.
2. FOR LOCATION OF SECTION C-C' SEE FIGURE 8.5.1-3
3. FOR DETAILS OF BOREHOLE GEOPHYSICAL RECORDS SEE FIGURES A1 to A3 IN APPENDIX A OF VOLUME 3.

REV	DATE	DES	REVISION DESCRIPTION	CAD	CHK	RVW
△						

PROJECT
ENVIRONMENTAL ASSESSMENT OF THE
CAPITAL REGION RESOURCE RECOVERY CENTRE

TITLE
LOCAL STRUCTURAL GEOLOGIC
CROSS-SECTION C-C'

Golder Associates
Ottawa, Ontario, Canada

PROJECT No.		12-1125-0045
DESIGN	JPAO	Sept. 2013
CAD	JM/JFC	Feb. 2014
CHECK	PLE	Aug. 2014
REVIEW	PAS	Aug. 2014

FILE No. 1211250045-4000-8.5.1-4.dwg
SCALE AS SHOWN REV.

FIGURE 8.5.1-4

PLOT DATE: June 26, 2014
FILENAME: N:\Active\Spatial_IM\Miller_Paving_Ltd\CRRRC\ACAD\Phase 4000\1211250045-4000-8.5.1-4.dwg

The Upper Ordovician shale sequence that forms the bedrock surface north of the Gloucester Fault includes the red shale of the Queenston Formation, the underlying dark grey shale and limestone of the Carlsbad Formation, the Billings Formation black shale. The thickness of this sequence shown in the section varies between approximately 200 and 260 metres. The shale sequence overlies approximately 200 to 215 metres of limestone of the Eastview, Lindsay, Verulam, Bobcaygeon and Gull River Formations, all fine grained, non-porous, relatively low permeability strata. The underlying Rockcliffe Formation is comprised of approximately 45 to 75 metres of dolostone, shale and quartz sandstone, which overlies the approximately 110 to 125 metres thick Oxford and March Formations dolostone. The basal sequence is comprised of approximately 145 to 190 metres of sandstone and conglomerate of the combined Nepean-Covey Hill Formations, which lie unconformably upon the Precambrian basement.

The boreholes cored into bedrock beneath the Site all encountered the Carlsbad Formation. The majority of the Site is underlain by the shaley member of the formation consisting of dark grey, very thinly to thinly interbedded shale and calcareous shale with thin to medium interbeds of argillaceous to shaley limestone and occasional beds of bioclastic limestone.

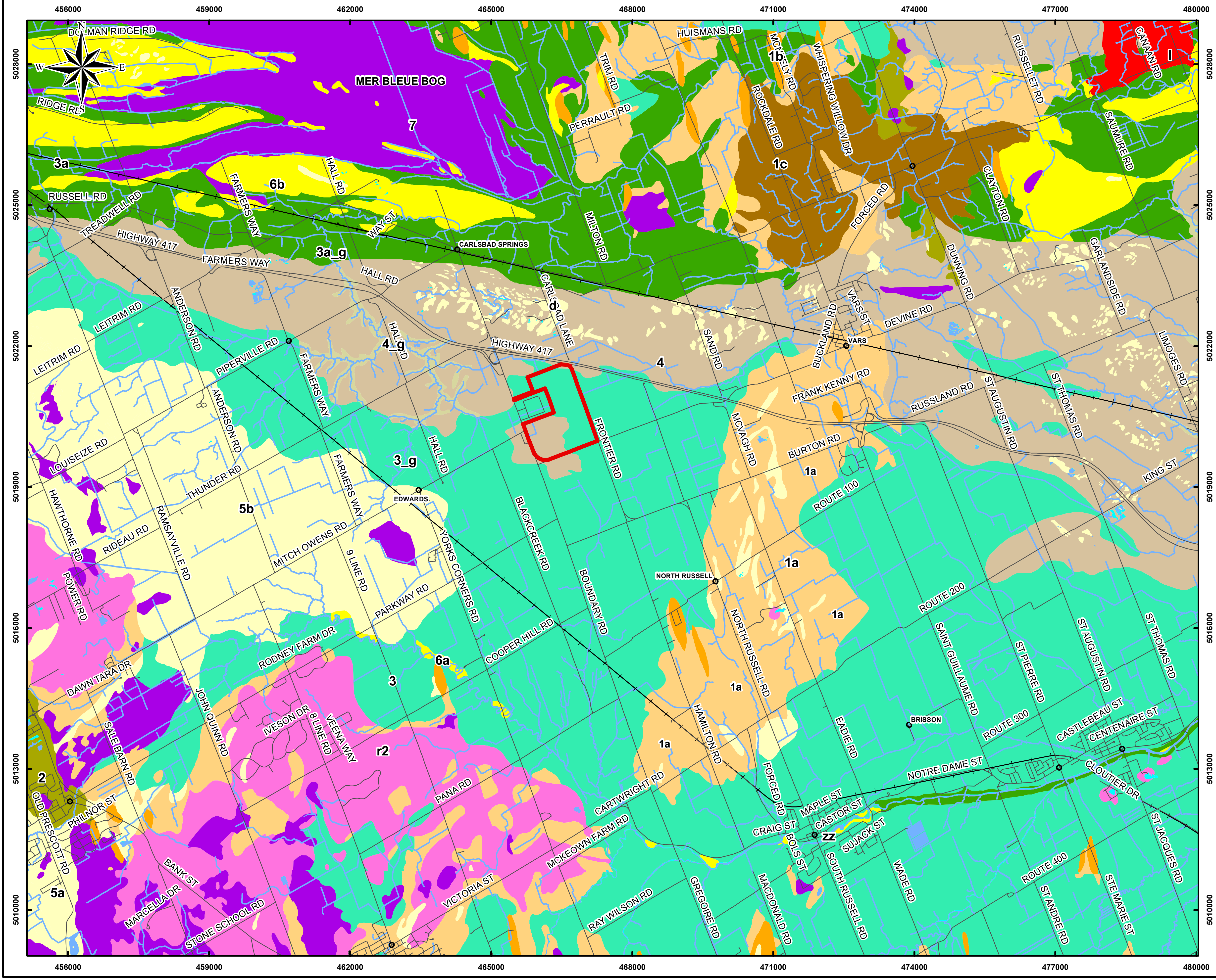
In summary, the bedrock elevation varies in the region, with the Site located within a bowl-like depression in the bedrock surface and a north-northeast trending bedrock ridge existing 6 kilometres east of the Site. The bedrock beneath the Site is the Carlsbad Formation and consists of shale with thin to medium interbedding of limestone. The Gloucester Fault and Russell-Rigaud Fault systems are in the southern portion of the local study area some seven to ten kilometres south of the Boundary Road Site.

8.5.1.2.2 Surficial Geology

The areas underlain by shale north of the Gloucester Fault have approximately 20 to 60 metres of soil deposits. The soil deposits are approximately 0 to 10 metres thick within the area overlying the north-northeast trending buried bedrock ridge. The deposits are similarly thin (5 metres or less) within the area underlain by Oxford Formation dolostone to the southwest of the Gloucester Fault. The Site is underlain by approximately 32 metres to 40 metres of soil deposits, representing one of the thicker areas of soil deposits within the local study area. The thickest section is beneath the eastern side of the Site.

Geological Survey of Canada (GSC) mapping of the surficial geological (soil) deposits is shown on Figure 8.5.1-5. Much of the area is underlain by deposits of offshore marine silts and clays associated with the former Champlain Sea. The Champlain Sea deposits are thickest within those areas of lower bedrock surface topography. The marine clay deposit overlies glacial till deposits above the bedrock. The till deposits come to surface along the north-northeast trending buried bedrock ridge and within the areas of thin overburden above the dolostone bedrock strata in the southwestern portion of the area. The relationship between the basal till and overlying deposits is shown on Section D-D’ Figure 8.5.1-6. The till is comparatively thin (2 to 9 metres) and follows the bedrock topography. The marine clay deposits have filled in the low areas and are generally overlain by surficial sandy soils.

A buried esker deposit of sand and gravel (Vars-Winchester Esker) occurs directly east of and roughly parallels the trend of the north-northeast trending buried bedrock ridge (Figure 8.5.1-6) and is about 8 kilometres east of the Site. This esker forms an aquifer beneath the clayey marine deposits. This aquifer is separated from the Site by the thick clay deposits and the buried bedrock ridge.



LEGEND

○ POPULATED PLACENAME

ROAD

RAILWAY

SURFACE WATER FEATURE

PROPERTY BOUNDARY

SURFICIAL GEOLOGY

1a	TILL, PLAIN WITH LOCAL RELIEF <5m
1b	TILL, DRUMLINIZED
1c	TILL, HUMMOCKY TO ROLLING WITH LOCAL RELIEF 5 TO 10 m
2	ICE CONTACT STRATIFIED DRIFT: GRAVEL & SAND
3	OFFSHORE MARINE DEPOSITS: CLAY, SILTY CLAY & SILT
3_g	OFFSHORE MARINE DEPOSITS: CLAY, SILTY CLAY & SILT (GULLIES & RAVINES)
3a	OFFSHORE MARINE DEPOSITS: CLAY & SILT UNDERLYING EROSIONAL TERRACES
3a_g	OFFSHORE MARINE DEPOSITS: CLAY & SILT UNDERLYING EROSIONAL TERRACES (GULLIES & RAVINES)
4	DELTAIC AND ESTUARY DEPOSITS: MEDIUM TO FINE GRAINED SAND
4_g	DELTAIC AND ESTUARY DEPOSITS: MEDIUM TO FINE GRAINED SAND (GULLIES & RAVINES)
5a	NEARSHORE SEDIMENTS: GRAVEL, SAND & BOULDERS
5b	NEARSHORE SEDIMENTS: FINE TO MEDIUM GRAINED SAND
6a	ALLUVIAL DEPOSITS: SILTY SAND, SILT, SAND & CLAY
6a_g	ALLUVIAL DEPOSITS: SILTY SAND, SILT, SAND & CLAY (GULLIES & RAVINES)
6b	ALLUVIAL DEPOSITS: MEDIUM GRAINED STRATIFIED SAND WITH SOME SILT
6b_g	ALLUVIAL DEPOSITS: MEDIUM GRAINED STRATIFIED SAND WITH SOME SILT (GULLIES & RAVINES)
7	ORGANIC DEPOSITS: MUCK & PEAT
d	DUNE
d_g	DUNE (GULLIES & RAVINES)
l	LANDSLIDE AREA
l_g	LANDSLIDE AREA (GULLIES & RAVINES)
r1	BEDROCK: INTRUSIVE & METAMORPHIC
r2	BEDROCK: LIMESTONE, DOLOMITE, SANDSTONE & LOCAL SHALE
r2_g	BEDROCK: LIMESTONE, DOLOMITE, SANDSTONE & LOCAL SHALE (GULLIES & RAVINES)

2,000 1,000 0 2,000

SCALE 1:80,000 METRES

NOTE

THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT.

REFERENCE

BELANGER, J. R., URBAN GEOLOGY OF THE NATIONAL CAPITAL AREA. GEOLOGICAL SURVEY OF CANADA, OPEN FILE D3256, 2001 © QUEEN'S PRINTER OF ONTARIO.

LAND INFORMATION ONTARIO (LIO) DATA PRODUCED BY GOLDER ASSOCIATES LTD. UNDER LICENCE FROM ONTARIO MINISTRY OF NATURAL RESOURCES, © QUEENS PRINTER 2012.

PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 18

PROJECT

ENVIRONMENTAL ASSESSMENT OF THE
CAPITAL REGION RESOURCE RECOVERY CENTRE

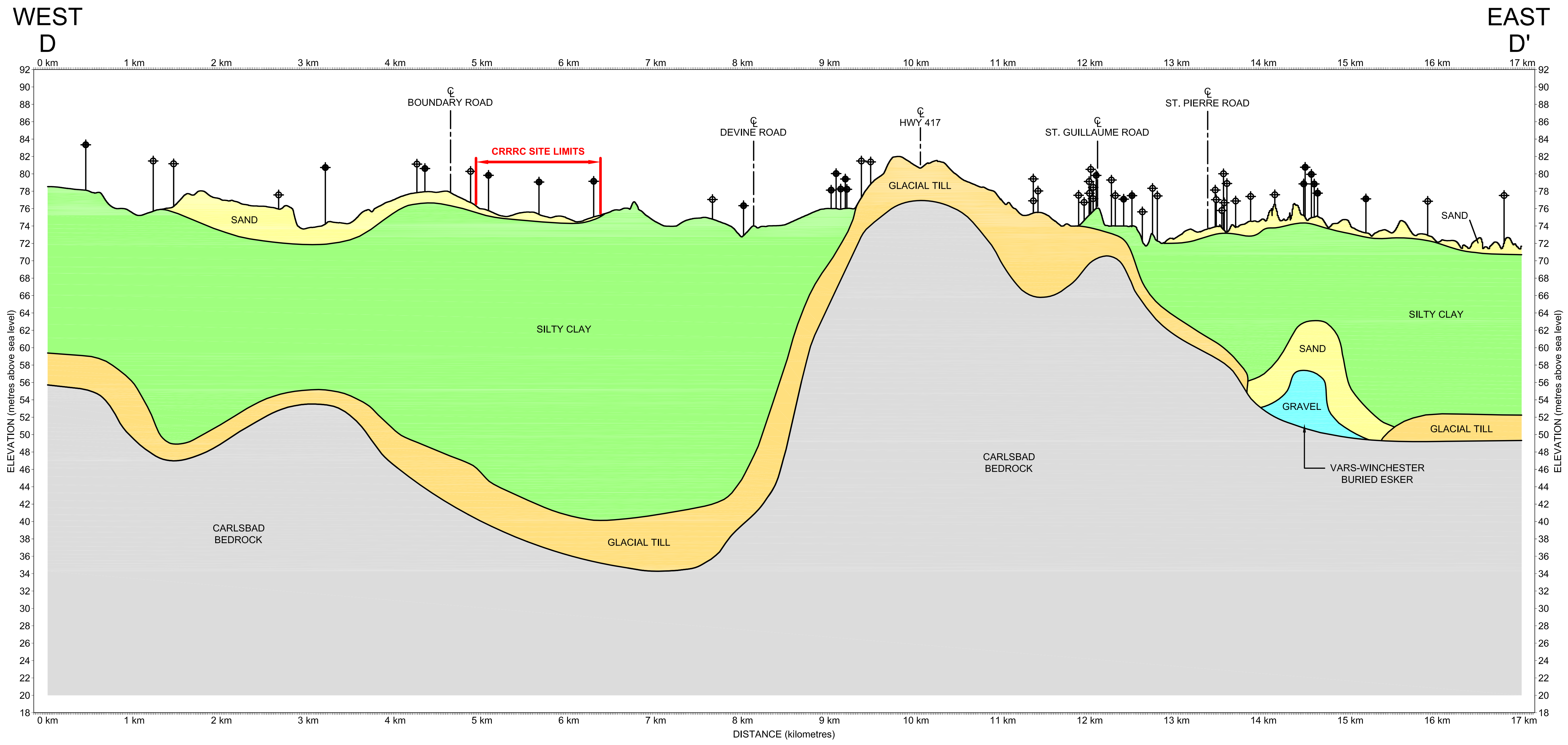
TITLE

LOCAL SURFICIAL GEOLOGY

Golder Associates
Ottawa, Ontario

PROJECT No. 12-1125-0045			SCALE AS SHOWN	REV. 0
DESIGN	JPAO	DEC. 2013	FIGURE 8.5.1-5	
GIS	BR/PM	DEC. 2013		
CHECK	PLE	AUG. 2014		
REVIEW	PAS	AUG. 2014		

Path: N:\Active\Spatial_IM\Miller_Paving_Ltd\CRRRC\GIS\MXDs\12-1125-0045\Reporting\Phase4000\Vol.1\1211250045-4000-Vol1-8.5.1-5.mxd



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VERTICAL
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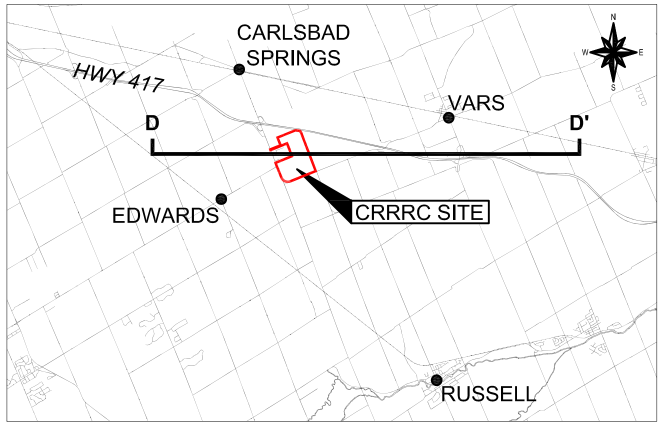
NOTE:
VERTICAL SCALE EXAGGERATED 100 TIMES THE HORIZONTAL SCALE FOR PRESENTATION PURPOSES



KEY MAP
1:300,000

LEGEND

✦	BOREHOLE LOCATION
⌖	MINISTRY OF THE ENVIRONMENT AND CLIMATE CHANGE WATER WELL RECORD LOCATION

NOTE

THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT.

REV	DATE	DES	REVISION DESCRIPTION	CAD	CHK	RVW
△						

PROJECT
ENVIRONMENTAL ASSESSMENT OF THE
CAPITAL REGION RESOURCE RECOVERY CENTRE

TITLE
LOCAL GEOLOGIC
CROSS-SECTION D-D'

Golder Associates
Ottawa, Ontario, Canada

PROJECT No.		12-1125-0045
DESIGN	JPAO	June 2013
CAD	JM	Nov. 2013
CHECK	PLE	Aug. 2014
REVIEW	PAS	Aug. 2014

FILE No. 1211250045-V1 Figure 8.5.1-6.d
SCALE AS SHOWN REV.

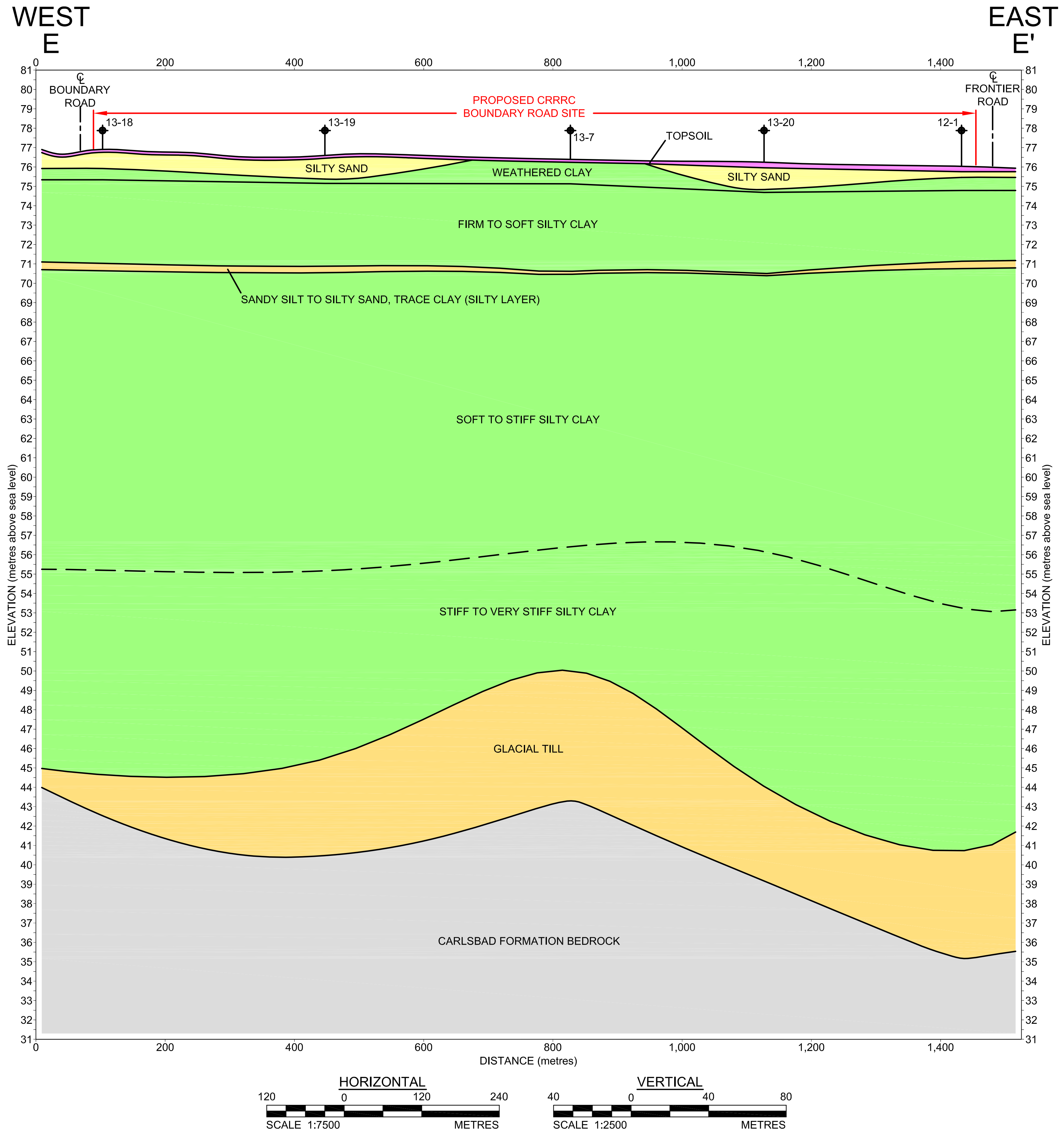
Fig. 8.5.1-6

PLOT DATE: October 7, 2014
FILENAME: N:\Active\Spatial_IM\Miller_Paving_Ltd\CRRRC\ACAD\Vol 1 (Report Figures)\Chapter 8\1211250045-V1 Figure 8.5.1-6.dwg

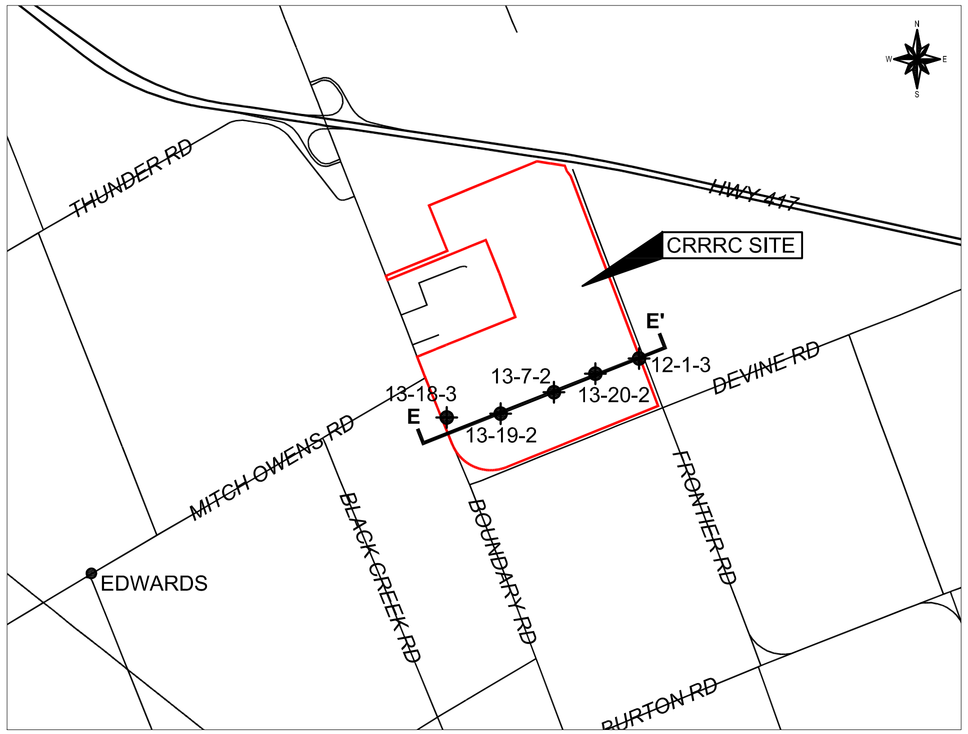
The clayey marine deposits are locally overlain by a thin layer of surficial sand and silt deposited during the retreat of the Champlain Sea from the area. A former channel of the Ottawa River passes through the area directly north of Highway 417. The channel cut linear terrace faces into the marine clays and deposited stratified silts, sands and gravels along the channel bed. Following the retreat of the Ottawa River to its present channel, organic bog deposits accumulated in the low areas such as the extensive Mer Bleue Bog to the north/northwest of the Site (see location on Figure 8.5.1-5).

The majority of the boreholes drilled on-Site encountered a 1 metre to 2 metre thick veneer of silty sand at the surface overlying marine silty clay, while a few of the boreholes encountered the underlying marine silty clay at surface. Two cross sections illustrating the subsurface soil stratigraphy are provided on Sections E-E' and F-F' on Figures 8.5.1-7 and 8.5.1-8, respectively. The silty clay is the dominant soil horizon overlying a comparatively thin glacial till layer above the bedrock. A thin (0.1 to 0.6 metres), near flat lying layer of sandy silt to silty sand, trace clay (described as the 'silty layer') was encountered at a consistent depth of approximately 4 to 6 metres below ground surface (mbgs) and was reasonably interpreted to be continuous beneath the Site.

In summary, the overburden in the area is of varying thickness and is comprised primarily of marine silts and clays. Above the marine silts and clays is a thin layer of surficial sand and silt, and below the marine silts and clays is a layer of glacial till. There is a north-northeast trending sand and gravel esker that acts as an aquifer eight kilometres east of the Site. Organic bog deposits have accumulated in low areas cut into the marine silts and clays by former paths of the Ottawa River north of Highway 417. Investigations at the Site indicate that the majority of the overburden is silty clay with a layer of glacial till at the bottom. A thin layer of silty sand is present at the surface in some areas, but is not always present. A thin silty layer exists across the site within the upper portion (4 to 6 metres below ground surface) of the silty clay.



NOTE:
VERTICAL SCALE EXAGGERATED 100 TIMES THE HORIZONTAL SCALE FOR PRESENTATION PURPOSES



KEY MAP
1:50,000

LEGEND

✦ BOREHOLE LOCATION

NOTES

THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT.

REV	DATE	DES	REVISION DESCRIPTION	CAD	CHK	RVW
△						

PROJECT

ENVIRONMENTAL ASSESSMENT OF THE
CAPITAL REGION RESOURCE RECOVERY CENTRE

TITLE

SITE CROSS-SECTION E-E'

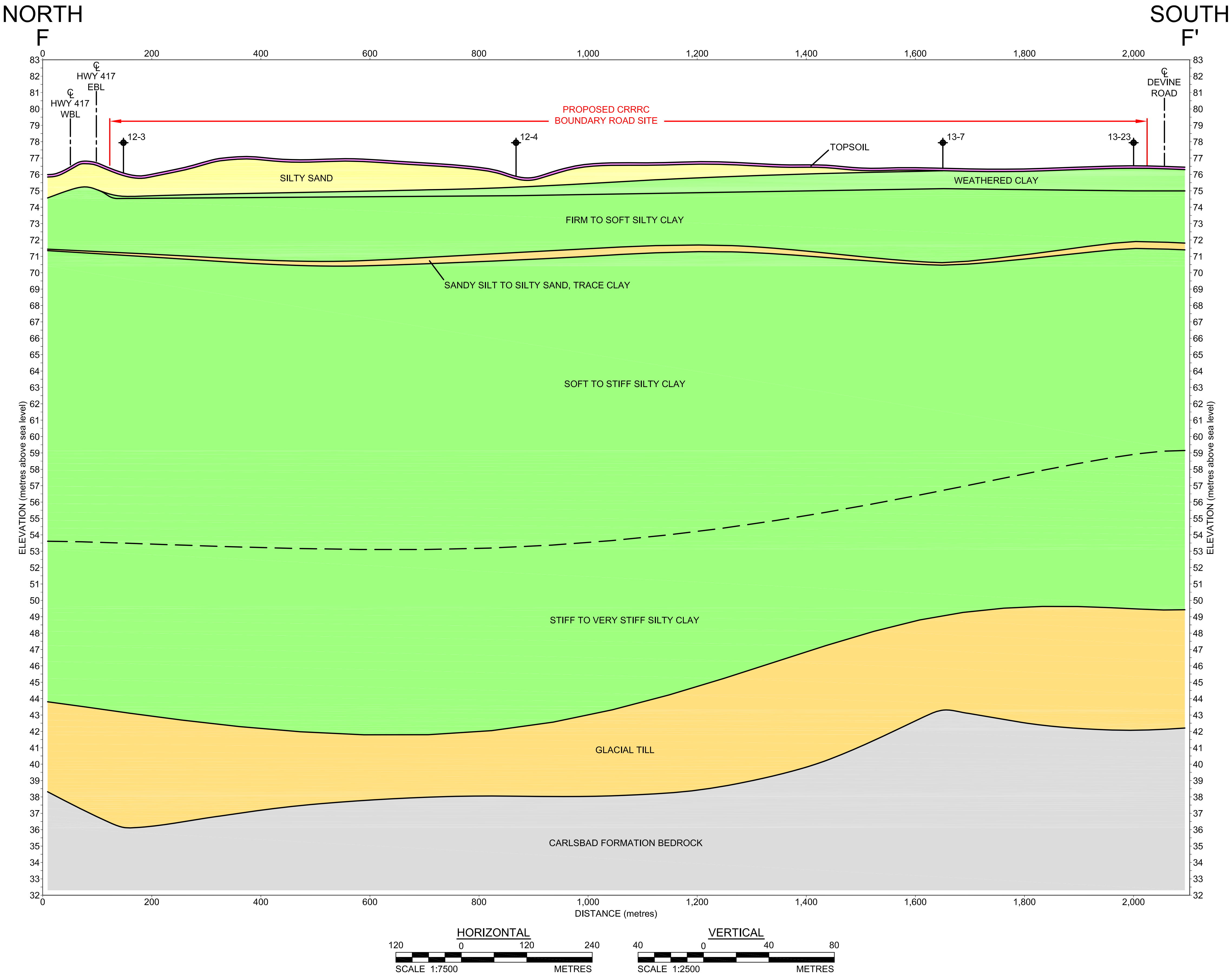
Golder Associates
Ottawa, Ontario, Canada

PROJECT No.		12-1125-0045
DESIGN	SAT	Oct. 2013
CAD	JM	Nov. 2013
CHECK	PLE	Aug. 2014
REVIEW	PAS	Aug. 2014

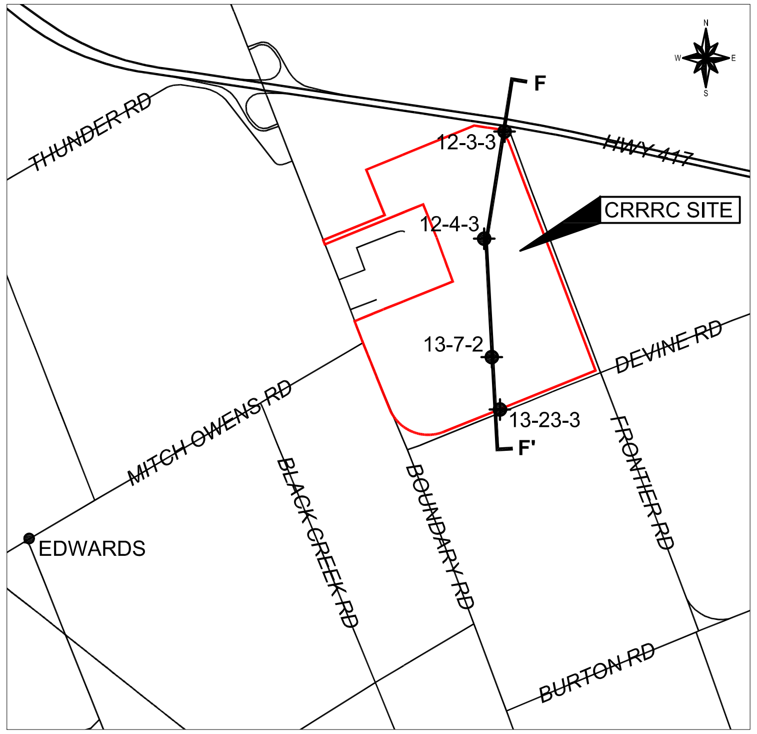
FILE No. 1211250045-V1 Figure 8.5.1-7.d
SCALE AS SHOWN REV.

Fig. 8.5.1-7

PLOT DATE: June 26, 2014
FILENAME: N:\Active\Spatial_IM\Miller_Paving_Ltd\CRRRC\ACAD\Vol 1 (Report Figures)\Chapter 8\1211250045-V1 Figure 8.5.1-7.dwg



NOTE:
VERTICAL SCALE EXAGGERATED 100 TIMES THE HORIZONTAL SCALE FOR PRESENTATION PURPOSES



KEY MAP
1:50,000

LEGEND

✦ BOREHOLE LOCATION

NOTES

THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT.

REV	DATE	DES	REVISION DESCRIPTION	CAD	CHK	RVW

PROJECT

ENVIRONMENTAL ASSESSMENT OF THE
CAPITAL REGION RESOURCE RECOVERY CENTRE

TITLE

SITE CROSS-SECTION F-F'

Golder Associates
Ottawa, Ontario, Canada

PROJECT No.		12-1125-0045
DESIGN	SAT	Oct. 2013
CAD	JM	Nov. 2013
CHECK	PLE	Aug. 2014
REVIEW	PAS	Aug. 2014

FILE No. 1211250045-V1 Figure 8.5.1-8.d

SCALE AS SHOWN REV.

Fig. 8.5.1-8

PLOT DATE: June 26, 2014
FILENAME: N:\Active\Spatial_IM\Miller_Paving_Ltd\CRRRC\ACAD\Vol 1 (Report Figures)\Chapter 8\1211250045-V1 Figure 8.5.1-8.dwg

8.5.1.3 *Seismicity*

Structurally, the Site is located near the southeast end of the Ottawa-Bonnechere Graben. The Ottawa-Bonnechere Graben is within the larger Western Quebec Seismic Zone (WQSZ) that extends from the Timiskaming region of Quebec to the Adirondack Highlands of upstate New York. The Site is located at the southeastern end of the WQSZ – one of five seismic zones in southeastern Canada. These seismic zones have an historic record of relatively frequent small to moderate-magnitude earthquakes over about the last 250 years (Lamontagne et al., 2007).

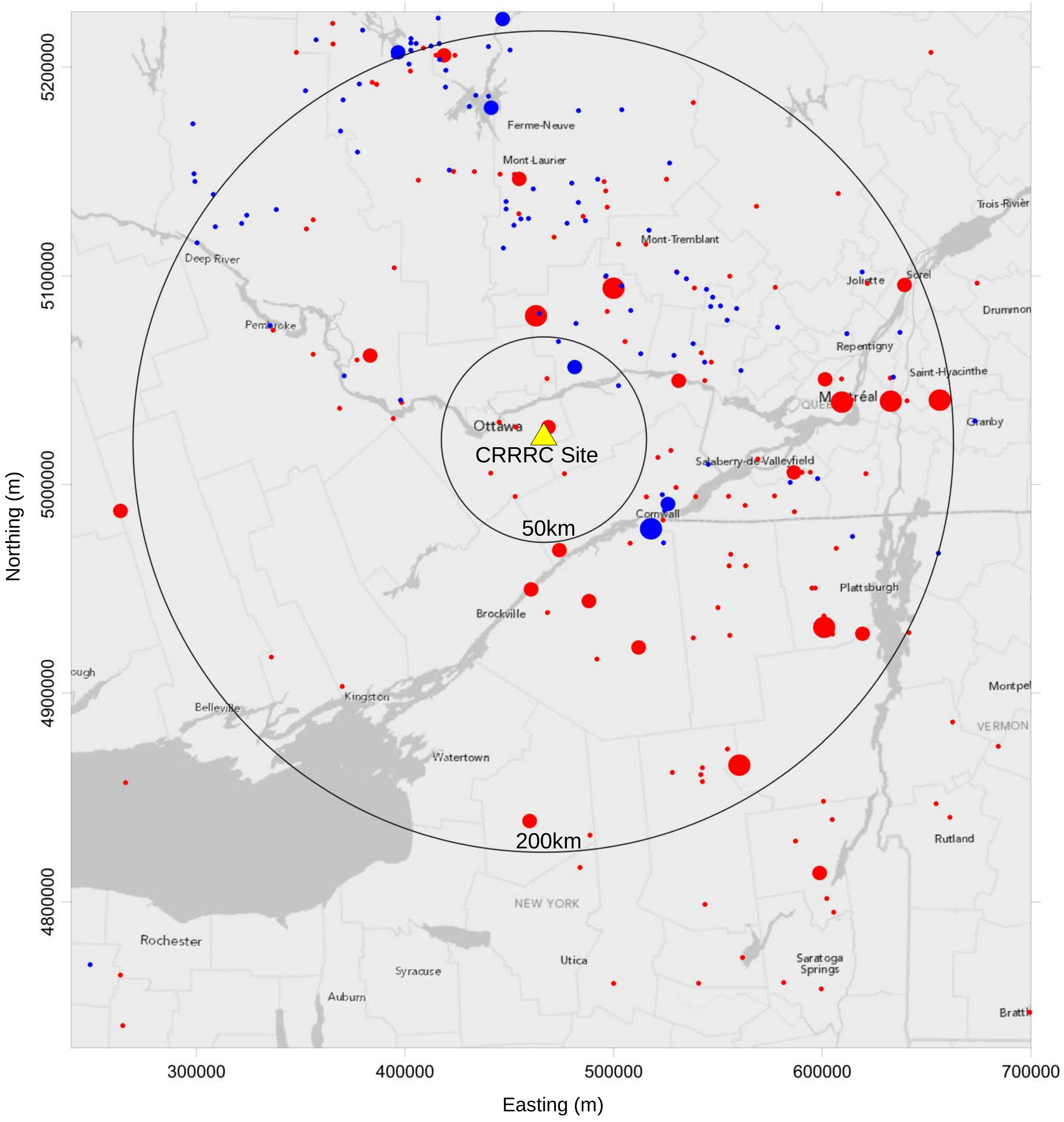
Circumstantial evidence of large regional earthquakes in the Holocene Epoch (last 11,000 years) has been inferred from the clustering of ages of landslides in the Ottawa Valley by Aylsworth et al. (2000). Shaking from these earthquakes and probably some historic earthquakes is inferred to have deformed bedding within near-surface sediments, generated differential settlement and resulted in the formation of irregular topography within the surficial deposits. While the occurrence of large landslides in eastern Ontario/western Quebec on at least three occasions in the Holocene Epoch suggests earthquake-related shaking, no evidence for fault movement/rupture at the ground surface has been found to be associated with these prehistoric earthquakes and/or local larger earthquakes in the more recent past.

The historical record of earthquake occurrence in the region has been evaluated from pre-instrumental and instrumental records extending from the late 17th century to the present day. These records reveal that at least 289 earthquakes of moment magnitude (M) ≥ 3.0 have epicenters located within about 200 kilometres of the Site (Figure 8.5.1-9). Approximately 72% of the recorded earthquakes occurred at distances greater than 100 kilometres from the CRRRC Site.

The largest earthquake recorded close to the Site was the 1944 Cornwall-Massena earthquake that occurred on September 5, 1944. The epicenter of the M 5.8 Cornwall-Massena earthquake was located on the Saint Lawrence rift system between Massena, New York and Cornwall, Ontario about 66 kilometres from the Site.

The occurrence of historical earthquakes and numerous micro-seismic events and adjoining areas suggests that some of the faults in the Ottawa-Bonnechere Graben and other fractures may be seismically active. Although some earthquake activity appears to be localized along the Ottawa-Bonnechere Graben, the irregular pattern of earthquake locations suggests that the main mapped geological structures of the graben probably do not control the seismicity distribution. Rather, the well-developed regional fracture pattern of northwest faults and fractures and a less well developed northeast-striking set of faults may exercise the major control on the distribution of instrumental earthquakes (Kumarapeli, 1987).

Figure 8.5.1-10 shows the orientation of the present day stress field near the Site. Interpretation of stresses was made by Adams and Fenton (1994) from horizontal offsets of up to 25 millimetres of closely-spaced drillholes in and around the Ottawa area. They observed drillhole offsets of up to 25 millimetres at three locations: Baskatong, Quebec, Hull, Quebec and Carling Avenue, Ottawa. However, other excavation sites showed no evidence of borehole or other reference feature offset. The offsets were relatively small, not associated with known earthquakes and were interpreted by Adams and Fenton (1994) to have a probable cause related to near-surface stress relief rather than major seismogenic tectonic stresses.



LEGEND

MAGNITUDE

- ● 5 < Mw < 6
- ● 4 < Mw < 5
- ● 3 < Mw < 4

DEPTH

- ● < = 15 km
- ● > 15 km

NOTE

THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT
PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 18

PROJECT

ENVIRONMENTAL ASSESSMENT OF THE
CAPITAL REGION RESOURCE RECOVERY CENTRE

TITLE

SEISMICITY NEAR THE
CRRRC SITE

Golder Associates

PROJECT No. 12-1125-0045			PHASE No. 4500	
DESIGN	CV	27 NOV. 2013	SCALE AS SHOWN	REV.0
GIS	NB	27 NOV. 2013	FIGURE 8.5.1-9	
CHECK	PLE	AUG 2014		
REVIEW	PAS	AUG 2014		

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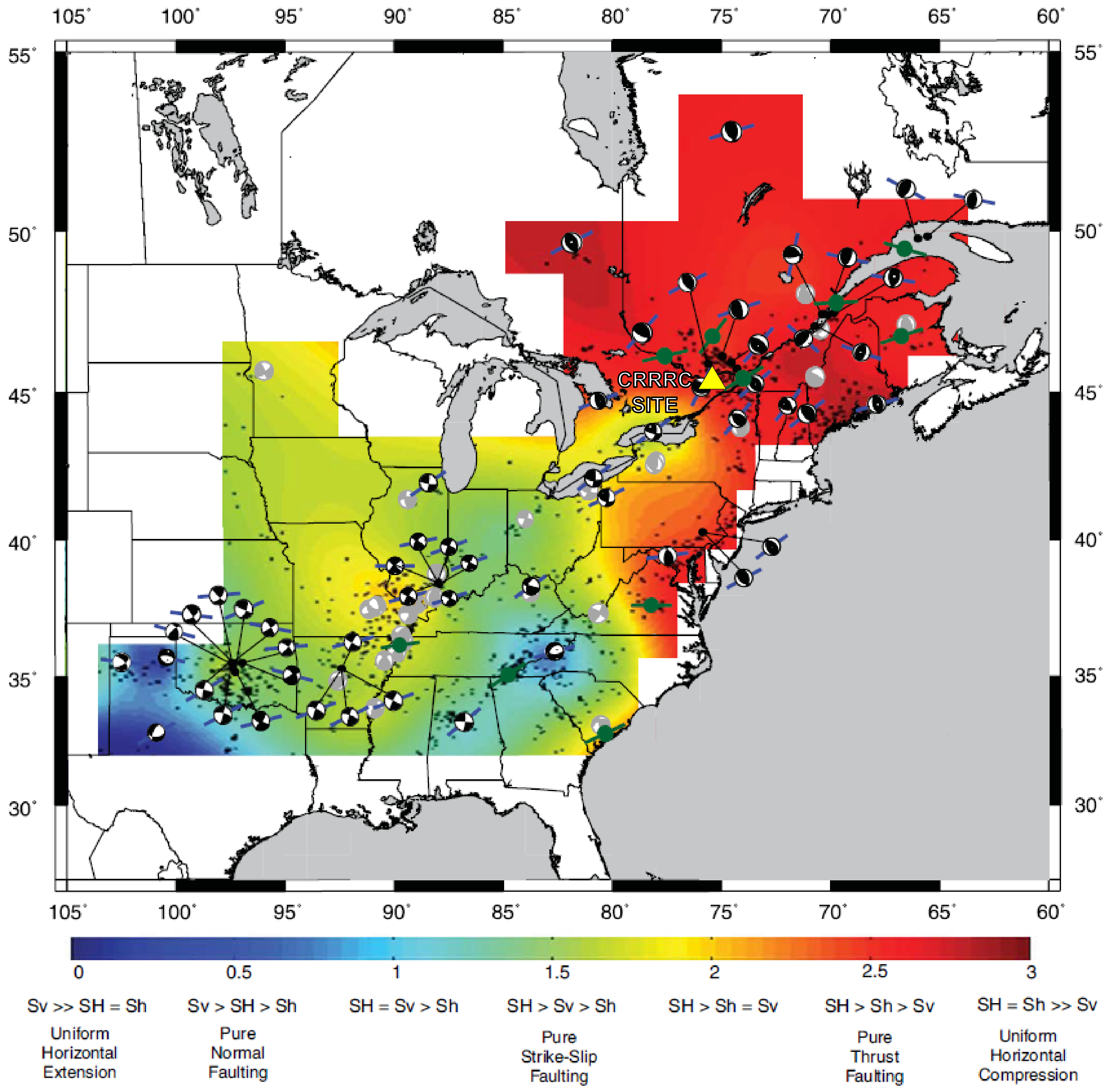


LEGEND

FOCAL MECHANISM SHOWING S_{HMAX} ORIENTATION (HURD AND ZOBACK STUDY)
FOCAL MECHANISM SHOWING S_{HMAX} ORIENTATION (EARLIER STUDIES)
STRESS INVERSIONS
● BACKGROUND SEISMICITY FROM USG/NEIC CATALOG (1973 – 2010)

STRIKE-SLIP
THRUST
NORMAL

NOTE

THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT

REFERENCE

SOURCE: HURD, O., AND ZOBACK, M.D. (2012). INTERPLATE EARTHQUAKES, REGIONAL STRESS AND FAULT MECHANICS IN THE CENTRAL AND EASTERN U.S. AND SOUTHEASTERN CANADA. TECTONOPHYSICS, 581, 182-192.

PROJECT

ENVIRONMENTAL ASSESSMENT OF THE
CAPITAL REGION RESOURCE RECOVERY CENTRE

TITLE

REGIONAL STRESS MAP

PROJECT No. 12-1125-0045			PHASE No. 4500
DESIGN	CV	27 NOV. 2013	SCALE AS SHOWN REV.0
GIS	NB	27 NOV. 2013	FIGURE 8.5.1-10
CHECK	PLE	AUG 2014	
REVIEW	PAS	AUG 2014	

N:\Active\2012\1125 - Environmental and Civil Engineering\12-1125-0045 CRRRC EA Eastern ON\Phase 4000_EA_Documentation\Vol 3 - G H&G\Geology Figures\ppt

In summary, the Site is located within a seismic zone that has a historic record of relatively frequent small to moderate magnitude earthquakes. There is circumstantial evidence in the region indicating that there has been widespread earthquake-related shaking during the last 11,000 years, however, there is no known evidence of fault movement/rupture at the ground surface associated with these earthquakes. Earthquakes have been recorded in the region over the last 300 or so years, with the majority occurring at distances greater than 200 kilometres from the Site.

8.5.2 Hydrogeology

8.5.2.1 Site-Vicinity Hydrogeology

In the vicinity of the Site, the shallow groundwater flow within the surficial silty sand material is influenced by local topography and the position of local surface water features and is interpreted to be primarily horizontal. Within the marine clay deposits (at surface and at depth), there is minimal groundwater flow and the groundwater flow direction is typically vertical. At depth, the groundwater flow direction within the basal till/bedrock contact zone and within the upper portion of the bedrock is towards the east and northeast (Raisin Region-South Nation Source Protection Region, 2012; WESA, 2010, WESA and EarthFX, 2006; Golder, 2004).

Within the vicinity of the Site, water supply to residences, farms and commercial/industrial properties is provided by private wells. Approximately 8 kilometres to the east of the Site, the communities of Vars and Limoges obtain their water supply from communal wells completed in a north-south trending buried sand and gravel esker (Vars-Winchester Esker), which is separated from the Site by thick clay deposits and a bedrock ridge. In the area surrounding, but some distance from the Site, drilled wells for private water supply obtain their water from the basal till/bedrock contact zone or from within the upper portion of the bedrock. The groundwater quality from the till/bedrock contact zone and within the bedrock in the immediate vicinity of the Site is reported as salty, sulphurous or mineralized; the presence of methane gas in the groundwater is also reported (WESA, 1986). For this reason, it is understood that most residents in the vicinity of the Site who do not have access to the City "trickle feed" system use shallow dug wells to provide a water supply from the surficial silty sand layer. The Site is not within a Source Water Protection Area.

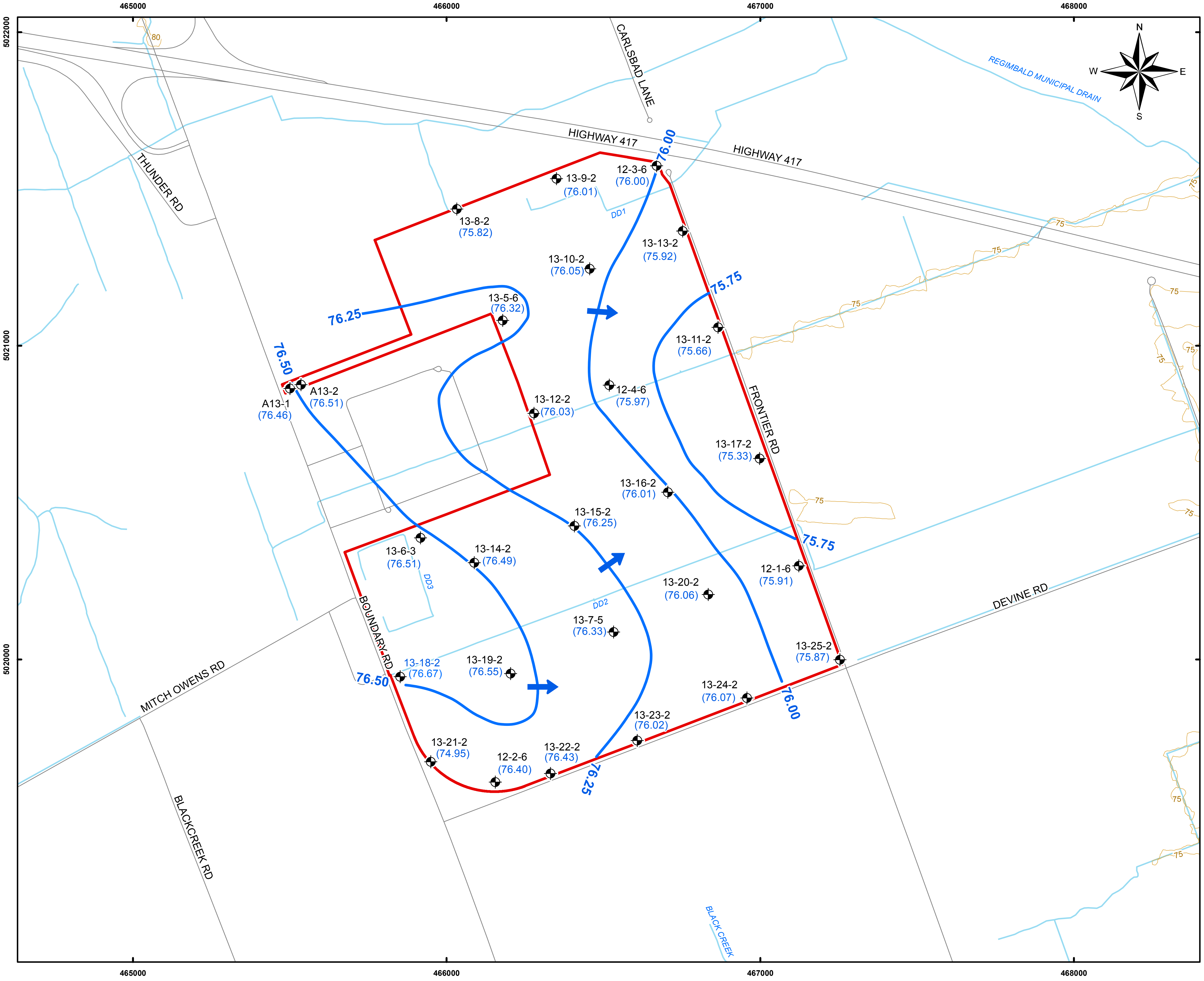
In summary, groundwater flows horizontally in the upper surficial silty sand material and the bedrock. There is primarily vertical groundwater movement in the marine clay deposits. Drinking water in the area is sourced from dug wells in the upper surficial silty sand material and the City "trickle feed" system; further away from drilled wells in bedrock; and there are communal wells completed in the esker some 8 kilometres east of the Site.

8.5.2.2 Site Hydrogeology

The groundwater flow direction in the surficial silty sand layer, the silty layer and the silty clay at the Site are consistently towards the east, while the groundwater flow direction in the glacial till is interpreted to be consistently towards the east/northeast. Based on a review of available groundwater levels, the groundwater flow direction in the upper bedrock is interpreted to be consistently towards the northeast in the southern and central portions of the Site. Although based on limited data, the groundwater flow direction in the bedrock in the northern portion of the Site is occasionally towards the southeast; at other times, the groundwater flow in the upper bedrock is interpreted to be towards the northeast across the entire Site. A representative set of groundwater levels collected on October 16, 2013 were used to generate the groundwater contours and interpret the groundwater flow direction in the each stratigraphic unit as shown on Figures 8.5.2-1 through to 8.5.2-5.

Groundwater elevations in the surficial silty sand measure on average 0.4 mbgs across the Site and range from 0.1 metres above ground surface to more than 1.5 mbgs. The overall range in groundwater elevations observed within the surficial silty sand was between 75.0 and 76.8 masl. Groundwater levels in the silty layer measured between 0 and 1.0 mbgs. Groundwater levels in the middle silty clay measured between 0.4 and 1.9 mbgs (74.6 and 76.2 masl), while groundwater levels within the glacial till layer measured between 1.3 and 1.9 mbgs (74.4 and 75.0 masl). Finally, groundwater levels in the upper bedrock zone ranged between 1.4 and 2.0 mbgs across the Site (74.2 and 75.3 masl).

Based on the monthly and daily groundwater elevation data collected to date, vertical gradients at the Site are typically either downward (recharge conditions) or absent between the surficial silty sand, the silty layer, silty clay, glacial till and upper bedrock formations at most monitoring locations.



LEGEND

(75.61) GROUNDWATER ELEVATION ON OCTOBER 16, 2013 (METRES ABOVE SEA LEVEL)

— GROUNDWATER ELEVATION CONTOUR (METRES ABOVE SEA LEVEL)

➡ INTERPRETED GROUNDWATER FLOW DIRECTION

⊕ MONITORING WELL LOCATION

— ROAD

— CONTOUR LINE, (5m)

— SURFACE WATER FEATURE

▨ WATER AREA

▭ PROPERTY BOUNDARY

200 100 0 200

SCALE 1:12,000 METRES

NOTE

THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT.

REFERENCE

LAND INFORMATION ONTARIO (LIO) DATA PRODUCED BY GOLDER ASSOCIATES LTD. UNDER LICENCE FROM ONTARIO MINISTRY OF NATURAL RESOURCES, © QUEENS PRINTER 2012.
PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 18

PROJECT

ENVIRONMENTAL ASSESSMENT OF THE CAPITAL REGION RESOURCE RECOVERY CENTRE

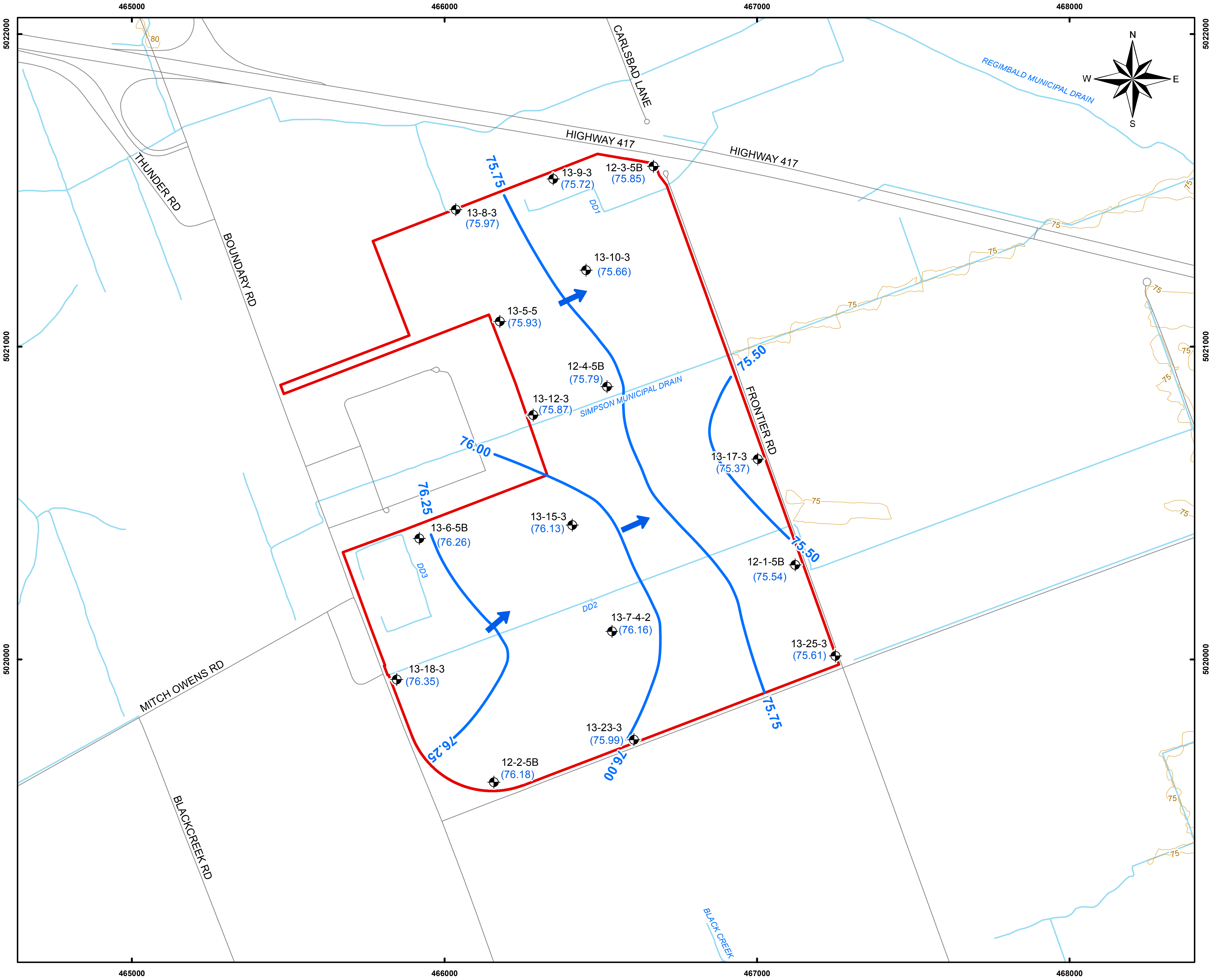
TITLE

SURFICIAL SILTY SAND GROUNDWATER FLOW

Golder Associates

PROJECT No. 12-1125-0045			SCALE AS SHOWN	REV. 0
DESIGN	DH	DEC. 2013	FIGURE 8.5.2-1	
GIS	BR/PM	DEC. 2013		
CHECK	JPAO	AUG. 2014		
REVIEW	PAS	AUG. 2014		

Path: N:\Active\Spatial_IM\Miller_Paving_Ltd\CRRRC\GIS\MXDs\12-1125-0045\Reporting\Phase4000\Vol.1\1211250045-4000-Vol1-8.5.2-1.mxd



LEGEND

(75.61) GROUNDWATER ELEVATION ON OCTOBER 16, 2013 (METRES ABOVE SEA LEVEL)

GROUNDWATER ELEVATION CONTOUR (METRES ABOVE SEA LEVEL)

INTERPRETED GROUNWATER FLOW DIRECTION

MONITORING WELL LOCATION

CONTOUR LINE, (5m)

SURFACE WATER FEATURE

WATER AREA

PROPERTY BOUNDARY

200 100 0 200

SCALE 1:12,000 METRES

NOTE

THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT.

REFERENCE

LAND INFORMATION ONTARIO (LIO) DATA PRODUCED BY GOLDER ASSOCIATES LTD. UNDER LICENCE FROM ONTARIO MINISTRY OF NATURAL RESOURCES, © QUEENS PRINTER 2012.
PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 18

PROJECT

ENVIRONMENTAL ASSESSMENT OF THE CAPITAL REGION RESOURCE RECOVERY CENTRE

TITLE

SILTY LAYER GROUNDWATER FLOW

PROJECT No. 12-1125-0045			SCALE AS SHOWN	REV. 0
DESIGN	DH	DEC. 2013	FIGURE 8.5.2-2	
GIS	BR/PM	DEC. 2013		
CHECK	JPAO	AUG. 2014		
REVIEW	PAS	AUG. 2014		

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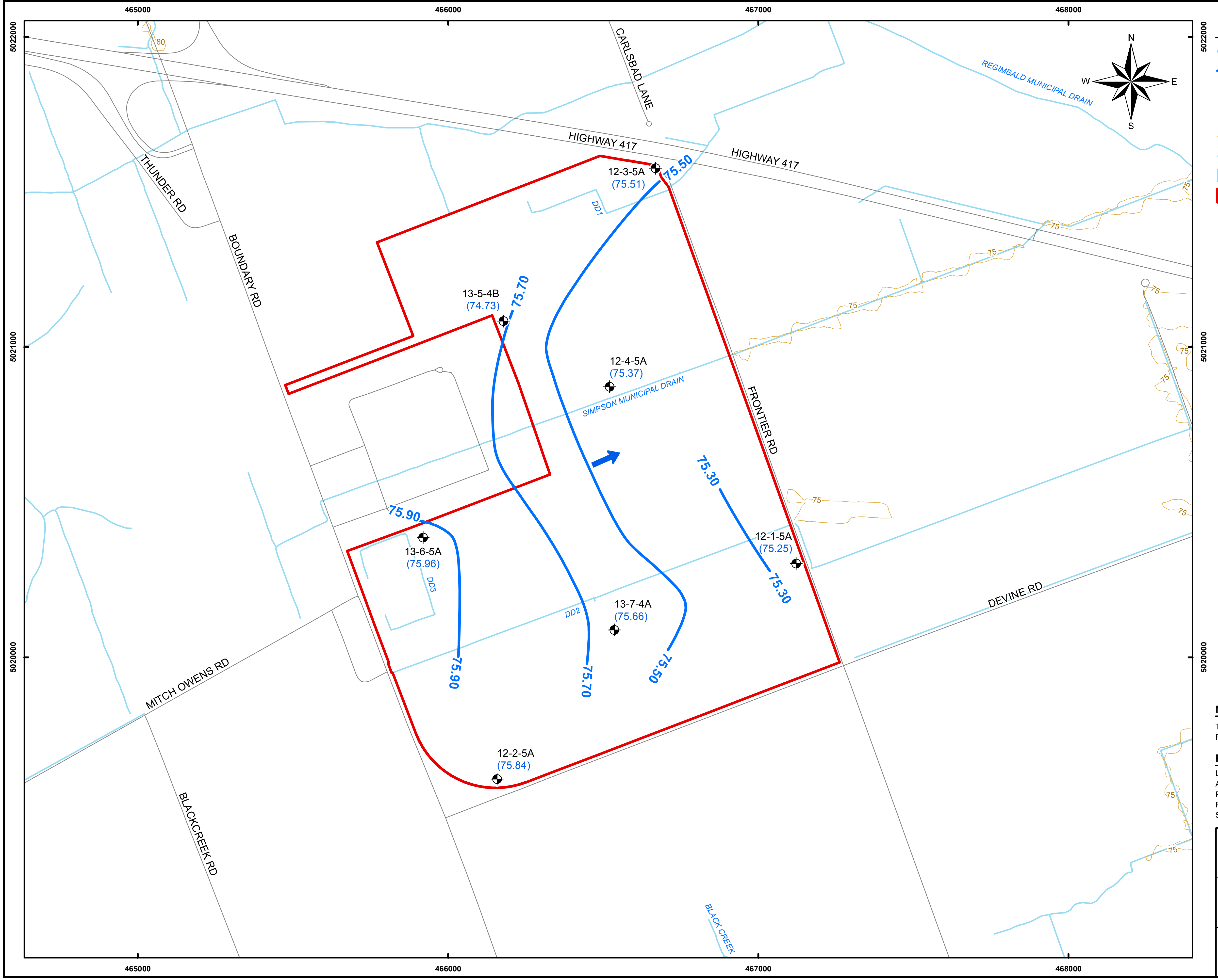


LEGEND

(75.61)	GROUNDWATER ELEVATION ON OCTOBER 16, 2013 (METRES ABOVE SEA LEVEL)
—	GROUNDWATER ELEVATION CONTOUR (METRES ABOVE SEA LEVEL)
➡	INTERPRETED GROUNDWATER FLOW DIRECTION
⊕	MONITORING WELL LOCATION
—	CONTOUR LINE, (5m)
—	SURFACE WATER FEATURE
▨	WATER AREA
☐	PROPERTY BOUNDARY

200 100 0 200

SCALE 1:12,000 METRES

NOTE

THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT.

REFERENCE

LAND INFORMATION ONTARIO (LIO) DATA PRODUCED BY GOLDER ASSOCIATES LTD. UNDER LICENCE FROM ONTARIO MINISTRY OF NATURAL RESOURCES, © QUEENS PRINTER 2012.

PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 18

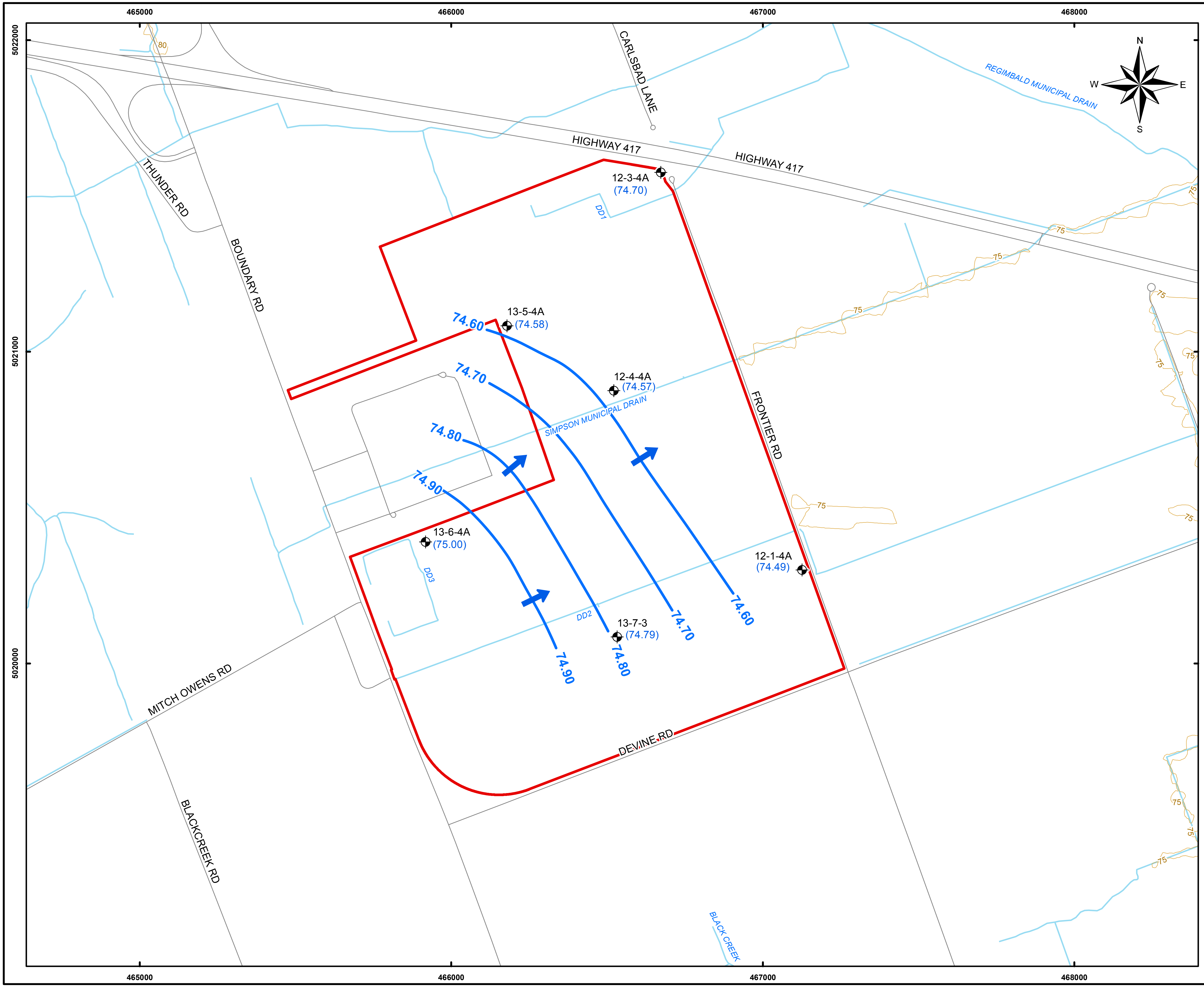
PROJECT
ENVIRONMENTAL ASSESSMENT OF THE CAPITAL REGION RESOURCE RECOVERY CENTRE

TITLE
MIDDLE SILTY CLAY GROUNDWATER FLOW

Golder Associates

PROJECT No. 12-1125-0045			SCALE AS SHOWN	REV. 0
DESIGN	DH	NOV. 2013	**FIGURE 8.5.2-3**	
GIS	BR/PM	DEC. 2013		
CHECK	JPAO	AUG. 2014		
REVIEW	PAS	AUG. 2014		

Path: N:\Active\Spatial_IM\Miller_Paving_Ltd\CRRRC\GIS\MXDs\12-1125-0045\Reporting\Phase4000\Vol.1\1211250045-4000-Vol1-0120-8.5.2-3.mxd



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LEGEND

(75.61) GROUNDWATER ELEVATION ON OCTOBER 16, 2013 (METRES ABOVE SEA LEVEL)
GROUNDWATER ELEVATION CONTOUR (METRES ABOVE SEA LEVEL)
INTERPRETED GROUNWATER FLOW DIRECTION
MONITORING WELL LOCATION
CONTOUR LINE, (5m)
SURFACE WATER FEATURE
WATER AREA
PROPERTY BOUNDARY

200 100 0 200

SCALE 1:12,000 METRES

NOTE

THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT.

REFERENCE

LAND INFORMATION ONTARIO (LIO) DATA PRODUCED BY GOLDER ASSOCIATES LTD. UNDER LICENCE FROM ONTARIO MINISTRY OF NATURAL RESOURCES, © QUEENS PRINTER 2012.
PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 18

PROJECT

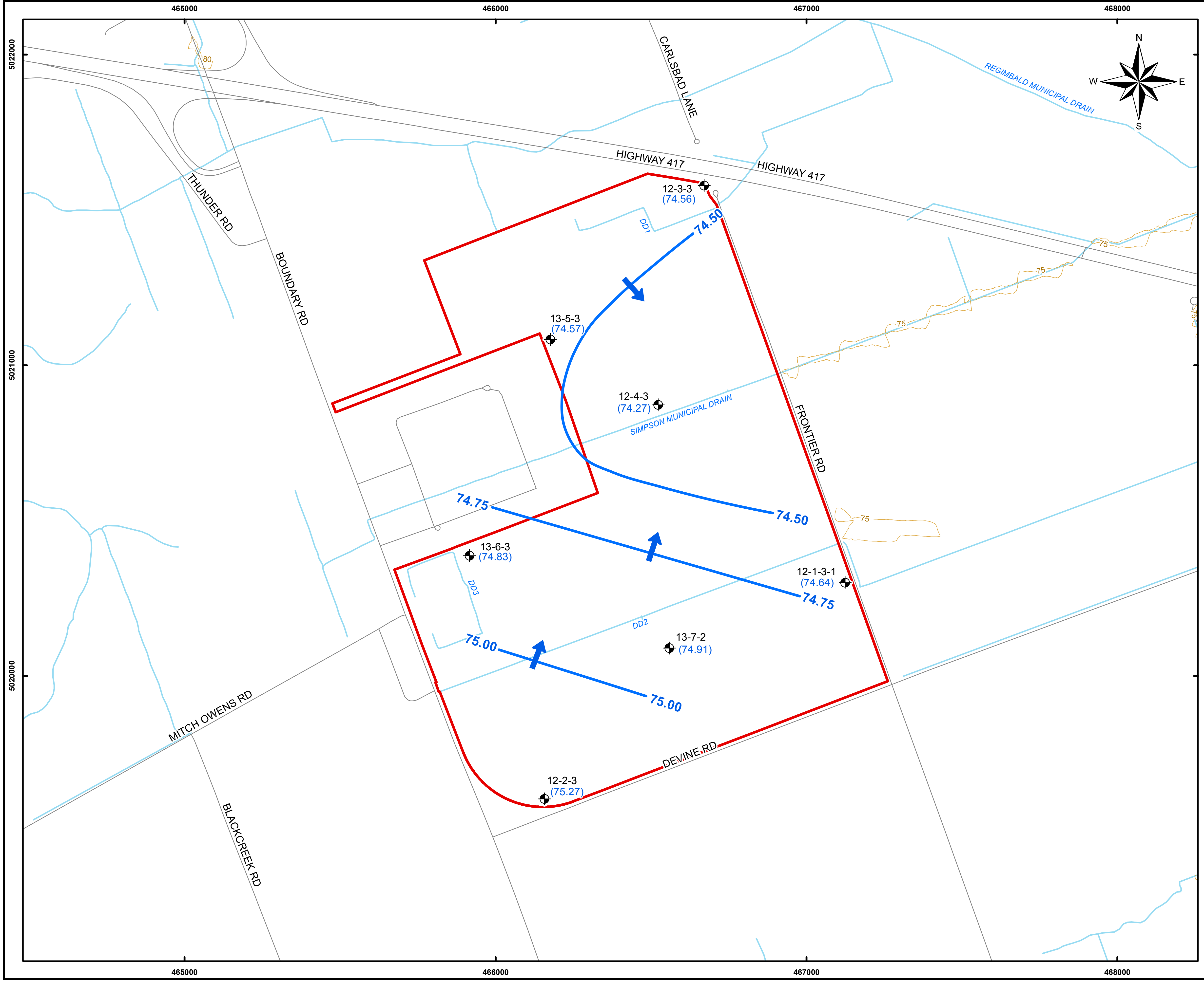
ENVIRONMENTAL ASSESSMENT OF THE CAPITAL REGION RESOURCE RECOVERY CENTRE

TITLE

GLACIAL TILL GROUNDWATER FLOW

Golder Associates

PROJECT No. 12-1125-0045			SCALE AS SHOWN	REV. 0
DESIGN	DH	DEC. 2013	**FIGURE 8.5.2-4**	
GIS	BR/PM	DEC. 2013		
CHECK	JPAO	AUG. 2014		
REVIEW	PAS	AUG. 2014		



Path: N:\Active\Spatial_IM\Miller_Paving_Ltd\CRRRC\GIS\MXDs\12-1125-0045\Reporting\Phase4000\Vol.1\1211250045-4000-Vol1-8.5.2-5.mxd

LEGEND

(75.61)	GROUNDWATER ELEVATION ON OCTOBER 16, 2013 (METRES ABOVE SEA LEVEL)
—	GROUNDWATER ELEVATION CONTOUR (METRES ABOVE SEA LEVEL)
➡	INTERPRETED GROUNWATER FLOW DIRECTION
⊕	MONITORING WELL LOCATION
—	ROAD
—	CONTOUR LINE, (5m)
—	SURFACE WATER FEATURE
■	WATER AREA
▭	PROPERTY BOUNDARY

200 100 0 200

SCALE 1:12,000 METRES

NOTE

THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT.

REFERENCE

LAND INFORMATION ONTARIO (LIO) DATA PRODUCED BY GOLDER ASSOCIATES LTD. UNDER LICENCE FROM ONTARIO MINISTRY OF NATURAL RESOURCES, © QUEENS PRINTER 2012.
PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 18

PROJECT
ENVIRONMENTAL ASSESSMENT OF THE CAPITAL REGION RESOURCE RECOVERY CENTRE

TITLE
UPPER BEDROCK GROUNDWATER FLOW

PROJECT No. 12-1125-0045			SCALE AS SHOWN	REV. 0
DESIGN	DH	DEC. 2013	FIGURE 8.5.2-5	
GIS	BR/PM	DEC. 2013		
CHECK	JPAO	AUG. 2014		
REVIEW	PAS	AUG. 2014		

The results of the vertical hydraulic conductivity testing indicate the silty clay has a consistently low permeability at the various depths sampled. Based on the hydraulic conductivity of the silty clay, the formation is referred to as an aquitard and serves as a confining stratigraphic unit to the underlying glacial till and upper bedrock. Groundwater flow is assumed to predominantly occur in the vertical direction within the silty clay aquitard, and based on estimates of the vertical hydraulic conductivity there is minimal groundwater flow in this material.

Based on the results of the in-situ hydraulic conductivity testing completed at the Site, assumed horizontal to vertical anisotropy in the silty clay and measured horizontal hydraulic gradients, the ranges in horizontal hydraulic conductivity and average linear groundwater velocity were determined for the various overburden and upper bedrock formations as shown in Table 8.5.2-1.

Table 8.5.2-1: Hydraulic Conductivity and Groundwater Velocity

Formation	Horizontal Hydraulic Conductivity Range (m/s)	Average Linear Groundwater Velocity Range at the CRRRC Site (m/year)
Surficial Silty Sand	9 x 10^{-8} to 2 x 10^{-5} (moderate hydraulic conductivity)	<0.01 to 1.8
Shallow Clay with Silty Layer	3 x 10^{-8} to 3 x 10^{-6} (moderate hydraulic conductivity)	<0.01 to 0.2
Silty Clay	7 x 10^{-9} to 2 x 10^{-8} (low hydraulic conductivity)	<0.01
Glacial Till	8 x 10^{-9} to 2 x 10^{-4} (variably low to high hydraulic conductivity)	<0.01 to 9
Upper Bedrock Zone	2 x 10^{-8} to 2 x 10^{-5} (low to moderate hydraulic conductivity)	<0.01 to 4.4

In summary, groundwater flow is generally in an easterly direction across the Site. Groundwater movement is quite slow. The groundwater table is close to the ground surface and has a tendency to move vertically downwards. The silty clay does not allow water to flow easily and is therefore seen as a confining layer to the underlying glacial till and upper bedrock.

8.5.2.3 Background Groundwater Quality

Based on the results of the groundwater quality sampling program, groundwater quality at the Site varies from fresh to brackish and deteriorates with depth. The groundwater within the surficial silty sand and the silty layer typically exceed the Ontario Drinking Water Quality Standards (ODWQS; MOE, 2003a) for total dissolved solids (TDS) and manganese, and occasionally for dissolved organic carbon (DOC). Within the glacial till and upper bedrock, elevated concentrations of barium, chloride, sodium and TDS and occasionally manganese are observed compared to the applicable ODWQS. Groundwater quality samples collected in the upper bedrock were also analyzed for dissolved methane, which consistently exceeded the ODWQS at several monitoring wells. These elevated concentrations are interpreted to be naturally occurring.

Two residential water supply wells and one commercial water supply well were sampled in January 2013. Residential water supply wells are situated along Frontier Road (two: Frontier-1 and Frontier-2) within the northeast limits of the CRRRC Site and one commercial supply well (Boundary-1) is situated west of the CRRRC

Site. The residential water supply wells are shown in Figure 8.5-1. The results of the water supply sampling program indicate that most parameters analyzed were below the respective ODWQS (MOE, 2003a). Parameters exceeding the ODWQS include DOC and manganese at all three water supply locations, along with TDS and iron at the commercial water supply well only. The results of the residential water supply wells sampling program indicate that groundwater quality at the private well locations is comparable to the groundwater quality observed at monitoring wells screened within the surficial silty sand at the Site, with the exception of chloride, chemical oxygen demand (COD), total phosphorus, sodium, TDS and total Kjeldahl nitrogen (TKN) that are generally observed at higher concentrations in the Site monitoring wells.

8.5.3 Geotechnical

This section presents information on the geotechnical parameters of the subsurface materials encountered at the Site. These materials were described in Section 8.5.1.2.

Below the topsoil layer (measuring between 0.05 and 0.3 metres in thickness) is between 0 to 2.7 metres of sand, silty sand and/or sandy silt with trace to some clay. Standard penetration tests indicated a very loose to compact state of packing for the sandy soils.

The surficial silty sand soils are underlain by a thick deposit of silty clay. The upper 0.1 to 1.3 metres of the silty clay at most of the investigation locations has been weathered to a red brown crust (referred to as 'weathered crust'). Layers and seams of silty sand, sand and clayey silt were also encountered within the weathered portion of the silty clay. Standard penetration tests carried out in the weathered material indicated a stiff consistency.

The silty clay below the surficial silty sand and silt or weathered crust (where present) is unweathered. The results of *in-situ* vane testing in this unweathered material indicated that undrained shear strengths generally increase with depth, with a generally soft consistency to about 9 to 10 metres depth, followed by a firm consistency to about 15 to 18 metres depth, followed by stiff to very stiff for the remainder of the deposit. The measured sensitivity of the unweathered silty clay deposit indicates a medium sensitive to extrasensitive soil. The results of Atterberg limit testing carried out on several samples of the unweathered silty clay indicate a relatively high plasticity soil. The water content above about 20 metres depth is typically in the range of 65% to 85%, while the water content below about 20 metres depth is generally slightly less, being typically in the range of 60% to 70%.

The silty clay is underlain by a deposit of glacial till. Based on the retrieved samples and observations of the sampler/drilling resistance, the glacial till is considered to generally consist of a heterogeneous mixture of gravel, cobbles and boulders in a matrix of sand and silt with a trace to some clay. Standard penetration tests indicate a loose to very dense state of packing. However, the higher standard penetration test results encountered in the glacial till likely reflect the presence of cobbles and boulders in the deposit.

The boreholes cored into bedrock beneath the Site all encountered the Carlsbad Formation. The Rock Quality Designation (RQD) values measured on recovered bedrock core samples typically range from about 59% to 100%, indicating a fair to excellent quality rock. However, two lower RQD values of 12% and 29% were measured within the upper portion of the bedrock at borehole locations 12-3-3 and 12-2-3, respectively, indicating poorer quality bedrock.

The results of geophysical testing that was carried out in two boreholes at the Boundary Road Site indicate measured average shear-wave velocity that corresponds to the Site being a Class E site, as related to design of structures as set out in the National Building Code of Canada (NRC, 2010) and the Ontario Building Code (MMAH, 2012). This agrees with the published seismic site class map of the Ottawa area (Hunter et. al., 2012).

In summary, based on geotechnical testing at the Site, the surficial silty sand layer is considered to be loosely packed, followed by a limited thickness of stiff weathered silty clay "crust" (in some areas). The unweathered silty clay which underlies the Site has a soft consistency at shallower depths and becomes stiff below about 15 to 18 metres depth. The underlying glacial till is a mixture of gravel, cobbles, boulders, sand and silt. The upper portion of the bedrock is considered to generally have a fair to excellent quality (i.e., it has a low degree of fracturing).

8.6 Surface Water

This section presents the existing surface water conditions in and around the Site. The study area for this component is provided in Section 2.3. The information and assessments presented in this section have been compiled from more detailed information contained in Volume IV.

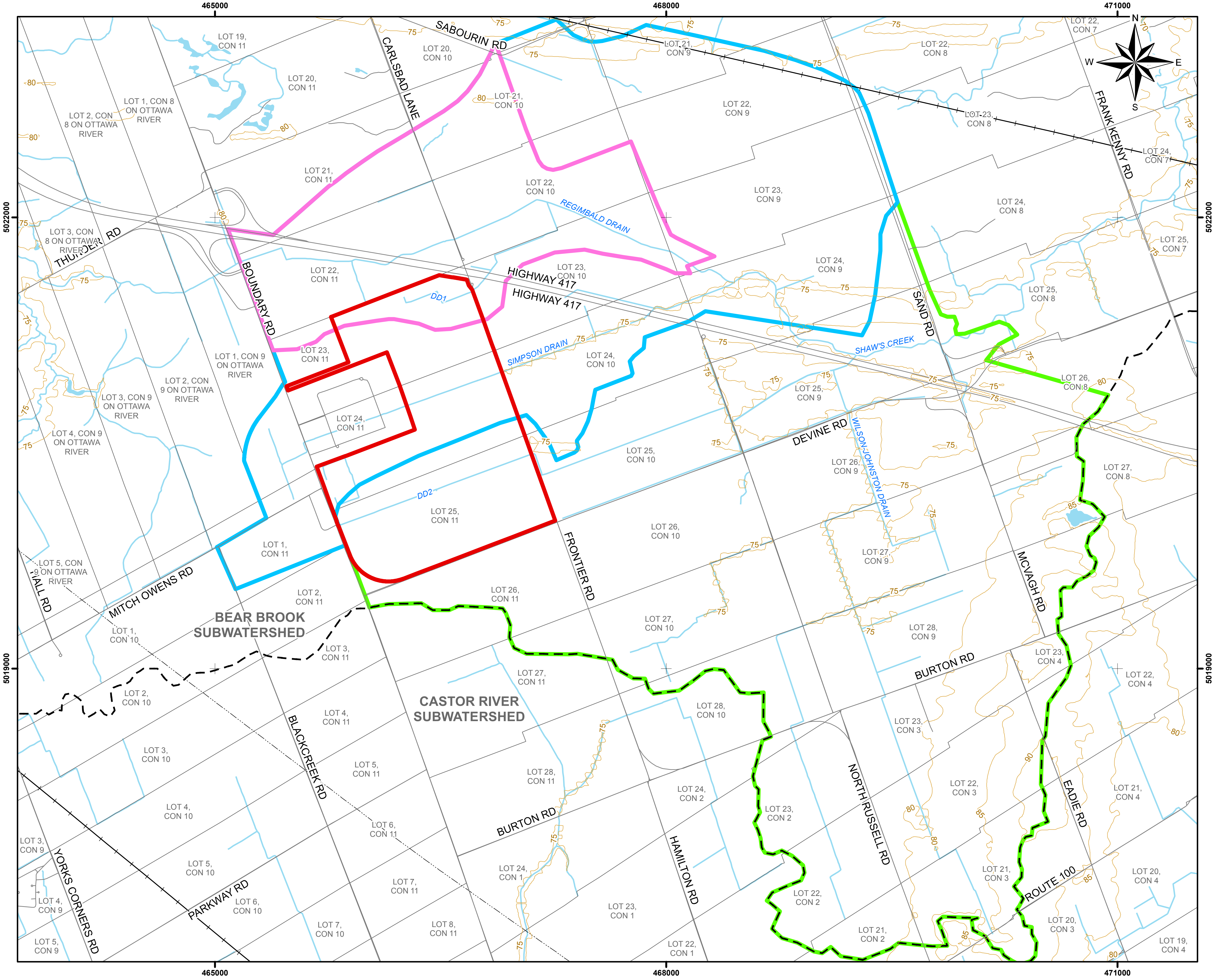
In order to assess the existing surface water conditions, a field monitoring program was initiated to capture seasonal changes that exist at the Site and surrounding area. Data regarding the existing surface water flow and quality representative of conditions upstream and downstream of the proposed CRRRC were collected and other resources such as municipal waterway monitoring reports were reviewed. Because of the intermittent to stagnant nature of surface water flow in the area of the Site, a hydrological model was used to calculate surface water runoff and peak flows in the area of the Site under existing conditions, using 2, 5, 25 and 100 year design storms.

8.6.1 Natural Watercourses

There are four natural watercourses within 5 kilometres of the Site. Bear Brook Creek is 3.4 kilometres to the northwest of the property boundaries and Shaw's Creek is 1.6 kilometres to the east. Bear Brook Creek is a major tributary of the South Nation River. The North Castor River is 4.7 kilometres to the southwest of the property, while Black Creek is approximately 2.5 kilometres to the southeast. Both the North Castor River and Black Creek are part of the Castor River subwatershed and, as such, are isolated by the subwatershed boundary from receiving potential drainage from the Site. The approximate boundary between the Bear Brook Creek subwatershed and the Castor River subwatershed is shown on Figure 8.6.1-1. There are no municipal surface water intakes located along tributaries or sections of Bear Brook Creek, with communities primarily relying on groundwater or municipal systems for their water supply (South Nation Conservation Authority, 2012).

The water quality in Bear Brook Creek is reflective of the rural, agricultural population in its vicinity. According to the City of Ottawa Water Environment Protection Program (WEPP) 2008 to 2014 data for Bear Brook Creek (City of Ottawa, 2014), 0% to 44% of the phosphorus, E.*coli* and copper inwater quality samples meet provincial and federal targets and 95% to 100% of zinc samples meet provincial and federal targets.

The average daily discharge at HYDAT station 02LB008 for 2001 to 2010 is 7.42 m^3/s (HYDAT: Environment Canada, 2010). This represents seven years of data as the records were incomplete for 2001, 2004 and 2007.



Path: N:\Active\Spatial_IM\Miller_Paving_Ltd\CRRRC\GIS\MXDs\12-1125-0045\Reporting\Phase4000\Vol.1\1211250045-4000-Vol1-8.6.1-1.mxd

LEGEND

○	POPULATED PLACENAME
—	ROAD
┼	RAIL ROAD
—	CONTOUR LINE, (5m)
-·-	UTILITY LINE
—	REGIMBALD MUNICIPAL DRAIN BOUNDARY
—	SIMPSON MUNICIPAL DRAIN BOUNDARY
—	WILSON-JOHNSTON MUNICIPAL DRAIN BOUNDARY
—	SURFACE WATER FEATURE
🟦	WATER AREA
- -	SUBWATERSHED DIVIDE
☐	LOT/CONCESSION
🟥	PROPERTY BOUNDARY

500 250 0 500

SCALE 1:25,000 METRES

NOTE

THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT.

REFERENCE

LAND INFORMATION ONTARIO (LIO) DATA PRODUCED BY GOLDER ASSOCIATES LTD. UNDER LICENCE FROM ONTARIO MINISTRY OF NATURAL RESOURCES, © QUEENS PRINTER 2012.
PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 18

PROJECT

ENVIRONMENTAL ASSESSMENT OF THE CAPITAL REGION RESOURCE RECOVERY CENTRE

TITLE

SURFACE WATER FEATURES

PROJECT No. 12-1125-0045			SCALE AS SHOWN	REV. 0
DESIGN	JPAO	DEC. 2013	FIGURE 8.6.1-1	
GIS	BR	DEC. 2013		
CHECK	PLE	AUG. 2014		
REVIEW	PAS	AUG. 2014		

Golder Associates

8.6.2 Existing Drainage

Drainage in the vicinity of the Site is mainly by means of a network of agricultural ditches and three municipal drains. Ditches that cross the Site, some of which are old farm field drainage, have not been maintained. There are roadside ditches along Boundary, Devine and Frontier Roads that eventually all drain eastward. At present, drainage on the Site is not well established and the land is poorly drained. Delineated pre-development drainage catchments are presented in Figure 8.6.2-1.

The Site is divided into three sub-catchment areas with discharge to the eastern boundaries of the Site. The discharge ditches of the three sub-catchments all eventually tie into municipal drains. Summaries for each of these Site drainage areas are provided below.

8.6.2.1 Regimbald Municipal Drain

The northern Site sub-catchment area primarily drains to two on-Site agricultural ditches. One ditch segment drains northerly from the Site while another drains easterly towards Frontier Road. Both ditch segments eventually become part of the Regimbald Drain, the first about 200 metres north of the northern property limit, while the second is on the east side of Frontier Road. The portion of the Site draining to the Regimbald Drain is about 21 hectares, or about 11% of the Site.

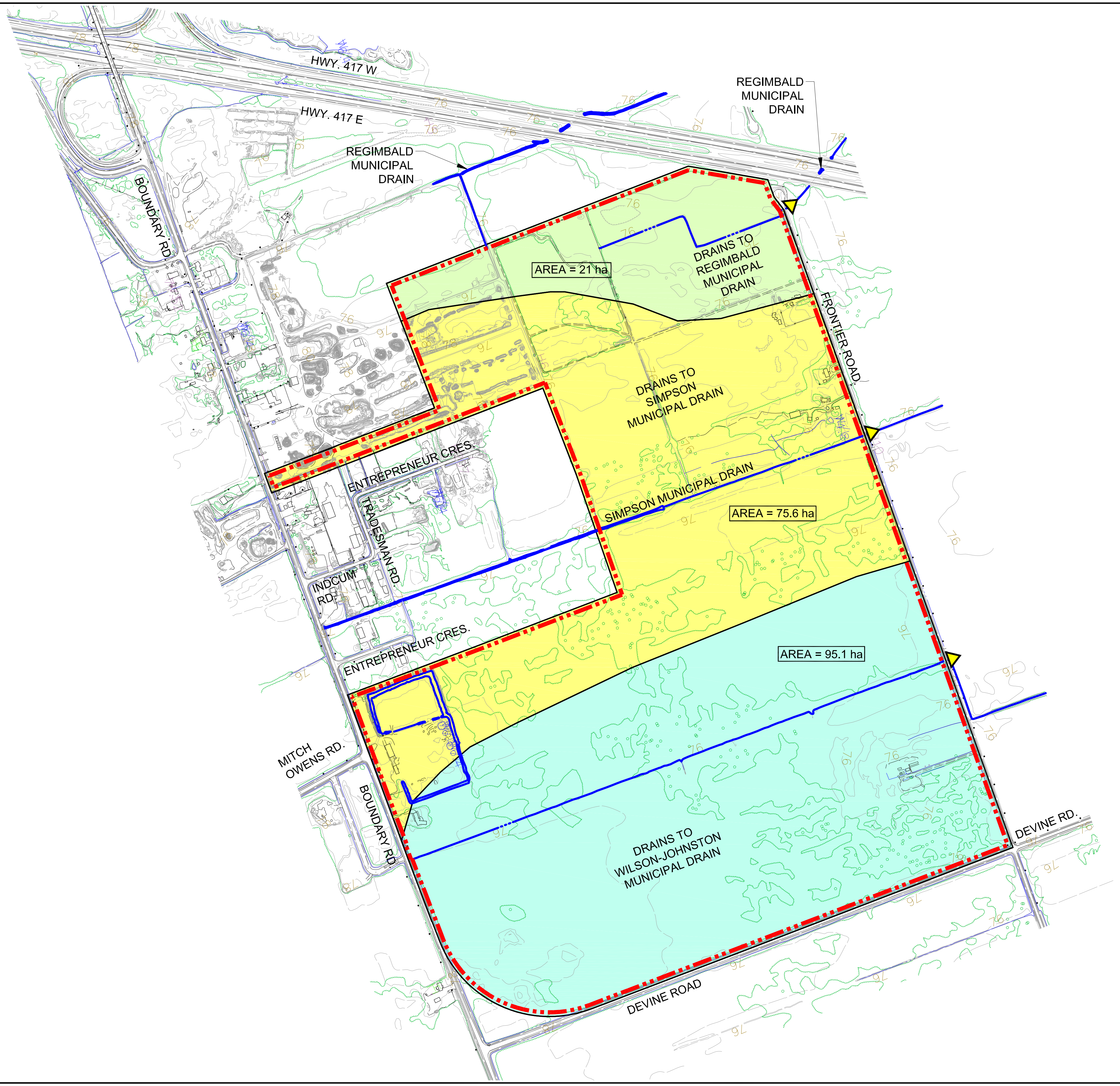
8.6.2.2 Simpson Municipal Drain

The Simpson Municipal Drain bisects the Site and drains from west to east. An upstream drainage area drains to the Simpson Drain segment through the Site, extending to the west of Boundary Road, along Mitch Owens Road to Black Creek Road.

The runoff from the central portions of the Site is directed to the Simpson Municipal Drain and is conveyed off-Site and then discharges through a culvert under Frontier Road. Downstream, the Simpson Drain continues under Highway 417 and then as Shaw’s Creek, which eventually feeds Bear Brook Creek. The portion of the Site draining to the Simpson Drain is about 75.6 hectares, or about 39% of the Site.

8.6.2.3 Wilson-Johnston Municipal Drain

The southern portion of the Site is primarily drained by a ditch flowing west to east across the entire width of the Site. This ditch extends west to Boundary Road but only receives runoff from the eastern half of the road allowance as the western portion connects to the Simpson Drain at Mitch Owens Road. This ditch continues to flow east and eventually becomes part of the Wilson-Johnston Municipal Drain. The portion of the Site draining to the Wilson-Johnston Drain is about 95.1 hectares, or about 50% of the Site.



N
W E
S

LEGEND:

🟥 PROPERTY BOUNDARY

🟦 SURFACE WATER

△ OUTLET

— DRAINAGE AREA BOUNDARY

NOTE

1. THIS FIGURE SHOULD BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT.

REFERENCES:

1. BASE DRAWING PROVIDED IN A DIGITAL FORMAT BY BASE MAPPING CO. LTD., CONTRACT No. 2517-12, PHOTO DATE: NOVEMBER 7, 2012, DATE RECEIVED: JANUARY 9, 2013.
2. PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 18.
3. MUNICIPAL DRAIN BOUNDARIES FROM TOWNSHIP OF CUMBERLAND MUNICIPAL DRAIN & MUTUAL AGREEMENT PREPARED BY STANTEC, REVISED MARCH 2000.

200 0 200 400

SCALE 1:10,000 METRES

REV	DATE	DES	REVISION DESCRIPTION	CAD	CHK	RVW
△						

PROJECT

ENVIRONMENTAL ASSESSMENT OF THE
CAPITAL REGION RESOURCE RECOVERY CENTRE

TITLE

PRE-DEVELOPMENT DRAINAGE AREAS

Golder Associates
Ottawa, Ontario, Canada

PROJECT No.		12-1125-0045
DESIGN	D.H.	22 Jan. 2013
CAD	M.L.F.	23 Jan. 2013
CHECK	D.V.K.	Aug. 2014
REVIEW	P.A.S.	Aug. 2014

FILE No.1211250045-V1 Figure 8.6.2-1.dwg

SCALE AS SHOWN REV. 0

FIGURE No.

8.6.2-1

PLOT DATE: September 5, 2014
FILENAME: N:\Active\Spatial_IM\Miller_Paving_Ltd\CRRRC\ACAD\Vol 1 (Report Figures)\Chapter 8\1211250045-V1 Figure 8.6.2-1.dwg

8.6.3 Surface Water Quantity

The collection, conveyance and detention of runoff through the Site were modelled. The modelling data denotes the extent of knowledge on the quantity of surface runoff water from the Site. The values from the hydrological modelling are presented in Table 8.6.3-1.

Table 8.6.3-1: Estimated Pre-Development Peak Flow Rates

Peak Flow (Litres per second)				
24 Hour Design Storm				
Sub-Catchment Area	**1:2 Year**	**1:5 Year**	**1:25 Year**	**1:100 Year**
Regimbald (northern)	86	298	471	538
Simpson (central)	35	284	585	732
Wilson-Johnston (southern)	40	345	715	898

The Regimbald sub-catchment experiences the highest peak flows for the 1:2 year event, while the Wilson-Johnston Drain experiences the highest peak flows in all the other design storm events.

8.6.4 Surface Water Quality

Surface water monitoring was conducted in December 2012, May 2013, July 2013, October 2013 and November 2013. Many samples were found to have elevated levels of phosphorus and iron, and dissolved oxygen lower than the Provincial Water Quality Objective (PWQO) (MOE, 1994a) range. The elevated phosphorus levels, and possibly in part the lower dissolved oxygen, are expected due to the mainly agricultural land use in the area and the accompanying fertilizer use. Iron levels were observed within the range of 110 micrograms per litre (µg/L) and 3,100 µg/L for the majority of the stations and are common in the Ottawa urban environment. A single one time exceedance of the PWQO for copper and chromium were also noted. Phenolics were detected at elevated levels in the fall 2013 sampling event for all but one station; an additional winter sampling event confirmed the elevated levels of phenolics at most locations.

A comparison of stations upstream and downstream of drainage ditches that cross the Site reveals decreases of phosphorus levels and improving dissolved oxygen levels downstream of the Site. Iron levels were observed to decrease along the Wilson-Johnston Municipal Drain to Shaw's Creek reach, but they also increased along the Simpson Municipal Drain and Shaw's Creek reach.

8.7 Biology

This section presents the existing aquatic and terrestrial biology environment conditions in and around the Site. The study area for this component is provided in Section 2.3. The information and assessments presented in this section have been compiled from more detailed information contained in TSD #4.

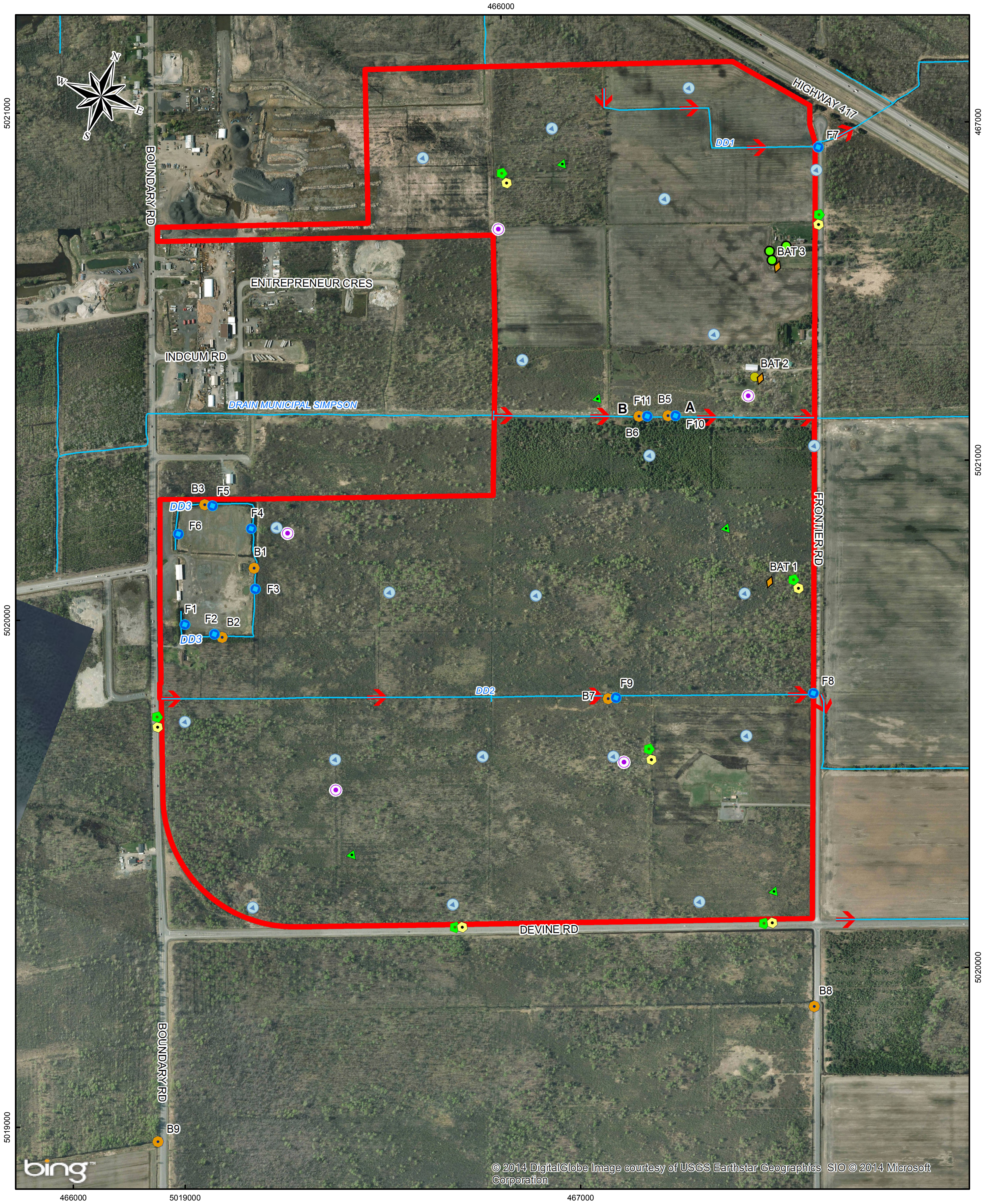
The existing conditions were assessed using both a desktop review of existing data and data collected through field surveys. The background information search and literature review were used to gather data about the local area, provide context for the evaluation of the natural features, and facilitate gap analysis/identification and field scoping.

SAR considered for this report include those species listed in the *Ontario Endangered Species Act* (ESA) and the federal *Species at Risk Act* (SARA), as well as species ranked S1-S3 (MNR, 2013a)) and regionally rare species. An assessment was conducted to determine which SAR had potential habitat on the Site. A screening of all SAR that have the potential to be found in the vicinity of the Site was conducted first as a desktop exercise. Species with geographic ranges overlapping the Site, or recent occurrence records in the Site-vicinity, were screened by comparing their habitat requirements to existing habitat conditions. The Kemptville district MNRF also provided a list of SAR that have potential to be on the Site or in the Site-vicinity. These species were also considered in the assessment.

The habitats and communities on the Site were characterized through field surveys. During all surveys, area searches were conducted and additional incidental wildlife, plant and habitat observations were recorded. Searches were also conducted to document the presence or absence of suitable habitat, based on habitat preferences, for those species identified in the desktop SAR screening described above. The dates when all surveys were conducted are included in Table 8.7-1. Survey locations are indicated on Figure 8.7-1.

Table 8.7-1: Summary of Natural Environment Field Surveys

Year	Date	Type of Survey
2012	Sept 20, Oct 1	Ecological Land Classification and vegetation survey
	Sept 20	Mammal area search/visual encounter survey
	Sept 20	Aquatic (fish and fish habitat) survey at DD1, DD2 and Simpson Drain
	Oct 11	Benthic survey at DD2 and Simpson Drain
2013	Apr 21, May 22, Jun 20	Nocturnal amphibian survey
	Apr 21	Salamander habitat assessment and egg mass survey
	Apr 21, Jun 6, Jun 20, Jun 26, Aug 29, Sept 13, Sept 20, Sept 21, Oct 15	Herpetile area search/visual encounter survey
	Apr 21	Mammal area search/visual encounter survey
	Apr 21	Snake emergence survey
	Apr 21, May 22, Jun 20	Owl and crepuscular/nocturnal breeding bird survey
	Apr 21	Raptor nesting survey
	Apr 21, Jun 6, Jun 26, July 13, Aug 29, Sept 13, Sept 20, Sept 21	Ecological Land Classification and vegetation survey
	May 16	Aquatic (fish habitat) survey DD1, DD2 and Simpson Drain.
	Jun 6, Jun 26	Breeding bird and marsh bird playback survey
	Jun 14	Mobilization of bat detectors BAT1 and BAT2
	Jun 14	Bat habitat survey
	Jun 14, Jun 26, Aug 29, Sept 13, Sept 20, Sept 21, Oct 15	Area search/visual encounter survey for all wildlife, including butterflies and dragonflies
	Jul 3	Mobilization of bat detector BAT3
	Jul 13	Demobilization of bat detectors
	Aug 26	Fish habitat mapping at DD1, DD2 and Simpson Drain
	Sept 6	Fish community inventory survey at DD1, DD2 and Simpson Drain
	Sept 13	Fish habitat mapping at DD3
	Sept 20	Fish community survey at DD3
	Oct 15	Benthic survey at DD3
	Oct 18	Benthic survey at off-Site reference stations (B7 and B8 on Figure 8.7-1)



LEGEND

- SURFACE WATER FEATURE
- PROPERTY BOUNDARY

SURVEY STATIONS

- ⬟ AMPHIBIAN SURVEY
- ◆ BAT ACOUSTIC SURVEY
- ⬡ NOCTURNAL BIRD SURVEY
- ◉ WILDLIFE MOTION CAMERA
- ◀ BREEDING BIRD SURVEY
- ▲ MARSH BIRD SURVEY
- ⬢ BENTHICS SURVEY
- ■ FISH SURVEY

SPECIES AT RISK

- ● BARN SWALLOW
- ● LITTLE BROWN MYOTIS

230 115 0 230

SCALE 1:8,000 METRES

NOTE

THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT

REFERENCE

BACKGROUND IMAGERY - BING MAPS AERIAL (C) 2010 MICROSOFT CORPORATION AND ITS DATA SUPPLIERS.
AERIAL PHOTOGRAPHS PURCHASED FROM THE CITY OF OTTAWA.
LAND INFORMATION ONTARIO (LIO) DATA PRODUCED BY GOLDER ASSOCIATES LTD. UNDER LICENCE FROM ONTARIO MINISTRY OF NATURAL RESOURCES, © QUEENS PRINTER 2012.
PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 18

PROJECT
ENVIRONMENTAL ASSESSMENT OF THE
CAPITAL REGION RESOURCE RECOVERY CENTRE

TITLE
SPECIES AT RISK AND SURVEY LOCATIONS

Golder Associates
Ottawa, Ontario

PROJECT No. 12-1125-0045			SCALE AS SHOWN	REV. 0.0
DESIGN	FN	DEC. 2013	**FIGURE 8.7-1**	
GIS	BR/PM	DEC. 2013		
CHECK	PLE	AUG. 2014		
REVIEW	PAS	AUG. 2014		

Path: N:\Active\Spatial_IM\Miller_Paving_Ltd\CRRRC\GIS\MXDs\12-1125-0045\Reporting\Phase4000\Vol.1\1211250045-4000-Vol1-8.7-1.mxd

8.7.1 Ecosystem Setting

The Site is located within the Mixedwood Plains Ecozone, an area underlain by Paleozoic limestones and dolostone bedrock. Within the larger Ecozones are nested Ecoregions, areas defined by characteristic climate patterns. The Site is located within the Lake Simcoe Rideau Ecoregion, which extends southward from a line connecting Lake Huron in the west to the Ottawa River in the east. This area contains extensive agricultural lands, as well as deciduous and mixed forests (MNR, 2007).

The following natural features are located in the general area of the Site:

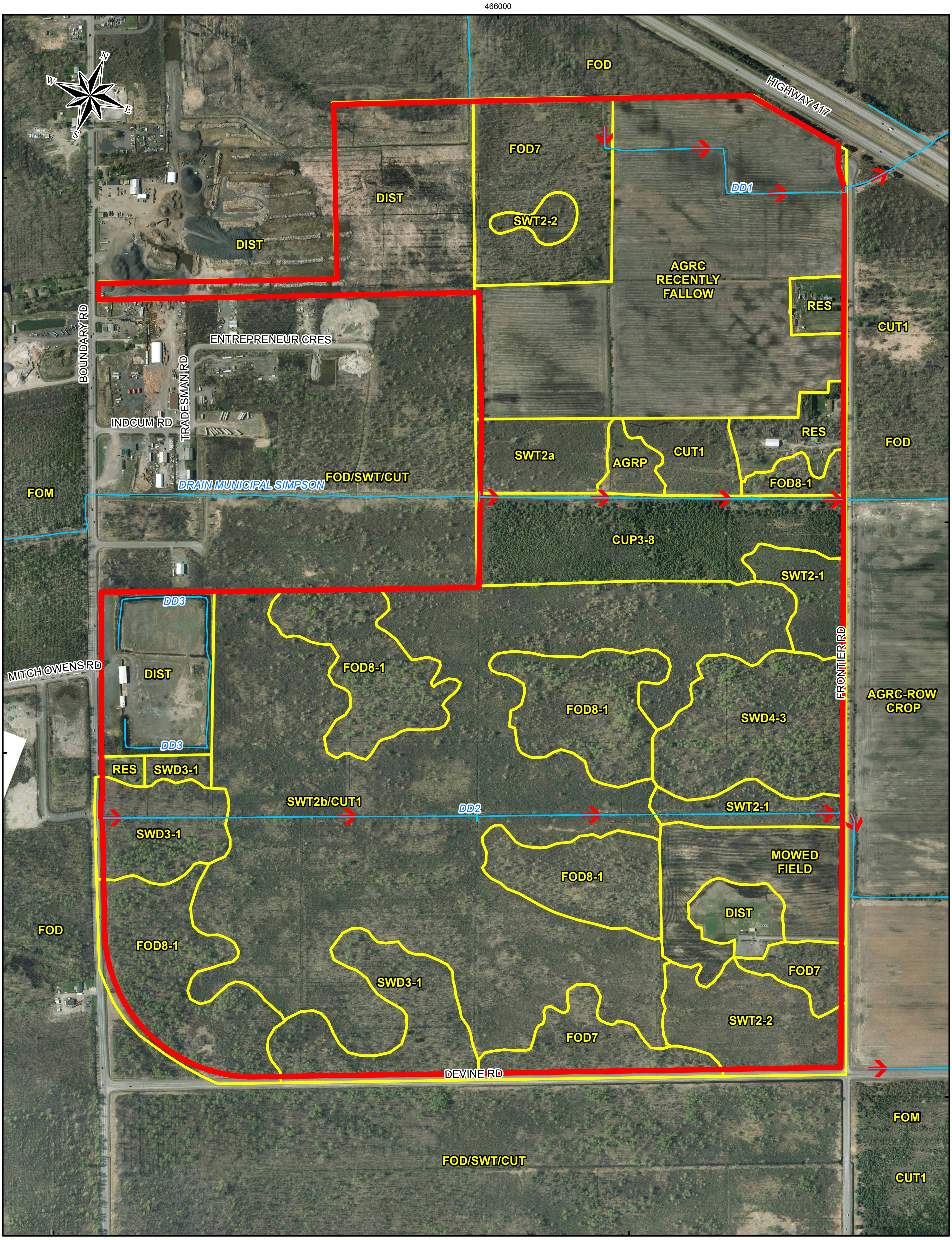
- Mer Bleue (Earth Science Provincially significant Area of Natural and Scientific Interest (ANSI)) is located approximately 3.5 kilometres to the northwest of the Site. This 3,500 hectare conservation area contains the second largest bog in southern Ontario, providing habitat to many species of regionally rare and significant plants, birds and other wildlife (NCC, 2013a).
- The Cumberland Forest, which is managed by the City of Ottawa, is spread over three blocks of properties with a total size of 598.56 hectares. The largest portion of the Cumberland Forest is located approximately 1.3 kilometres northeast of the northern Site boundary across Highway 417. The centre portion of the forest is located east of Vars and includes part of the Limoges Wetland Complex, a provincially significant wetland (Nancy Young, pers. comm., 2013). The portion of the Limoges Wetland Complex nearest to the Site is located approximately 6.5 kilometres to the east of the Site boundary. The western portion of the Cumberland Forest includes a portion of the Vars West Life Science Area, which consists primarily of young poplar and red maple swamp and upland forest (MNR, 2013a). The Life Science Area continues west of the Cumberland Forest and at its closest point is approximately 100 metres to the northeast of the Site, across Highway 417.
- Carlsbad Springs Southwest (Life Science Area) is located approximately 950 metres northwest of the Site across Highway 417. Most of this natural area is owned by the NCC. It is located just south of Mer Bleue and contains mainly red maple swamp and white cedar forest on acidic sand plain (MNR, 2013a).
- Edwards (Life Science Area) is located approximately 500 metres from the main CRRRC Site area across Boundary Road. This forest is dominated by red maple and poplar on non-acidic sand. All of the forest is indicated as upland in the City of Ottawa Geographic Information System (GIS) database (MNR, 2013a).

The Capital Context Greenbelt Concept identifies an Ecological Corridor extending from the Cumberland Forest through the Vars Forest, across Highway 417 and the Site and then to the west of Boundary Road (NCC, 2013b)

8.7.2 Ecological Land Classification

There were 13 distinct vegetation communities identified on the Site based on the Ecological Land Classification system (Lee et al., 1998; 2008). These communities are shown on Figure 8.7.2-1 and are summarized in TSD #4.

Overall the Site is characterized by a mix of thickets, immature deciduous forests, swamps, agricultural fields and limited residential structures, and disturbed areas.



LEGEND

🟨 ECOLOGICAL LAND CLASSIFICATION

🟥 PROPERTY BOUNDARY

⇉ SURFACE WATER FEATURE

ECOLOGICAL LAND CLASSIFICATION:

AGRC : ROW CROP
AGRC : HAYFIELD
AGRP : HORSE PASTURE
CUP3-8 : WHITE SPRUCE PLANTATION
CUT1 : DECIDUOUS THICKET
DD-1-2 : DRAINAGE DITCHES
DIST : DISTURBED LANDS FOR VARIOUS USES
FOD : DECIDUOUS FOREST
FOD7 : MOIST EUROPEAN WHITE BIRCH - POPLAR DECIDUOUS FOREST
FOD8-1 : FRESH-MOIST POPLAR - RED MAPLE - EUROPEAN WHITE BIRCH DECIDUOUS FOREST
FOM : MIXED FOREST
RES : RESIDENTIAL
SWD3-1 : RED MAPLE MINERAL DECIDUOUS SWAMP
SWD4-3 : POPLAR-EUROPEAN WHITE BIRCH MINERAL DECIDUOUS SWAMP
SWT2A : ALDER-WILLOW-GLOSSY BUCKTHORN MINERAL THICKET SWAMP
SWT2B/CUT1 : GLOSSY BUCKTHORN MINERAL THICKET SWAMP/DECIDUOUS THICKET COMPLEX
SWT2-1 : SPECKLED ALDER-GLOSSY BUCKTHORN MINERAL THICKET SWAMP
SWT2-2 : WILLOW MINERAL THICKET SWAMP
SWT – MINERAL THICKET SWAMP

200 100 0 200

SCALE 1:7,000 METRES

NOTE

THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT

REFERENCE

BACKGROUND IMAGERY - BING MAPS AERIAL (C) 2010 MICROSOFT CORPORATION AND ITS DATA SUPPLIERS.
AERIAL PHOTOGRAPHS PURCHASED FROM THE CITY OF OTTAWA.
LAND INFORMATION ONTARIO (LIO) DATA PRODUCED BY GOLDER ASSOCIATES LTD. UNDER LICENCE FROM ONTARIO MINISTRY OF NATURAL RESOURCES, © QUEENS PRINTER 2012.
PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 18

PROJECT

ENVIRONMENTAL ASSESSMENT OF THE
CAPITAL REGION RESOURCE RECOVERY CENTRE

TITLE

ECOLOGICAL LAND CLASSIFICATION

Golder Associates
Ottawa, Ontario

PROJECT No. 12-1125-0045			SCALE AS SHOWN	REV. 0.0
DESIGN	FN	DEC. 2013	**FIGURE 8.7.2-1**	
GIS	BR/PM	DEC. 2013		
CHECK	PLE	AUG. 2014		
REVIEW	PAS	AUG. 2014		

Path: N:\Active\Spatial_IM\Miller_Paving_Ltd\CRRRC\GIS\MXDs\12-1125-0045\Reporting\Phase4000\Vol.1\1211250045-4000-Vol1-8.7.2-1.mxd

8.7.3 Vegetation

A total of 195 species of plants were observed during all field surveys. In general, the Site has moderate plant species richness. The tree species dominance in the deciduous forests on the Site varies, but the most abundant species include red maple (*Acer rubrum*) and European white birch (*Betula pendula*). The thicket areas and the forest understory and ground cover is very dense throughout the Site and includes thick stands of shrubs such as glossy buckthorn (*Rhamnus frangula*) and speckled alder (*Alnus incana*). Within several of the plant communities there is a large component of alien and alien invasive species such as glossy buckthorn and European white birch. Given the large number of glossy buckthorn seedlings observed on Site, it appears that this species will continue to increase in dominance, especially within the swamps where it is up to 80% of the ground cover in some areas.

None of the plant species or plant communities identified on the Site, or in the Site-vicinity are rare or significant in the region or Ontario (MNR, 2013a; Brunton, 2005). None of the SAR that have ranges that overlap with the Site, including butternut, were observed on the Site, nor is there suitable habitat available.

8.7.4 Breeding Birds

A total of 61 bird species were identified during all breeding season field investigations. The majority of bird species were detected during morning point counts. American robin (*Turdus migratorius*), a habitat generalist (Sallabanks and James, 1999), was the most abundant species observed. Additional abundant species included forest and thicket species such as red-eyed vireo (*Vireo olivaceus*) and yellow warbler (*Setophaga petechia*).

During crepuscular and nocturnal point counts, one additional species not observed during the morning surveys was detected: Wilson’s snipe (*Gallinago delicata*).

Although no raptor nests were located during surveys, four raptors were detected: American kestrel (*Falco sparverius*), Cooper’s hawk (*Accipiter cooperii*), northern harrier (*Circus cyaneus*) and red-tailed hawk (*Buteo jamaicensis*). Potential nesting habitat for these species does exist on Site, however no nests were observed and potential nesting habitat is abundant on the adjacent properties and the surrounding area.

Three species identified on the Site during breeding bird surveys, including ovenbird (*Seiurus aurocapilla*), veery (*Catharus fuscescens*) and yellow-bellied sapsucker (*Sphyrapicus varius*) are considered woodland area sensitive (MNR, 2012).

The bird community is typical for the habitats that occur on the Site. All species are common in the region and in southern Ontario (MNR, 2013a, Cadman et al., 2007). No SAR or rare species were identified during field investigations with the exception of barn swallow. Barn swallow is not uncommon, but is listed under the ESA as threatened due to long term population declines. At least three active nests and three pairs were observed in the vicinity of the barns and outbuildings of the farm in the northeastern corner of the Site. Adults were observed feeding over the fields on Site in the vicinity of this farm, but also on the adjacent properties to the east where an abundance of foraging habitat exists.

Habitat for secretive marsh birds was limited to openings and patches of marsh vegetation within thicket swamps on the Site. Only two individuals of one species of secretive marsh birds, sora, was observed during these surveys.

The MNRF indicated that there is the potential for eastern whip-poor-will, Henslow's sparrow (*Ammodramus henslowii*), bobolink (*Dolichonys oryzivorus*), eastern meadowlark (*Sturnella magna*) and short-eared owl (*Asio flammeus*) on the Site. It was determined through the field surveys that there is no suitable habitat on the Site for any of the significant species identified in the SAR screening, or for those species identified by the MNRF. In addition, there were no other observations of significant bird species during any of the field surveys.

8.7.5 Dragonflies and Butterflies

A total of 20 species of dragonflies and butterflies were identified during all breeding season field surveys on the Site. Species diversity and abundance fluctuated through the seasons, but generally the most abundant butterfly species identified on the Site were cabbage white (*Pieris rapae*) and clouded sulphur (*Colias philodice*). The dragonfly community identified on the Site was dominated by common species whose preferred habitats include small ponds and wetlands, and open upland areas, including white-faced meadow hawk (*Sympetrum obtrusum*) and common whitetail (*Plathemis lydia*) (Jones, et al., 2008).

None of the butterfly species identified on the Site are unusual for the habitats in the area, or uncommon in the region, or in southern Ontario. No threatened, endangered, or special concern species were identified on the Site, nor was suitable habitat found for any SAR.

8.7.6 Mammals

A total of 11 mammals (other than bats, which are discussed below), were observed through the surveys on the Site, including the track and sign surveys and the motion sensor cameras. The wildlife community observed on the Site is what would be expected in the region, based on the habitat types. In general, the highest amount of mammal activity, with the exception of rodents that were distributed and active throughout the Site, appeared to be in the edge habitats. Beaver activity was concentrated around the Simpson Drain.

Six bat species were recorded at the three survey stations. The most common species observed was big brown bat (*Eptesicus fuscus*), recorded most often at station BAT01. Two bat species, both listed as endangered under the ESA, were recorded only at station BAT02. Little brown myotis (*Myotis lucifugus*) was recorded four times on June 30 and July 12, 2013. Small-footed Myotis (*Myotis leibii*) was recorded once on June 30, 2013.

If little brown myotis and small-footed myotis were breeding on the Site (i.e., if the Site provided maternity roosting habitat), numerous recordings of these species over several nights would be expected. The recordings would be representative of the bat emergence and return to maternity roosts for a large number of bats, or repeated recordings of the same bat, which was not observed on the Site for either of these species. Because there was no maternity roosting habitat identified on the Site, and the acoustic data substantiate that finding, it is likely that these recordings were indicative of little brown myotis and small-footed myotis "flyovers", or a small number of bats moving from one habitat to another in the area. This assessment was confirmed by the MNRF (Erin Thompson-Seabert, personal communication, August 27, 2013).

Aside from the recordings of little brown myotis and small-footed myotis, there were no mammals observed on the Site that are designated threatened or endangered. All other mammals are considered common and widespread in southern and eastern Ontario.

None of the other SAR that have ranges that overlap with the Site were observed, nor was there suitable habitat identified on the Site.

8.7.7 Herpetofauns

A total of five amphibians, including American toad (*Bufo americanus*), grey tree frog (*Hyla versicolor*), northern leopard frog (*Rana pipiens*), spring peeper (*Pseudacris crucifer*) and wood frog (*Rana sylvatica*) were observed during all of the field surveys. There were no survey stations that had particularly higher levels of activity of frogs or toads than others. Because the Site is generally wet in the spring, the distribution of amphibians was relatively homogeneous across the Site. There were no significant amphibian species identified, nor was there suitable habitat found on the Site.

No suitable habitat for salamanders was identified on the Site.

Although there is habitat for snakes throughout the Site, eastern garter snake (*Thamnophilis sirtalis*) was the only reptile observed on the Site. Although milksnake (*Lampropeltis triangulum*), listed as a special concern under the ESA, was not observed on the Site, it is a cryptic species that can be difficult to find during field surveys. The habitat on the Site is suitable and there are records for this species in the area (MNR, 2013a), so there is moderate potential for individuals to use the Site or the Site-vicinity.

The only habitat on the Site that has the potential to be suitable for turtles is associated with DD3 on the property on the west central side of the Site. Overall, there was minimal suitable habitat for turtles on the Site. No individuals were observed during any of the basking surveys, or during any of the other field surveys.

None of the other SAR that have ranges that overlap with the Site were observed, nor is there suitable habitat for these species on the Site.

8.7.8 Fish and Fish Habitat

There are four surface water features on the Site, consisting of DD1, Simpson Drain, DD2 and DD3 (Figure 8.7-1). A summary of the fish captured in each of the surface water features is included in Table 8.7.8-1, while the quality of fish habitat in each feature is discussed in the subsequent sections.

Table 8.7.8-1: Fish Community on the Site in 2012 and 2013

Surface Water Feature	Date Sampled	Pumpkinseed	Finescale dace	Brown bullhead	Brassy minnow	Brook stickleback	Creek chub	Central Mudminnow	Total Catch
2012									
Simpson Drain A (F10)	Oct 2	2	0	0	0	1	2	1	6
Simpson Drain B (F11)	Oct 2	3	0	0	0	0	1	0	4
DD2 (F9)	Oct 11	0	0	0	0	0	0	0	0
2013									
DD1 (F7)	Sept 3	0	0	2	0	1	0	0	3
Simpson Drain A (F10)	Sept 3	0	0	0	0	7	2	6	15
Simpson Drain B (F11)	Sept 3	0	0	0	0	0	0	0	0
DD2 (F8)	Sept 3	0	0	0	0	0	0	0	0
DD3 (F1-F6)	Sept 20	121	2	2	1	9	0	1	136

8.7.8.1 DD1

The reach of DD1, on the Site, is a disturbed, channelized intermittent feature. During the 2012 survey, DD1 was dry along its entire length. During the September 6, 2013 survey, it was dry in the agricultural field and the channel was overgrown with grasses and sparse cattail. There was an approximately 5-metre section with pooled water that had an estimated wetted width of one metre and average depth of 0.45 metres at the time of the survey. There was no measurable flow in this pool. The substrate was comprised of approximately 50% organic material and 50% sand/silt. The fish habitat in DD1 is marginal and poor quality.

8.7.8.2 Simpson Municipal Drain

In terms of aquatic habitat characteristics on the Site, the Simpson Drain is divided into two distinct reaches: Simpson Drain A and Simpson Drain B, as shown on Figure 8.7-1.

Simpson Drain A is a shallow, narrow channel approximately 290 metres in length that flows from west to east through a corrugated steel pipe culvert under Frontier Road. The average water depth was approximately 0.1 metres with an estimated average wetted width of 1.2 metres and an average bankfull width of 3.3 metres. The flow was measured at 0.02 metres per second and the substrate was comprised of approximately 50% fines and 50% coarse material. The riparian vegetation along Simpson Drain A was comprised of approximately 60% shrubs and trees and 40% grasses providing an estimated 15% of overhanging vegetation.

Simpson Drain B begins at the upstream reach of Simpson Drain A where there is a beaver dam, approximately 300 metres to the west of Frontier Road (between F10 and F11 on Figure 8.7-1), with an approximate size of 4 metres by 0.7 metres, which regulates flow. The beaver dam impounds water, resulting in a flooded area approximately 170 metres long with a generally uniform wetted width of approximately 5 metres and depth of approximately 0.8 metres. The average bankfull width was approximately 6.2 metres and the flow was measured at 0.01 metres per second at the time of the survey. The substrate composition and riparian vegetation was uniform along both A and B reaches of Simpson Drain.

Although the beaver dam in Simpson Drain likely obstructs some fish passage, there is generally good quality fish habitat in this surface water feature.

8.7.8.3 DD2

The majority of DD2 was dry during the survey conducted in September 2012 and 2013. The water in the central reach of DD2, with a length of approximately 100 metres, was stagnant and there was no measurable flow. The wetted width ranged from approximately 0.75 to 1.0 metres, the average bankfull width was approximately 2.5 metres and the water depth in this reach ranged from approximately 0.15 to 0.3 metres. The substrate was comprised of approximately 60% organic matter and 40% fines. The riparian vegetation was dominated by speckled alder, buckthorn and grasses. This reach was also characterized by approximately 65% overhanging vegetation. There is no direct fish habitat in DD2.

8.7.8.4 DD3

DD3 is a manmade surface water feature, approximately 800 metres in length, nearly encircling the former scrapyard property on the west central side of the Site. The feature ranges in wetted width between 2.9 and 8.5 metres with very steep banks. Depth was estimated greater than 1.5 metres, but there was no measurable flow. Overhanging vegetation (grasses and shrubs) provided approximately 50% canopy along the shoreline of the feature. The substrate was comprised of approximately 30% fines and 70% coarse material.

8.7.8.5 Summary

There were no fish captured in DD2 and it appears that there is only flowing water in this surface feature following high water events such as storm events or spring freshet. During the remainder of the year, water is pooled in low depressions in some reaches along its length. DD2 would not be considered direct fish habitat. DD3 is an isolated relatively deep, incised constructed channel that may have a tenuous connection with DD2 during periods of high water, such as following a storm event or spring freshet. The direct fish habitat in DD1 is minimal and of poor quality. The fish community sampled on the remainder of the Site (DD1, Simpson Drain and DD3) is indicative of a common warmwater baitfish community. No aquatic SAR were observed during any of the field surveys, nor was there suitable habitat noted.

8.7.9 Benthic Invertebrates

Stations B5 and B6 were sampled in 2012, whereas B1, B2, B3, B7, B8 (reference) and B9 (reference) were sampled in 2013. In general, the dominant substrate at each benthic sampling station was silt, or fines. There was little or sparse aquatic vegetation and no benthic algae was observed.

Taxonomic richness was greatest at station B6 with 24 taxa and the average richness value observed was 21 taxa. Station B5 had the lowest richness with 19 taxa (Table 8.7.9-1).

Table 8.7.9-1: Benthic Indices on the Site in 2012 and 2013

Indices	B1	B2	B3	B5	B6	B7	B8 (Ref)	B9 (Ref)
Abundance (no. org)	394	231	121	5744	1522	576	310	825
Richness (no. of taxa)	22	26	18	19	24	20	25	22
Percent Dominance (%)	26.40	32.03	19.00	42.90	34.16	18.05	3.13	28.12

In all of the surface water features, the benthic community was comprised of Naididae representing 42% of the population present. The remainder of the population was composed of Tubificidae representing 34% and the remaining 24% of combined taxa that contributed to less than 5% of the population. Of all the taxa at all of the stations, including at the reference stations, the most common species were the worms (Order Oligochaeta, Family Tubificidae and Family Naididae), followed by the roundworms (P. Nemata) and water scuds (Order Amphipoda, Family Crangonyctidae).

An EPT Index measures the relative density of Ephemeroptera (mayflies), Plecoptera (stoneflies) and Trichoptera (caddisflies) in a benthic sample. EPT Index is based on the premise that high-quality streams generally have the greatest species richness. The relative density of Ephemeroptera/Plecoptera/Trichoptera (EPT) indicates that all stations, including the reference stations, have low to no populations of Trichoptera, Plecoptera and Ephemeroptera. Typically, these species prefer habitat types of flowing, well oxygenated waters over a gravel to cobble substrate. The structure of the habitats on the Site and in the Site-vicinity is generally not suitable for these species.

In general, the abundance of worm species and the low EPT index in the surface water features in the Site-vicinity (including the two reference stations) indicate systems with low productivity. The structure of the benthic communities from all of the sampling stations (i.e., not particularly diverse or abundant) suggests that the surface water features are stressed and have been impacted by historic and ongoing agricultural and other activities and conditions.

8.7.9.1 Sediment

The sediment quality at each of the benthic stations (Table 8.7.9-2) was compared with Provincial Sediment Quality Guidelines (MOE, 2008). The sediment guidelines are considered to provide a level of human health and sensitive ecosystem protection consistent with background levels. These guidelines establish three levels of effect: (1) the No Effect Level (NEL), which indicates a concentration of a chemical in the sediment that does not affect fish or sediment-dwelling organisms; at this level, there is a negligible transfer of chemicals through the food chain and no effect on water quality is expected; (2) Lowest Effect Level (LEL), which indicates the upper level of contamination that has no effect on the majority of sediment-dwelling organisms. Sediments meeting the LEL are considered clean to marginally polluted; and (3) the Severe Effect Level (SEL), which indicates a level of contamination that is expected to affect the health of the majority of sediment-dwelling organisms. Sediments exceeding the SEL are considered heavily contaminated (MOE, 2008).

The LEL for chromium, iron and nickel was exceeded at both reference stations (B8 and B9), likely due to inputs from the adjacent roads. The LEL for copper was exceeded at B2 and B8. The LEL for total organic carbon was exceeded at B2, B6 and B9. The SEL was not exceeded at any location.

The sediments at the benthic stations were generally found to be coarser at B1, B2 and B3, relatively even with respect to percent of fines and coarse materials at B5, B6, B7 and B8, and very fine at B9. Substrate particle size influences benthic community composition, where a wider range of substrate sizes generally supports a more diverse community than a limited substrate size. As such, it would be expected that the benthic invertebrate community at B1, B2, B3 and B9 would be more limited than at the other stations.

Table 8.7.9-2: Sediment Quality at Benthic Stations

Parameter	RDL	PSQG LEL	PSQG SEL	B1	B2	B3	B5	B6	B7	B8 (Ref)	B9 (Ref)
*Arsenic (µg/g)	1	6	33	1	1	<1	1.2	1.5	1.0	2	2
*Cadmium (µg/g)	0.1	0.6	10	0.1	0.2	<0.1	0.10	0.13	<0.10	<0.1	0.2
*Chromium (µg/g)	1	26	110	22	19	11	14	25	18	**44**	**35**
*Copper (µg/g)	0.5	16	110	11	**21**	5.8	7.1	11	6.8	**20**	14
*Iron (µg/g)	50	20,000	40,000	13,000	1,300	6,900	8,000	13,000	9,000	**22,000**	**23,000**
*Manganese (µg/g)	1	460	1100	180	100	81	100	160	85	310	260
*Mercury (µg/g)	0.05	0.2	2	<0.05	<0.05	<0.05	<0.050	<0.050	<0.050	<0.050	<0.050
*Nickel (µg/g)	0.5	16	75	13	10	6.3	8.5	14	9.8	**25**	**19**
*Zinc (µg/g)	5	120	820	42	61	16	36	49	30	50	64
Total Organic Carbon	500	10,000	100,000	6,900	**12,000**	2,300	7,800	**12,000**	7,800	4,800	**21,000**

Notes:

* Acid Extractable
µg/g - micrograms per gram
RDL - Reportable Detection Limit
PSQG - Provincial Sediment Quality Guidelines
LEL - Lowest Effect Level
SEL - Severe Effect Level
Bold - A level exceeding PSQG LEL

8.8 Land Use & Socio-economic

This section presents the existing land use and socio-economic conditions in and around the Site. This component is divided into land use, socio-economic and visual sub-components; the study areas for these sub-components are provided in Section 2.3. The information and assessments presented in this section have been summarized from more detailed information contained in TSD #5.

8.8.1 Land Use

This section includes a review of the land use planning policy and regulatory context in addition to an analysis of existing land uses within the Site-vicinity and on-Site study areas. Planning policy was assessed to determine potential for future development in the area. Planning policy reviewed includes:

- MOECC Guideline D-4 - Land use On or Near Landfills and Dumps; 1994c;
- MMAH Provincial Policy Statement (PPS); 2014;
- MMAH Shape the Future: Eastern Ontario Smart Growth Panel; Final Report 2003;
- City of Ottawa Official Plan, By-law (2003-203), as amended; 2003a;
- City of Ottawa Background to the Official Plan Review – City of Ottawa Employment Lands Study, 2012 Update; 2013e;
- City of Ottawa Master Plans; various;
- City of Ottawa Zoning By-law (2008-250), as amended; 2008;
- City of Ottawa published data on public recreational facilities and activities; 2013f;
- NCC – Plan for Canada's Capital; 1999;
- NCC – Canada's Capital Greenbelt Master Plan; 2013; and
- Current Development Applications.

The Site is located in an area of the City with limited development, which has been constrained due to poor quality groundwater. As a result of this issue, the City has invested in a municipal drinking water supply to portions of this area of the City, known as the Carlsbad Springs Trickle Feed System. The Site is currently vacant, with the exception of three residences (owned by Taggart Miller) and a model aircraft club along Frontier Road and one residence along Boundary Road (also owned by Taggart Miller). The remainder of the Site is regenerating vegetative growth on land formerly used for agricultural area. Agricultural lands are located to the east of the Site along the opposite side of Frontier Road and a vacant, regenerating agricultural area, which is partially treed, to the south of the Site. Various industrial uses and an industrial subdivision are located immediately to the west of the Site along Boundary Road and six residences currently exist immediately to the west of the Site mixed in with the industrial and commercial uses along Boundary Road. In total, nine residences are located off-Site within 500 metres of the Site. A golf course is located to the north of the Site, on the opposite side of Highway 417. Importantly, there is an existing industrial subdivision adjacent to the Site and industrial/commercial activities such as soil management immediately northwest of the Site. An auto wrecker formerly occupied some of the land on which the proposed CRRRC will be situated. No environmental, archaeological or agricultural constraints have been identified on the Site by the City of Ottawa.

There are currently no Zoning By-law Amendments or Draft Plans of Subdivision active in this immediate area. Previously, a zoning amendment was approved to rezone 5592, 5606 and 5630 Boundary Road and 9460 Mitch Owens Road from Rural Commercial to Rural General Industrial. There are currently two applications for site plan in the vicinity of the Site. The first application is for a Long Combination Vehicle Truck Transport De-Coupling facility at the southeast corner of the Boundary Road and Highway 417 interchange and the site is identified as 5341 Boundary Road. This development is commercial/industrial in nature, which is consistent with the immediate surrounding area. The second application is for a Light Industrial Use including a warehouse and office within the Industrial Subdivision directly west of the CRRRC lands and identified as 100 Entrepreneur Crescent. This development being industrial in nature is consistent with the immediate surrounding area.

8.8.2 Socio-Economic Environment

In order to establish the general context, information was compiled from Statistics Canada census data, and municipal and regional economic development data, studies and reports on socio-economic conditions in the study area, including:

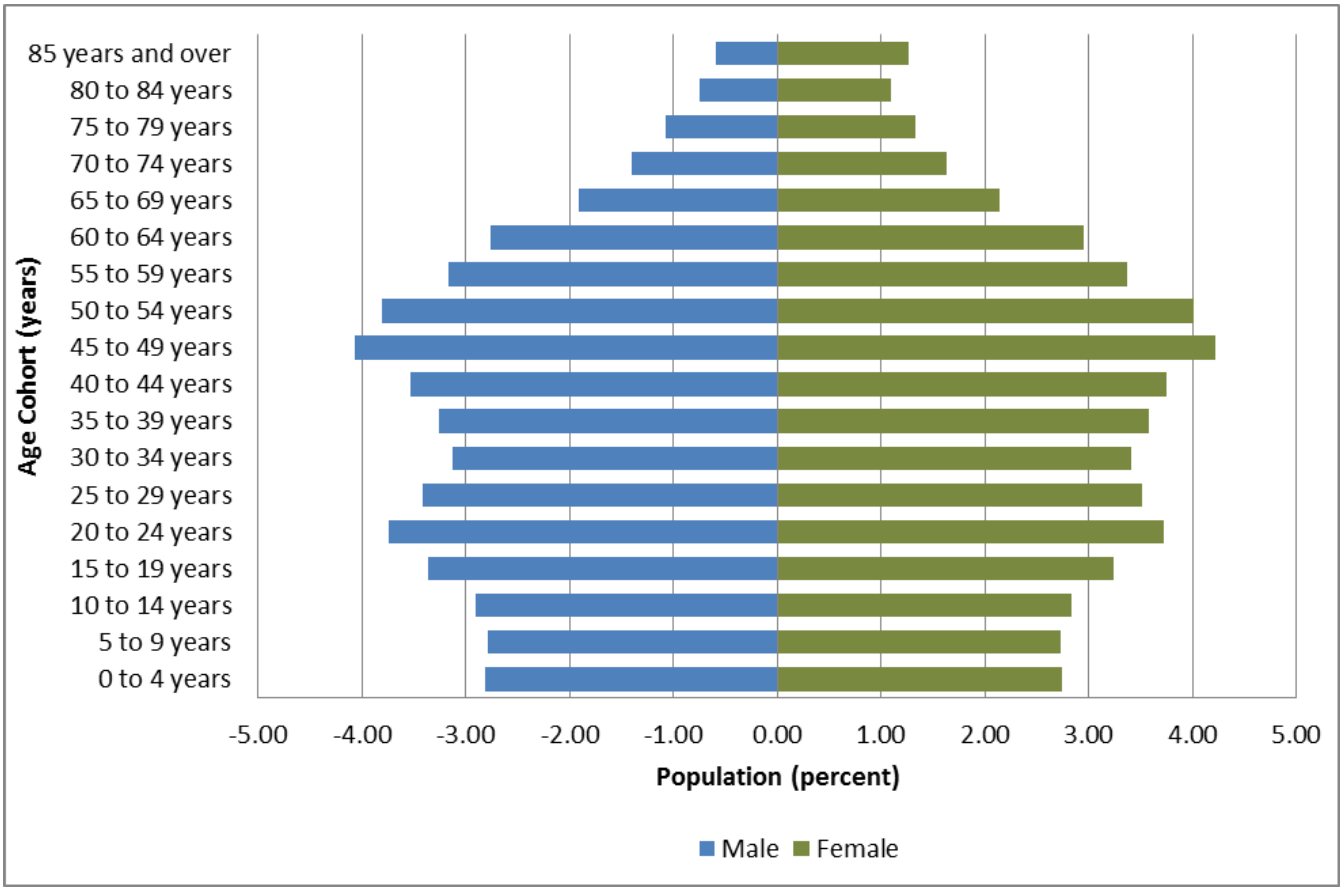
- Population and demographics;
- Labour force distribution;
- Key employment sectors and employers;
- Employment, unemployment and participation rates;
- Average household and personal incomes;
- Economic development trends and plans; and
- City of Ottawa financial statements.

8.8.2.1 Population and Demographics

The City of Ottawa, with a population of 883,391 in 2011 (Statistics Canada, 2013b), represents 6.9% of the population of the Province. It should be noted that the City of Ottawa estimated a population of 922,046 at mid-year 2011 and 927,120 at the end of 2011 (City of Ottawa, 2012a) and attributed the discrepancy with the Statistics Canada number largely to a 4.2% undercount by the census. Over the past decade, the City of Ottawa has shown a higher population growth rate than the Province overall. Similarly, the population density is substantially higher than the Province due to the mainly urban nature of the City of Ottawa.

The Site is located in a rural ward of the City of Ottawa. At year-end 2012, the estimated population of the ward of Cumberland was 44,400, including 16,300 households (City of Ottawa, 2013a). This represents 4.7% of the total population of the City of Ottawa and 4.2% of households.

The age structure of the Site-vicinity is shown in Figure 8.8.2-1. The population pyramid exhibits a negative growth scenario, whereby the largest age cohorts are from ages 45 to 59 years. This age structure is reflective of the aging baby boom generation.



NOTE

THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT

REFERENCE

STATISTICS CANADA. (2012). OTTAWA, ONTARIO (CODE 3506008) AND OTTAWA, ONTARIO (CODE 3506) (TABLE). CENSUS PROFILE. 2011 CENSUS. STATISTICS CANADA CATALOGUE NO. 98-316-XWE. OTTAWA. RELEASED OCTOBER 24, 2012. HTTP://WWW12.STATCAN.GC.CA/CENSUS-RECENSEMENT/2011/DP-PD/PROF/INDEX.CFM?LANG=E (ACCESSED AUGUST 15, 2013).

PROJECT

ENVIRONMENTAL ASSESSMENT OF THE
CAPITAL REGION RESOURCE RECOVERY CENTRE

TITLE

AGE PROFILE FOR THE SITE-VICINITY IN 2011

Golder Associates

PROJECT No. 12-1125-0045			PHASE No. 4500	
DESIGN	LB	NOV. 2013	SCALE AS SHOWN	REV.0
GIS	--	--	FIGURE 8.8.2-1	
CHECK	PLE	AUG 2014		
REVIEW	PAS	AUG 2014		

8.8.2.2 *Population Projections*

The City of Ottawa released revised growth projections from 2006-2031 in 2007 (City of Ottawa, 2007a). These growth projections, including population and households, are shown in Table 8.8.2-1. Overall the City is expected to exhibit growth over this period, including increases in over 30% for population and households. The number of households is expected to disproportionately increase compared to the population, with a projected growth rate that is 10% greater than the population growth rate over this period. It can be expected that based on growth trends over the past decade, the majority of growth will occur in urban centres outside of the rural areas of the Site-vicinity; from 2001 to 2011, the rural areas maintained a consistent population of about 10% of the overall population of the city (City of Ottawa, 2012a).

Table 8.8.2-1: Growth Projections for the City of Ottawa from 2006-2031 (City of Ottawa, 2007a)

Year	Population	Households
2006	871,000	346,000
2011	923,000	376,000
2021	1,031,000	436,000
2031	1,136,000	489,000
% change 2006-2031	30	41

8.8.2.3 *Labour Force Characteristics and Activities*

Employment and participation rates for the Site-vicinity in 2011 are shown in Table 8.8.2-2. At this time, employment and participation rates were higher for the City of Ottawa than the province overall. Median income data for 2011 are not yet available from Statistics Canada. In 2006, the median individual and household incomes were also higher than the province overall. These trends are reflective of the stable and successful nature of the local economy.

Table 8.8.2-2: Employment and Participation Rates for the Site-vicinity (Statistics Canada, 2007 and Statistics Canada, 2013b)

	City of Ottawa	Province of Ontario
Total population 15 years and over[1]	718,960	10,473,670
Labour force[1]	498,370	6,864,990
Employment rate (%)[1]	64.5	60.1
Unemployment rate (%)[1]	7.0	8.3
Participation rate (%)[1]	69.3	65.5
Individual median income ($)[2]	32,908	27,258
Median income – all private households ($)[2]	58,437	52,117

Notes: [1] Source: Statistics Canada National Household Survey, 2013b
[2] Source: Statistics Canada, 2007

Industries of employment for the Site-vicinity are shown in Figure 8.8.2-2. The main industry of employment in the City of Ottawa is concentrated in the public administration sector. Overall, the industry of employment is comparatively less evenly distributed for the City of Ottawa than the province overall, demonstrating a focus on knowledge based and federal government services.

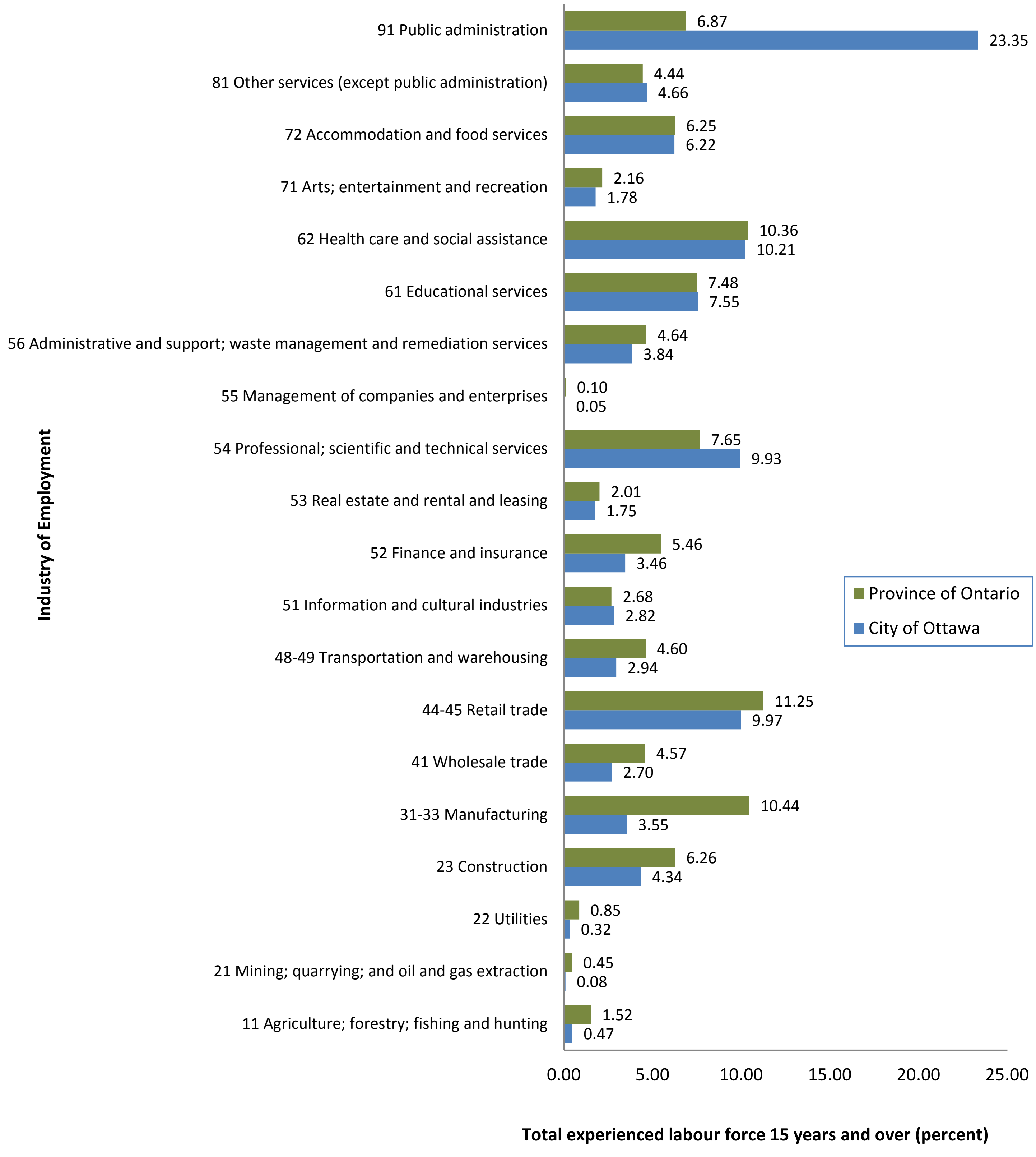
8.8.2.4 Municipal Finances

Consolidated Financial Statements from the City of Ottawa report total revenues of $3.28 billion in 2012 and $3.23 billion in 2011 (City of Ottawa, 2012b). Almost half of the revenue was derived from taxes, predominantly property taxes. The remaining revenue was from fees and user charges, government grants, capital assessments, development charges and other revenue sources. Total municipal government expenses were $2.89 billion in 2012 and $2.80 billion in 2011 (City of Ottawa, 2012b).

8.8.2.5 Economic Development Trends and Plans

In 2010, the City of Ottawa identified goals for sustainable economic development to address challenges associated with the local economy including: dependency on federal government, lack of diversification within the high-tech sector and lack of collaboration between sectors and stakeholders locally. The plan identified several actions for development over the next five years with the aim of leveraging development of knowledge-based businesses, promotion of Ottawa as a tourism location and place of residence, and placing an emphasis on holistic economic, social, cultural and environmental planning (City of Ottawa, 2010).

According to the City of Ottawa Annual Development Report (City of Ottawa, 2012a), in 2011 there was an increase in private-sector jobs from 60.2% to 60.4% of total employment in the City of Ottawa. A growth trend in professional, scientific and technical services was also observed in 2011 following a three year trend of industry job losses. While there was growth in the number of high-tech, or knowledge based jobs, this sector remained relatively focused. Twenty-six% of the workforce in the high-tech sector was employed by 10 large companies and there was an annual net loss of 22 companies. These trends demonstrate that while there has been some progress in developing private sector jobs, progress is still needed towards attaining the economic development goals identified by the City of Ottawa in 2010.



NOTE

THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT

REFERENCE

STATISTICS CANADA. (2007). OTTAWA, ONTARIO (CODE3506008) (TABLE). 2006 COMMUNITY PROFILES. 2006 CENSUS. STATISTICS CANADA CATALOGUE NO. 92-591-XWE. OTTAWA. RELEASED MARCH 13, 2007. HTTP://WWW12.STATCAN.CA/CENSUS-RECENSEMENT/2006/DP-PD/PROF/92-591/INDEX.CFM?LANG=E (ACCESSED AUGUST 15, 2013).

PROJECT

ENVIRONMENTAL ASSESSMENT OF THE
CAPITAL REGION RESOURCE RECOVERY CENTRE

TITLE

INDUSTRIES OF EMPLOYMENT FOR THE
SITE-VICINITY IN 2006

Golder Associates

PROJECT No. 12-1125-0045			PHASE No. 4500
DESIGN	LB	NOV. 2013	SCALE AS SHOWN REV.0
GIS	--	--	
CHECK	PLE	AUG 2014	FIGURE 8.8.2-2
REVIEW	PAS	AUG 2014	

8.8.3 Visual Environment

As shown in Figure 8.8.3-1, the overall existing landscape can be divided into four components:

1) East – Agricultural comprised of open fields, hayfields and row crops divided by areas with vegetation cover and wooded areas adjacent to Devine Road and Frontier Roads;

2) North – Highway 417, disturbed lands and wooded areas;

3) West – Mixed residential/commercial/industrial land use and wooded lots along Boundary Road; and

4) South – Devine Road and regenerating vegetated lands.

The vegetation that surrounds the Site is characterized primarily by stands of mixed and deciduous forest with some deciduous thicket to the south and east; a mineral thicket swamp lies directly south of the Site. Hayfields and row crops broken by hedgerows and tree stands stretches almost 3 kilometres to the northeast from Devine Road. A hedgerow of mature coniferous trees grows alongside Highway 417 directly north of the Site. Other areas of tree cover consist of regenerative growth at various stages of development along roadsides.

LEGEND

- ↙ VIEWPOINT LOCATIONS
- ▭ PROPERTY BOUNDARY

300 0 300 600

SCALE 1:15,000 METRES

NOTE

THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT.

REFERENCE

BACKGROUND IMAGERY - BING MAPS AERIAL (C) 2012 MICROSOFT CORPORATION AND ITS DATA SUPPLIERS (C) 2012 NOKIA (C) 2012 DIGITAL GLOBE
AERIAL PHOTOGRAPHS PURCHASED FROM THE CITY OF OTTAWA
BASE DATA - CANVEC PROVIDED BY HER MAJESTY THE QUEEN IN RIGHT OF CANADA, DEPARTMENT OF NATURAL RESOURCES, 2010
PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 18

PROJECT

ENVIRONMENTAL ASSESSMENT OF THE CAPITAL REGION RESOURCE RECOVERY CENTRE

TITLE

REPRESENTATIVE VIEWPOINTS SELECTED FOR VISUAL ANALYSIS

Golder Associates
Ottawa, Ontario

PROJECT No. 12-1125-0045			SCALE AS SHOWN	REV. 0.0
DESIGN	PJM	DEC. 2013	**FIGURE 8.8.3-1**	
GIS	PJM	DEC. 2013		
CHECK	PLE	AUG. 2014		
REVIEW	PAS	AUG. 2014		

Path: N:\Active\Spatial_IM\Miller_Paving_Ltd\CRRRC\GIS\MXDs\12-1125-0045\Reporting\Phase4000\Vol.1\1211250045-4000-Vol1-8.8.3-1.mxd

The mixed commercial/industrial land uses and trees to the west of the Site break up the views into the Site from Boundary Road. The Site and surrounding topography is flat.

Field investigations were conducted to identify representative viewpoints for the visual impact assessment. Five key viewpoints were selected as identified in the following list and shown on Figure 8.8.3-1:

- Viewpoint 1: Projection from Devine Road
- Viewpoint 2: Projection from Highway 417
- Viewpoint 3: Projection from Boundary Road
- Viewpoint 4: Projection from Mitch Owens Road
- Viewpoint 5: Projection from Boundary Road, proposed main Site entrance

After the field investigations were conducted to identify these representative viewpoints for the assessment, photographs were taken in the field from each viewpoint using a Nikon D80 digital SLR camera mounted on a tripod. The photographs used to depict existing conditions for each viewpoint are provided in the impact assessment (Section 11.6.3). Each viewpoint is described below in more detail.

VIEWPOINT 1: From Devine Road

This is a long view westward from Devine Road across existing farm fields that are bisected by existing hedgerows and stands of trees with some shrubs.

VIEWPOINT 2: From Highway 417

This view is taken from eastbound Highway 417 through a break in a hedgerow of coniferous trees along Highway 417 at the northeast corner of the Site.

VIEWPOINT 3: From Boundary Road

This represents a view of the Site from southbound Boundary Road just north of Mitch Owens Road.

VIEWPOINT 4: From Mitch Owens Road

This view looks directly east from Mitch Owens Road towards the Site.

VIEWPOINT 5: From Boundary Road, opposite future access location to the CRRRC

This view looks eastward directly into the future access location for the CRRRC Site. Presently there are stockpiles of granular and soil materials and vehicles associated with the Pomerleau operations in the foreground.

8.9 Cultural Heritage and Archaeology

This section presents the existing cultural heritage and archaeological resource conditions in and around the Site. This component is divided into cultural heritage and archaeology sub-components; the study areas for these sub-components are provided in Section 2.3. The following sections provide a summary of regional and Site history, followed by a description of the Site's cultural and archaeological environments. The information and assessments presented in this section have been compiled from more detailed information contained in TSD #6 (Archaeology) and TSD #7 (Cultural Heritage).

8.9.1 Regional Pre-European Aboriginal Occupation

Human occupation of southern Ontario dates back approximately 10,000 years before present (BP). These first peoples, known as Palaeo-Indians to archaeologists, moved into Ontario as the last of the glaciers retreated northward. Although there is limited information on the lifestyle of the Palaeo-Indians, the little evidence that is available suggests that they were highly mobile hunters and gatherers relying on caribou, small game, fish and wild plants found in the sub-arctic environment. The Ottawa Valley remained very much on the fringe of occupation at this time. The ridges and old shorelines of the Champlain Sea and early Ottawa River channels would be the areas most likely to contain evidence of Palaeo-Indian occupation in this region.

During the succeeding Archaic Period (ca. 9,000 to 3,000 BP), the environment of southern Ontario approached modern conditions. While more land became available for occupation as the glacial lakes drained, Archaic populations continued as hunter-gatherers; however they appear to have focused more on local food resources, abandoning the highly mobile lifestyle of their predecessors. The Archaic Period tool kit became more diversified, reflecting the adaptation to a temperate forest environment. Ground stone tools such as adzes and gouges first appeared and may indicate the construction of the dug-out canoes or other heavy wood working activities. Extensive trade networks had developed by the middle to late Archaic Period. Items such as copper from the north shore of Lake Superior were exchanged during this time.

The first significant evidence for occupation in the Ottawa Valley appears at this time. Archaic sites have been identified on Allumettes and Morrison Islands on the Ottawa River near Pembroke and within the boundaries of Leamy Lake Park within the City of Gatineau (Pilon, 1999: 43-53, 64). Late Archaic sites have also been identified to the west in the Rideau Lakes and the east at Jessup Falls and Pendleton along the South Nation River (Daechsel, 1980).

The Woodland Period (ca. 3,000 to 400 BP) is distinguished by the introduction of ceramics. Early Woodland groups continued to live as hunters, gatherers and fishers in much the same way as earlier populations had done. They also shared an elaborate burial ceremonialism evidenced by the inclusion of exotic artifacts within graves (Spence et. al., 1990: 129). Extensive trade networks continued through the early part of this period and Early Woodland populations in Ontario appear to have been heavily influenced by groups to the south, particularly the Adena people of the Ohio Valley. By 1,700 BP, the trade networks had reached their peak and covered much of North America.

A greater number of known sites from the Middle Woodland Period (ca. 2,400 to 1,100 BP) have allowed archaeologists to develop a better picture of the seasonal round followed in order to exploit a variety of resources within a home territory. Through the late fall and winter, small groups would occupy an inland 'family' hunting area. In the spring, these dispersed families would congregate at specific lakeshore sites to fish, hunt in the surrounding forest and socialize. The proliferation of sites suggests an increase in the population of Eastern Ontario. Middle Woodland sites have been noted in the South Nation Drainage Basin and along the Ottawa River including the northwest end of Ottawa at Marshall's and Sawdust Bays (Daechsel, 1980; Daechsel, 1981).

Another significant development of the Woodland Period was the appearance of domesticated plants ca. 1,450 BP. Initially only a minor addition to the diet, the cultivation of corn, beans, squash, sunflowers and tobacco gained economic importance for Late Woodland peoples. Along with this shift in subsistence, settlements located adjacent to the corn fields began to take on greater permanency as sites with easily tillable farmland became more important. Eventually, semi-permanent and permanent villages were built, many of which were surrounded by palisades, evidence of growing hostilities between neighbouring groups. By the end of the Late Woodland Period, distinct regional populations occupied specific areas of southern Ontario separated by vast stretches of largely unoccupied land, including the Huron along the north shore of Lake Ontario and the St. Lawrence Iroquois along the St. Lawrence River.

While there is clear evidence of these latter developments in much of southern Ontario, the Ottawa Valley remained a sparsely occupied region utilized by mobile hunter-gatherers. In part, this was because the terrain was less than suitable for early agriculture. It was also a reflection of the increased pressure on hunting territories and conflict over trade routes at the end of the Woodland Period. Facing persistent hostilities with Iroquoian populations based in what is now New York State, the Huron moved from their traditional lands on the north shore of Lake Ontario to the Lake Simcoe and Georgian Bay region. Algonquin groups, who had occupied the lands north of the Huron, also appear to have retreated further northward in order to place greater distance between themselves and the Iroquois.

Woodland sites have been recorded throughout the Ottawa Valley. Two small Late Woodland sites were located on a property near the Village of Cumberland to the east of the study area (Adams, 2009:8). A significant Woodland occupation has also been identified at the Leamy Lake site (Pilon 1999: 76-80). Finally, an ossuary burial was identified near the Chaudière Falls in the 1840s dates to this period. Although ossuaries are a burial practice normally associated with Iroquoian speaking populations, especially the Huron, this internment may have been Algonquin. Once again, a number of poorly documented Woodland find spots are known in the general study area (Jamieson, 1989).

At the time of initial contact, the French documented three Algonquin groups residing in the vicinity of the study area (Heidenreich & Wright, 1987: Plate 18). These included the Matouweskarini along the Madawaska River to the west, the Onontchataronon in the Gananoque River basin to the southwest and the largest of the three, the Weskarini, situated in the Petite Nation River basin north of the study area. While prolonged occupation of the region may have been avoided as a result of hostilities with Iroquoian speaking populations to the south, at least the northern reaches of the South Nation River basin were undoubtedly used as hunting territories by the Algonquin at this time.

8.9.2 Regional Post-Euro-Canadian Contact History

Étienne Brûlé is reported to be the first European in the region; having travelled up the Ottawa River in 1610, three years before Samuel de Champlain. For the next two centuries, the Ottawa River served as a major route for explorers, traders and missionaries from the St. Lawrence into the interior, and throughout the seventeenth and eighteenth centuries this route remained an important link in the French fur trade. A seigneury was established at L'Orignal, east of the study area, in 1674 and granted to Nathaniel Hazard Treadwell but there was little permanent European settlement at this early date. The recovery of European trade goods (i.e., iron axes, copper kettle pieces and glass beads) from Aboriginal sites throughout the Ottawa River drainage basin has provided evidence of the extent of contact between Aboriginals and the fur traders during this period. The English, upon assuming possession of New France, continued to use the Ottawa River as an important transportation corridor.

A French trading post was built near the mouth of Le Lievre River, near the present community of Buckingham, Quebec, sometime in the eighteenth century. This post had been abandoned by the time Alexander Henry travelled up the Ottawa River in 1761 (Voorhis, 1930:62). Independent trading posts at Buckingham and in the Rockland area were reportedly operated by Gabriel Foubert in the late eighteenth century (Beaulieu, N.D.). Gabriel was the father of Amable Foubert, one of the first recorded settlers in Cumberland Township.

Significant European settlement of the region did not occur until United Empire Loyalists and other immigrants began to move to lands along the Ottawa River in the late eighteenth and early nineteenth centuries. The need for land on which to settle the Loyalists led the British government into hasty negotiations with their indigenous military allies, the Mississauga, who were assumed, erroneously, to be the only Aboriginal peoples inhabiting eastern Ontario. Captain William Redford Crawford, who enjoyed the trust of the Mississauga chiefs living in the Bay of Quinte region, negotiated on behalf of the British government. In the so-called 'Crawford Purchase,' the Mississauga were cajoled into giving up Aboriginal title to most of eastern Ontario, including what would become the counties of Stormont, Dundas, Glengarry, Prescott, Russell, Leeds, Grenville and Prince Edward, as well as the front Townships of Frontenac, Lennox, Addington and Hastings and much of what is now the City of Ottawa (including the Geographic Townships of Gloucester, Nepean, Osgoode, Marlborough and North Gower) (Lockwood, 1996: 24). Two years after the 1791 division of the Province of Quebec into Upper and Lower Canada, John Stegmann, the Deputy Surveyor for the Province of Upper Canada, undertook an initial survey of four Townships (Nepean, Gloucester, North Gower and Osgoode) on both sides of the Rideau River near its junction with the Ottawa River.

8.9.3 Township of Cumberland, County of Russell

The subject Site is located very close to the tri-township border of the former Cumberland, Gloucester and Osgoode Townships. A brief overview of the general historical background of Cumberland Township and the Site is provided below. More information on Gloucester and Osgoode Townships is provided in TSD #7.

The Ottawa River was an important transportation route. Fur trading posts were erected along the Ottawa River where the Algonquin traded with the Europeans. A French trading post was situated across the river from Cumberland in modern-day Buckingham in 1761. This area was controlled by France until 1763 when the British gained control of the region following the completion of the Seven Years' War.

The first official survey of the former Township of Cumberland was conducted in 1791 (CTHS, N.D.) in order to divide the land into individual lots for settlement. Although many of the lots were granted to United Empire Loyalists, very few were settled. Many of the Loyalists had already settled on properties along the St. Lawrence River and remained absentee landowners of their Cumberland lots. Another hindrance to early settlement of the former Township of Cumberland was the lack of roads to the interior. The first major road, Montreal Road (originally called L'Orignal-Bytown Road), was not built until 1850; this road ran directly through Concession 1 along the Ottawa River (CTHS, N.D.; McGilvray, 2005).

The first settlers of the former Township of Cumberland were Abijah Dunning and Amable Faubert (also written Foubert), both arriving in 1801. Abijah Dunning originally obtained 800 acres of land in the former Township of Cumberland from the Crown and continued to acquire land, eventually coming to own 3,000 acres throughout the former Cumberland, Buckingham and Onslow Townships. Amable Faubert opened up a trading post along the river in 1807 and traded mostly fur, potash and lumber throughout the nineteenth century. The Foubert and Dunning families continued to have a large presence throughout the nineteenth century.

By 1858, the Village of Cumberland had a population of over 1,000 with an additional 2,000 residents in the rural parts of the former Township. Cumberland became a major seasonal forwarding centre along the Ottawa River in the 1870s, where two wharves were built and several forwarding companies were established, including one owned by the Faubert brothers. This helped facilitate a small ship building industry during the mid-nineteenth century (CTHS, N.D.).

In 1882, the Grand Trunk Railway was built through the community of Vars, which provided the first rail transportation route through the Township. Another railway, the Canadian National Railway (CNR), was built through the former Township of Cumberland in 1899 and was extended in 1907 to run through Concession I along the river (CTHS, N.D.). The CNR was closed during the Great Depression and the old rail line was replaced by the construction of Highway 417 in the 1960s and 1970s.

8.9.4 Property History

According to land registry documents, Lots 22-24 in Concession 11 were granted by Crown Patent to Andrew F. Gault in 1865, with all Lots subsequently bought by James Boyd in 1872. The block transfer of large amounts of land is usually indicative of speculative holding rather than settlement. All Lots were sold concurrently between O.N. Schnei, N. Smith, J. Bond, R. Scott and E. Keays during the period between 1875 and 1885 before returning to the possession of A. Gault. The Lots continued to be frequently traded well into the 1890s and early 1900s. It is highly unlikely that the Lots were settled prior to 1872, with the land registry suggesting that the area was settled possibly after 1880.

Lot 25, Concession 11 was granted by Crown Patent to William, F. Powell in 1874 and subsequently sold to John Nicholas in 1880. Ownership appears to have reverted to the Crown later in 1880. A series of entries involving the Ontario Bank occur, the net result of which is that the Lot was obtained from the Chancery by Martin O'Gara in 1885. The Lot was sold immediately by O'Gara and bought and sold with frequency over the next 10 years. The Lot appears to be split in the late 1890's. It is unlikely that the Lot was settled prior to 1880, possibly even the 1890s.

8.9.5 Potential Cultural Heritage Resources

The objective of the cultural heritage evaluation was to determine if any of the properties within the study area had cultural heritage value or interest (in accordance with *Ontario Heritage Act Regulation* 9/06 (MTCS, 2006)). This assessment was also necessary to determine what (if any) properties require a heritage impact assessment (or Cultural Heritage Impact Statement). The evaluation consisted of background historical research and site visits.

There are no properties within the study area identified as demonstrating cultural heritage value or interest by the City of Ottawa, the Ontario Heritage Trust, the Historic Sites and Monuments Board of Canada, the Federal Heritage Buildings Review Office, or the NCC.

Within the study area for this component (i.e., within a 250-metre buffer of the Site), five properties were identified as having potential cultural heritage resources. Both the MTO in its Environmental Guide for Built Heritage and Cultural Heritage Landscapes (MTO, 2007) and the MTCS, in its Screening for Impact to Built Heritage and Cultural Heritage Landscapes (MTCS, 2010) checklist, employ a rolling 40-year rule to identify properties of potential cultural heritage resources as part of the environment assessment process. The intent of the 40-year rule is to allow a resource to age sufficiently so that it can be better contextualized and a wider perspective applied to it.

The five properties included three former farm complexes (1129 Blackcreek Road, 5507 Boundary Road and 5508 Frontier Road). The two other properties were constructed as part of Post-War development in the rural areas surrounding Ottawa (5384 Boundary Road and 5409 Boundary Road). The property locations are shown on Figure 8.9.5-1.

The field work for the cultural heritage evaluation was carried out on January 22 and September 3, 2013. Each of the five properties was evaluated against *Ontario Heritage Act Regulation* 9/06 (MTCS, 2006), "Criteria for Determining Cultural Heritage Value or Interest," using the City of Ottawa's Heritage Survey and Evaluation Form.

Each of the five properties was evaluated for cultural heritage value or interest. It was found that none of the five potential cultural heritage resources demonstrate cultural heritage value or interest and are therefore not eligible for designation under the *Ontario Heritage Act*.

LEGEND

—	ROAD
—	SURFACE WATER FEATURE
☐	CITY OF OTTAWA PROPERTY PARCELS
▭	250 m BUFFER AROUND PROPERTY BOUNDARY
🟥	PROPERTY BOUNDARY
🟩	PRE-1973 POTENTIAL CULTURAL HERITAGE RESOURCE

①	5384 BOUNDARY ROAD
②	5409 BOUNDARY ROAD
③	5507 BOUNDARY ROAD
④	5508 BOUNDARY ROAD
⑤	1129 BLACKCREEK ROAD

200 100 0 200

SCALE 1:10,000 METRES

NOTE

THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT

REFERENCE

AIR PHOTOS PROVIDED BY CITY OF OTTAWA, FEBRUARY, 2012.
BING MAPS AERIAL, SEPT. 2010, PROVIDED BY ARCGIS ONLINE, ESRI, 2012. SOURCE: (C) 2010 MICROSOFT CORPORATION AND ITS DATA SUPPLIERS.
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PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 18

PROJECT

ENVIRONMENTAL ASSESSMENT OF THE CAPITAL REGION RESOURCE RECOVERY CENTRE

TITLE

PRE-1973 POTENTIAL CULTURAL HERITAGE RESOURCES

Golder Associates
Ottawa, Ontario

PROJECT No. 12-1125-0045			SCALE AS SHOWN	REV. 0
DESIGN	ML	DEC. 2013	FIGURE 8.9.5-1	
GIS	BR	DEC. 2013		
CHECK	PLE	AUG. 2014		
REVIEW	PAS	AUG. 2014		

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8.9.6 Archaeological Potential

An archaeological assessment was completed to identify known archaeological resources on and in the vicinity of the study area as well as assess the archaeological potential of the Site. The evaluation consisted of background historical research and site visits. Property inspections were conducted on November 22, 2012 and June 18, 2013.

There are no registered archaeological sites within a significant proximity to the study area.

There are a number of criteria employed in the assessment of archaeological site potential. For aboriginal sites, these criteria are principally focused on the topographical features of the landscape including ridges, knolls and eskers, and the type of soils found within the area being assessed. For post-contact or historic sites, documentary evidence such as maps and census records may indicate areas of settlement and activity. These criteria were formulated in close consultation with the MTCS's set guidelines for archaeological resource potential mapping (MTCS, 2011).

The assessment of archaeological potential was also formulated in consultation with the Archaeological Resource Potential Mapping Study of the Regional Municipality of Ottawa-Carleton: Technical Report (Archaeological Services Inc. & Geomatics International Inc., 1999), hereafter referred to as the Archaeological Master Plan. According to the Archaeological Master Plan modelling criteria, lands within 300 metres of 'two-line' rivers, watercourses with mapped floodplains and wetlands (as shown on 1:10,000 topographic maps) are considered to have aboriginal site potential, while lands with moderate or well drained soils within 200 metres of 'one-line' watercourses also have potential. Further, areas up to 300 metres from abandoned Ottawa and Rideau River terrace scarps have aboriginal site potential. In the case of drumlins and eskers, the entire feature has aboriginal potential. Areas near historical schools, churches, commercial buildings, industrial sites and early settlement roads are considered to have potential within 100 metres of the structure, known structure location or settlement road, the last with the object of locating early pioneer homes. Areas within 50 metres of historical railways are also considered to have site potential and, finally, any area within 100 metres of a registered or unregistered archaeological site.

8.9.6.1 Aboriginal Archaeological Potential

Aboriginal potential for the study area is low. The Site has very limited potential for aboriginal resources as it is poorly drained, low lying and a significant distance from any permanent or ancient source of water. In addition, there are no raised glacial or geological features that might be considered areas of aboriginal focus. As such, there is no direct evidence that would suggest that the study area would have been an area of focus or habitation for aboriginal populations in the Ottawa Valley.

8.9.6.2 Historic Archaeological Potential

The available historic information (historic maps, land records) indicate that this area of Cumberland Township was settled relatively late compared to other areas of the Township. The roads that border the study area have not been considered significant historic corridors as they do not appear on any maps until 1923. In addition, there is no evidence of historic structures present in the study area in any of the historic maps. The potential for historic archaeological resources within the study area is therefore very low.

8.9.6.3 Archaeological Master Plan

The Archaeological Master Plan does not indicate any archaeological potential within the study area.

In summary, no registered archaeological sites and no areas of archaeological potential were identified by the Archaeological Assessment.

8.10 Agriculture

This section describes the existing agricultural conditions within the Site and Site-vicinity. The information presented in this section has been compiled from more detailed information contained in TSD #8.

The assessment method was based on a compilation and review of agricultural information relevant to the Site, including available published information, visits to the Site and the Site-vicinity, and meetings with farmers and municipal officials. An Agricultural Land Evaluation was completed, including a detailed agricultural capability assessment and a review of compatiblity of the Site development with adjacent livestock facilities using Minimum Distance Separation (MDS) Formula (OMAFRA, 2006) calculations.

8.10.1 Site Conditions

The majority of the Site was previously cleared for agricultural purposes. A substantial portion of the Site has been allowed to re-vegetate, indicating marginal success of the attempt to use the Site for agriculture. The predominant form of vegetation is willow and poplar with some pine. There are several ditches crossing the Site in a west-east orientation.

A description of the soils within the Site is provided on Figure 8.10.1-1. The soils in this area have been developed on water deposited parent material consisting of fine sands and clay. This natural limitation combined with the level nature of the Site and the lack of sufficient outlets to provide under-drainage results in the entire Site being constrained by poor drainage. The Simpson Drain that crosses the property in a west-east orientation has a limited distance of influence in the fine sand soils.

Even those areas that have been cleared showed evidence of surface wetness and extended wetness during spring and fall. The wetness constraint for agricultural capability causes several issues that are evident on this Site. Wetness, particularly if it is a major constraint, serves to shorten the growing season, limit growth and restrict the use of planting and harvesting equipment.

The Site visits conducted during this assessment confirmed that the drainage channels crossing the property were full of water with little freeboard. With the exception of the major drainage channels, the inverts of all road culverts were very shallow and would not allow drainage depth sufficient to allow root depth development and infiltration of surface water. The treed areas showed signs of on-going wetness by type of vegetation. A limited soil sample survey confirmed the fine sand and clay soils as depicted on the soils map.

The period in which the soil is dry is less than 90 days in most years with soil deficits ranging from 2.5 to 6.4 centimetres. This restricts some frost sensitive crops but would allow a range of normal farm crops (OMAFRA, 1987).

Source: Excerpt from Map 1, The Soils of the Regional Municipality of Ottawa-Carleton

Legend

□	Property Boundary
ST6 1	St. Thomas sandy loam, slope class 1 - 0.0-0.5%, poor drainage
M6 2*	Manotick fine sand, slope class 2, nearly level - 0.5-2%, irregular slopes, poor drainage
M6 1	Manotick fine sand, slope class 1 - 0.0-0.5%, poor drainage
B2 1	Bearbrook heavy clay, level, poor drainage

NOTE

THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT

REFERENCE

FIGURE PROVIDED BY CLARK CONSULTING SERVICES

PROJECT

ENVIRONMENTAL ASSESSMENT OF THE
CAPITAL REGION RESOURCE RECOVERY CENTRE

TITLE

SOILS MAP

Golder Associates

PROJECT No. 12-1125-0045			PHASE No. 4500
DESIGN	LB	NOV. 2013	NOT TO SCALE — REV.0
GIS	--	--	
CHECK	PLE	AUG 2014	FIGURE 8.10.1-1
REVIEW	PAS	AUG 2014	

8.10.2 Land Uses on and Adjacent to the Site

The land uses to the south and east are agricultural. An agricultural land use survey of the Site and the Site-vicinity was conducted. There are no active livestock facilities on lands immediately adjacent to the Site. The closest barn is about 900 metres from the Site. There is a barn to the south at 6086 Frontier Road that is currently occupied by Mann Paving for storage of materials and equipment related to their business. Further south there is a large livestock facility.

The Site has a limited amount of active agricultural use. Cropland occupies approximately 16.3% of the Site. As noted above, this cropland has significant limitations from an agricultural perspective. The bulk of the Site is vacant and has been in non-agricultural production for many years. Within 1,000 metres of the Site, approximately 23% of the land area is devoted to active agricultural production.

8.10.3 Review of Planning Documents

The Site is not designated as an Agricultural Resource Area in the current Official Plan of the City of Ottawa (City of Ottawa, 2013g). Furthermore it is not proposed to change the current designation as part of the Land Evaluation and Area Review for Agriculture (LEAR) Study (LEAR, 2013) being conducted by the City in consultation with the Province. Therefore it is concluded that the Site is not part of a Prime Agricultural Area as defined by the PPS (MMAH, 2014).

8.11 Traffic

This section presents the existing traffic conditions on the roadways and intersections in the area of the Site. The information presented in this section has been compiled from more detailed information contained in TSD #9.

The CRRRC will have an access directly onto Boundary Road (refer to Figure 8.11-1), which would be used mainly by trucks entering and exiting the Site. The proposed access location is approximately 850 metres south of the eastbound Highway on/off ramp and 700 metres north of Mitch Owens Road. Boundary Road is a north-south two lane arterial road under the jurisdiction of the City of Ottawa (Ottawa Road 41). The road has an asphalt surface with a width of approximately 7.5 metres plus gravel shoulders. The posted speed limit along the road in the vicinity of the Site is 80 kilometres per hour (km/h).

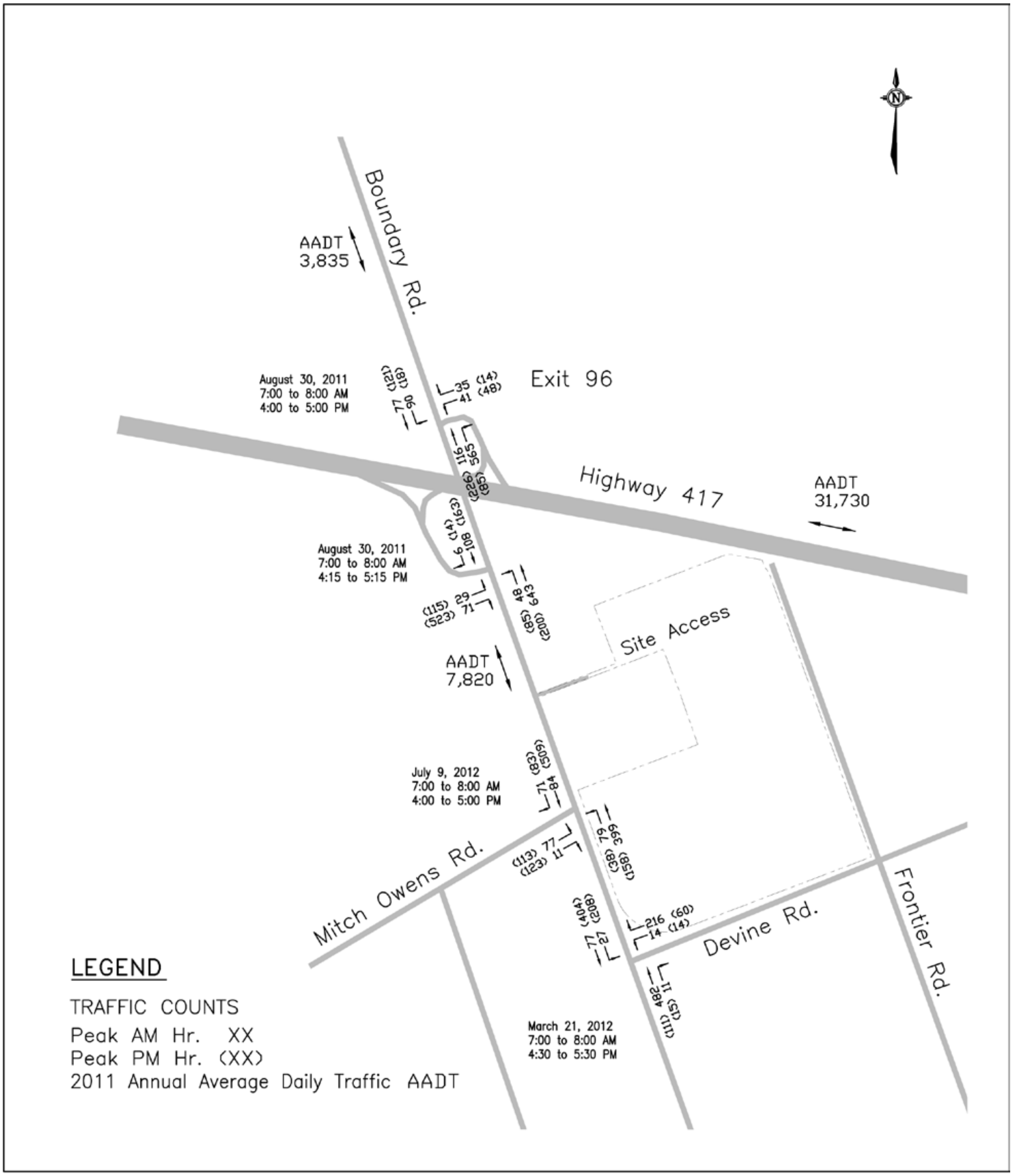
The Site will have a secondary access from Frontier Road, which borders the east limit of the Site. North of Devine Road, Frontier Road is a two lane local road with a gravel surface and “No Exit” signs posted (terminates at Highway 417). South of Devine Road, Frontier Road is a two lane rural collector road under the jurisdiction of the City of Ottawa with a posted speed limit of 80 km/h.

The south property limit of the facility borders onto Devine Road. Devine Road (Ottawa Road 8) is a City of Ottawa two lane rural arterial road with the west limit connecting to Boundary Road (Ottawa Road 41) and the east limit terminating at the east side of Vars. The road has an asphalt surface with gravel shoulders. Devine Road has an unposted speed limit of 80 km/h.

Mitch Owens Road (Ottawa Road 8) is an east-west two lane arterial road located approximately 770 metres north of Devine Road. Mitch Owens Road (Ottawa Road 8) has an asphalt surface and gravel shoulders, with a posted speed limit of 80 km/h. Mitch Owens Road meets Boundary Road at a “T” intersection.

Bordering a portion of the north limit of the Site is Highway 417. Highway 417 is a four lane divided highway under the jurisdiction of the MTO. The highway has two interchanges with Boundary Road (Exit 96) for the both the eastbound and westbound on/off ramps.

Figure 8.11-1 shows the road pattern and the weekday peak AM and PM hour traffic counts taken at the intersections that were examined in the traffic study. The Annual Average Daily Traffic (AADT) is shown along Boundary Road both north and south of Highway 417. The AADT is the total annual traffic volumes divided by the number of days in the year. The figure also shows the date the counts were taken and the peak hour of the counts. The intersection counts at Boundary Road/Mitch Owens Road were obtained from the City of Ottawa, the Highway 417 on/off ramps from the MTO and the Boundary Road/Devine Road counts were taken for this study. The traffic counts determined that over an eight hour period, trucks represent approximately 9.5% of the traffic along Boundary Road between Mitch Owens Road and the eastbound Highway 417 on/off ramps.



NOTE

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REFERENCE

FIGURE PROVIDED BY D.J. HALPENNY & ASSOCIATES LTD.

PROJECT

ENVIRONMENTAL ASSESSMENT OF THE
CAPITAL REGION RESOURCE RECOVERY CENTRE

TITLE

WEEKDAY PEAK AM AND PM HOUR TRAFFIC COUNTS

Golder Associates

PROJECT No. 12-1125-0045			PHASE No. 4500	
DESIGN	DJH	JUNE 2014	NOT TO SCALE	REV.0
GIS	---	---	FIGURE 8.11-1	
CHECK	PLE	AUG 2014		
REVIEW	PAS	AUG 2014		

9.0 IDENTIFICATION OF PREFERRED SITE DEVELOPMENT CONCEPT

Alternative Site development concepts are different ways that the CRRRC, i.e., the diversion facilities, the landfill and other project components, can be implemented on the Boundary Road Site. The potential Site layout needs to consider the Site access location and general Site operational requirements, provide the land area required for each of these components and take into account any physical or other constraints. The landfill will require sufficient airspace volume so that disposal capacity is available for the residuals from the diversion facilities and other materials that cannot be diverted for the 30 year planning period.

The main components of the CRRRC are conceptually described in Section 6.0. This Section updates that information by providing the land area required for each component in order to permit the preferred Site development concept to be identified. To prepare alternative Site development concepts for comparison, it was necessary to attempt to quantify the potential requirements for the diversion and landfill components. This required estimates of maximum annual tonnage that could be received at the CRRRC, projections on composition of the waste, the estimated range of achievable diversion at each of the facility components and the resultant potential landfill airspace volume requirement.

This section of the EASR corresponds to Task 2 of the methodology described in Section 2.3.

9.1 Waste Streams and Diversion

The first step was to examine the IC&I and C&D waste streams and estimate the quantity of the various types of materials that could be received and managed at the CRRRC.

In the analysis of the opportunity as described in the approved TOR and summarized in Section 4.0, within the CRRRC's proposed service area the estimated quantity of IC&I and C&D material requiring management over a 30 year planning period is approximately 1,000,000 tonnes/year using 2010 as the base year rising to 1,500,000 tonnes in 2046. The potential waste management capacity deficit ranges up to approximately 1,250,000 tonnes/year.

Unlike municipal waste where the composition and annual amount is known with a high degree of certainty, the IC&I and C&D waste stream is variable. In the absence of enforced diversion regulations every business owner makes their own decision about diversion, what they send to disposal and what waste management company/site they choose to contract with to fulfill their individual waste management needs. The types and quantities of the various materials the CRRRC will receive will depend on many factors, as will the corresponding diversion that can be achieved over time and the required disposal capacity and rate at which that capacity is consumed. In order to conceptually plan the size and capacity of the various CRRRC components, it was necessary for Taggart Miller to make some assumptions based on the estimated size and composition of the IC&I and C&D waste streams. Similarly, based on experience with other existing diversion facilities and end markets, the potential diversion rates for the various materials over time was estimated.

The IC&I and C&D waste streams include both mixed and source separated materials from a wide variety of businesses, manufacturing and industrial facilities, and institutions, as well as those associated with the construction industry. Some types of commercial developments are combined with residential; there are also multi-residential developments that are considered commercial waste generators. The recyclable material and waste services associated with these types of development are sometimes contracted to private waste companies, while in other cases the municipality offers these services. It was assumed for this EA that the recyclable material stream from mixed commercial/residential and multi-residential developments in the proposed service area would be available to and received by the CRRRC.

Taggart Miller has assumed for planning purposes that the waste and recyclable materials received at the CRRRC could be up to 450,000 tonnes/year as described in Section 6.2. This assumed maximum annual waste receipt is in the mid-range of annual tonnages approved for other private waste management facilities in the area (which range from about 235,000 to 755,000 tonnes/year).

The development of business for a new IC&I and C&D waste management facility such as the CRRRC requires the acquisition of customers in what is a competitive market. As such it is unrealistic to expect that the maximum annual tonnage would be received at the CRRRC in the initial years of its operation. Rather the annual tonnage received is expected to ramp up over time until the maximum allowable annual tonnage is reached. Taggart Miller assumed a ramp up scenario for the CRRRC as follows: Year 1 – 215,000 tonnes/year; Year 2 – 295,000 tonnes/year; Year 3 – 360,000 tonnes/year; Year 4 – 390,000 tonnes/year; Year 5 – 420,000 tonnes/year; and Years 6 through 30 – 450,000 tonnes/year.

Table 9.1-1 below provides the projected typical composition of the waste material anticipated by Taggart Miller to be received at the CRRRC, together with the target ultimate diversion rates. It is recognized that there will be variations from these assumptions, both in terms of total waste received annually and the amount of the individual components. There will also be variation in the achievable diversion rate, which depends on several factors including the quality and types of waste material received, whether materials are source separated or mixed and end markets. Based on experience, the following ranges around the target values were considered reasonable by Taggart Miller for this analysis:

- Waste components: ±30% of the typical anticipated annual quantity;
- Annual total waste received: ±20%, but not exceeding 450,000 tonnes/year total; and
- Diversion rates and ranges as shown in Table 9.1-1 below.

Table 9.1-1: Typical Waste Composition Expected at the CRRRC

Component	Anticipated Typical Annual Quantity (tonnes/year)	Target Ultimate Diversion Rate (%)	Range in Target Diversion Rate (%)
Organics	70,000*	70%	60 – 80%
IC&I (not including organics)	220,000	16%	11 – 26%
C&D	100,000	70%	60 – 80%
Soils	60,000	100%	95 – 100%

Note: * Consisting of approximately 20,000 tonnes of leaf and yard materials and the remainder source separated or mixed organics.

Estimated ranges in target diversion were based on Miller Waste's operating experience. Specifically, for organics the material received is anticipated to consist of approximately 20,000 tonnes of leaf and yard waste which, based on Miller's experience, can be almost 100% diverted. The remaining 50,000 tonnes are source-separated organics (containing about 75% organic material) and mixed IC&I waste with over 50% organic material. Miller expects over time to be able to get up to approximately 60% diversion of the 50,000 tonnes of material, giving an overall diversion of 70% of the combined 70,000 tonnes of organics received.

IC&I diversion is most efficiently achieved by processing that portion of the incoming loads highest in recoverable material content. It will be important to work with waste generators and collectors in this regard to obtain generator cooperation in source separating their recoverable materials with acceptable contamination levels. At this point, Taggart Miller anticipates processing IC&I loads when 50% of the load can reasonably be recovered. It has been assumed for these projections that one-third of IC&I loads could be suitable for processing. This would result in achieving a target diversion of 16% of IC&I materials in addition to organics diversion. Success with generators in source separation and/or minimizing contamination or future regulations by the MOECC requiring source separation could increase these projections.

The C&D diversion target is 70%. This level of diversion is being achieved by other facilities.

Surplus and contaminated soils, that have been appropriately treated where required, will be reused on-Site as alternative daily cover in the landfill, and possibly for other on-Site beneficial uses depending on the type of material and its quality. Treated soils could also be sent for off-Site use if there is market demand and its quality meets the applicable regulatory guideline. This will achieve the targeted diversion rate of 100%.

An analysis was completed for the 30 year planning period assuming the above ranges of anticipated annual total waste received (including the ramp up scenario) and the targeted ultimate diversion rates for each waste component. The results of this analysis provide a range in overall currently anticipated diversion rates at the CRRRC, as well as the corresponding tonnage of material that would require landfill disposal. From this the landfill airspace volume required to support the CRRRC over the 30 year planning period was estimated. The results of the analysis are as provided in Table 9.1-2.

Table 9.1-2: Anticipated Diversion Rate

Anticipated Ultimate Overall Diversion Rate		
	Target	**Anticipated Range**
Overall (30 years)	49%	43 – 57%
Overall (over 30 years, excluding soils)	40%	34 – 50%

The assumed range in total tonnage of material received at the CRRRC is illustrated on Figure 9.1-1, divided into the amount diverted and the amount requiring disposal. The total tonnage received over a 30 year period was estimated to range from just over 10 million tonnes to about 13 million tonnes.

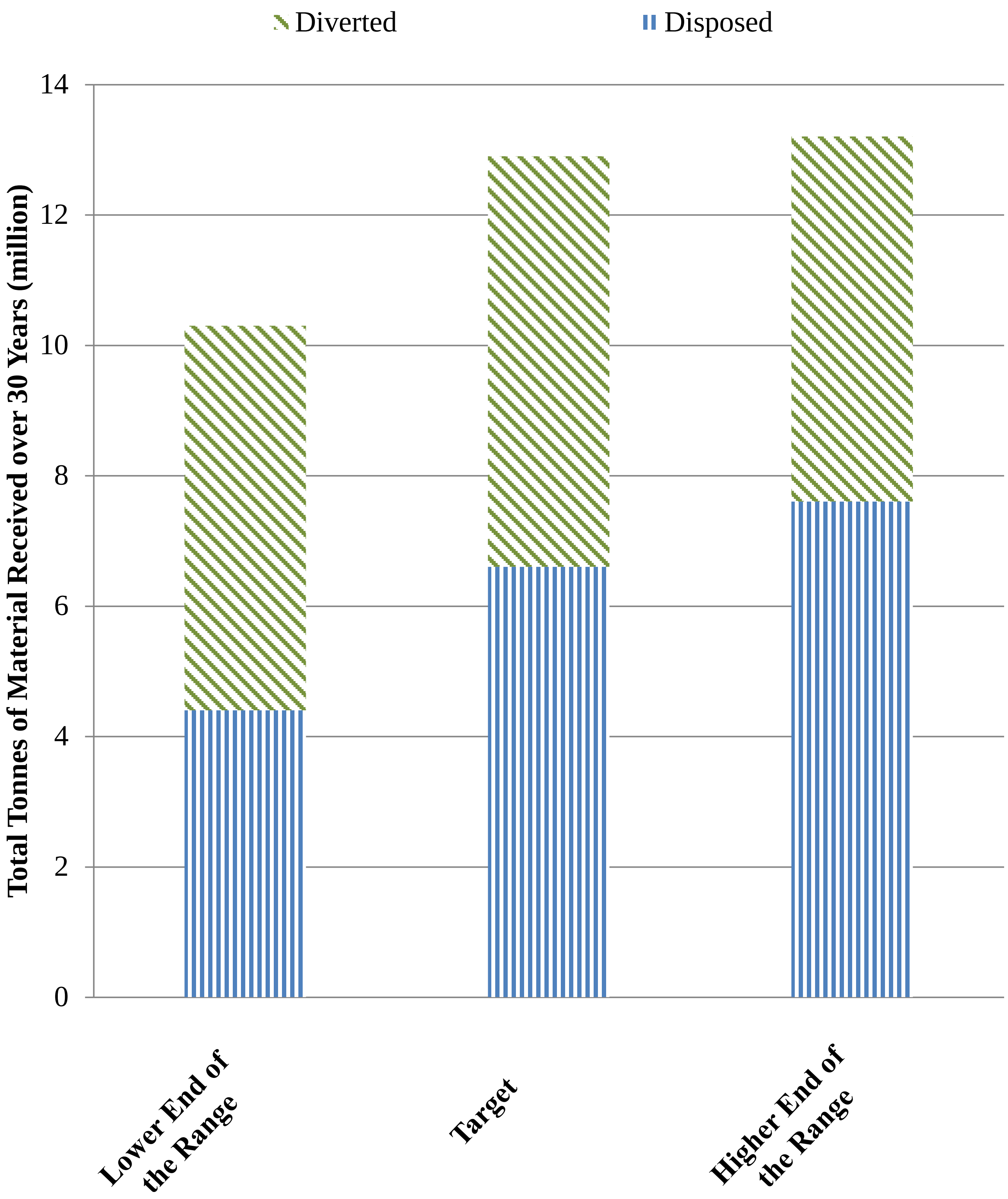
Figure 9.1-2 illustrates the diversion and disposal proportions for the tonnage received on an annual basis over the 30 year planning period using the assumptions set out above.

To determine the landfill airspace volume potentially required to support the diversion facilities over the 30 year planning period, the tonnage of material requiring disposal can be converted to volume assuming a typical 4 to 1 ratio of waste to daily cover material (by volume) and a compacted waste density of 0.85 tonnes per cubic metre. The analysis is provided in Table 9.1-3:

Table 9.1-3: Landfill Disposal Volume Requirements

	Lower End of Range	Target	Higher End of Range
30 Year Estimated Disposal Volume Required (million cubic metres)	6.2	9.4	10.7
Disposal Volume Conserved by Diversion Activities at the CRRRC (million cubic metres)	7.9	8.9	8.3

The analysis shows that for a 30 year planning period, the landfill component of the CRRRC could require approximately 9.4 to 10.7 million cubic metres of disposal capacity for materials that are not diverted. During this operating period, the CRRRC is projected to divert roughly a similar volume of material from landfill. This range in disposal capacity was further refined to a design value in Section 10.0 for purposes of the final proposed Site development plan.



NOTE

THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT

PROJECT

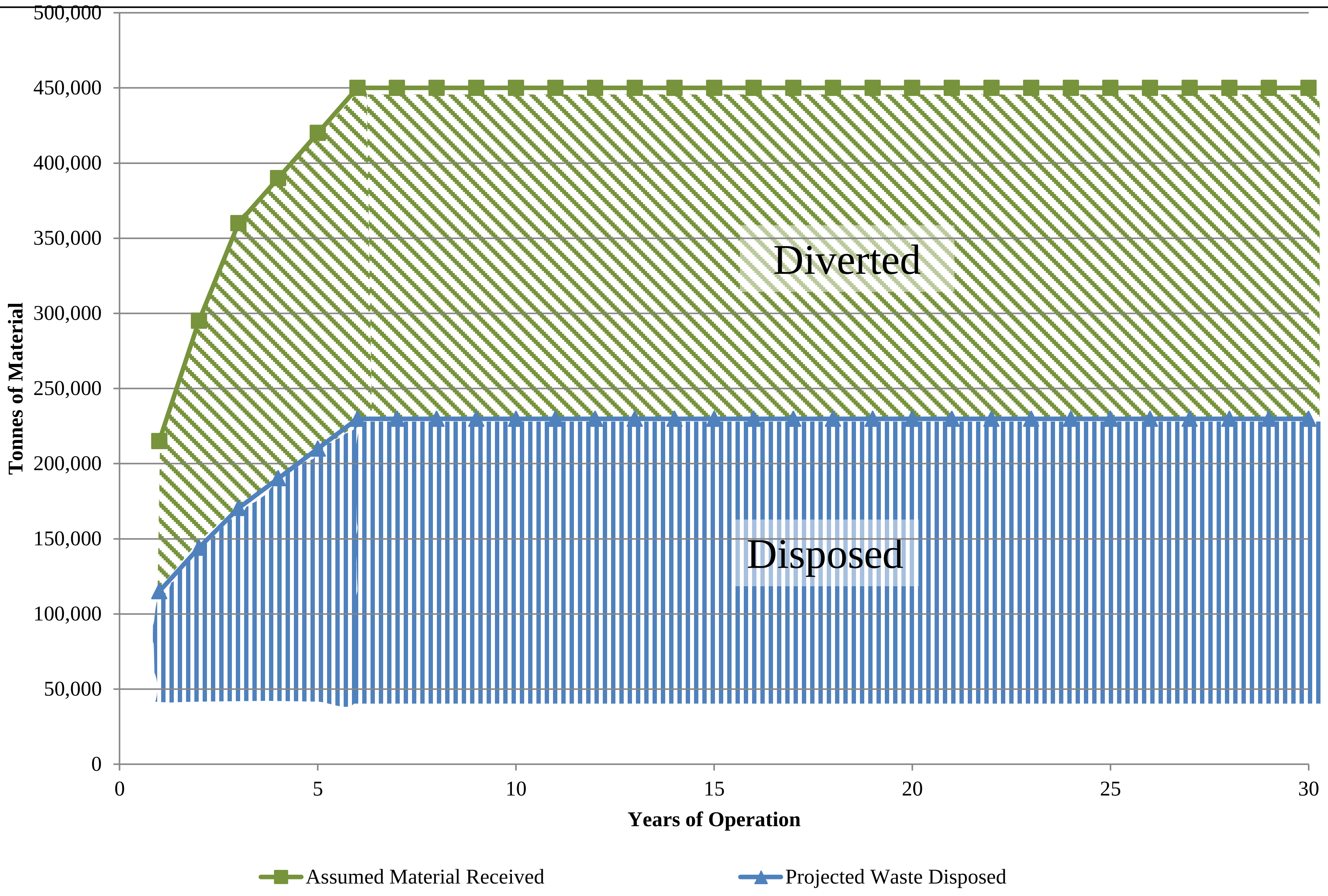
ENVIRONMENTAL ASSESSMENT OF THE
CAPITAL REGION RESOURCE RECOVERY CENTRE

TITLE

Total Tonnage Received

Golder Associates

PROJECT No. 12-1125-0045			PHASE No. 4500	
DESIGN	MIB	Nov. 2013	SCALE AS SHOWN	REV.0
GIS	--	--	FIGURE 9.1-1	
CHECK	PLE	Aug. 2014		
REVIEW	PAS	Aug. 2014		



NOTE

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PROJECT

ENVIRONMENTAL ASSESSMENT OF THE
CAPITAL REGION RESOURCE RECOVERY CENTRE

TITLE

Expected Tonnage Received Over Time

Golder Associates

PROJECT No. 12-1125-0045			SCALE AS SHOWN	REV.0
DESIGN	MIB	Nov. 2013	FIGURE 9.1-2	
GIS	--	--		
CHECK	PLE	Aug. 2014		
REVIEW	PLE	Aug. 2014		

9.2 Site Design Planning Considerations

9.2.1 General

The analysis of existing conditions carried out for selection of the preferred Site for the CRRRC (Section 7.0 and TSD #1) did not identify any on-Site constraints related to the natural environment, archaeology or built heritage that would preclude development on any specific part(s) of the Site.

The surface water flow network in the area of the Site provides three discharge outlet locations for the surface water management system that would be part of the CRRRC Site development. In addition, the Simpson Drain (a municipal drain) crosses the north central part of the Site from west to east. In terms of possible Site concept designs, it is necessary to leave a clear 10 to 15 metre wide corridor along at least one side of a municipal drain to allow equipment access for periodically cleaning out the drain and removing or spreading the material removed.

The subsurface investigation program showed that the Site is underlain by a limited thickness of surficial silty sand or weathered silty clay, followed by a thick and extensive deposit of silty clay. The upper portion of the silty clay deposit is soft and this will dictate the geometry (for example the excavation depth, sideslope angles, height) and design of the landform of the landfill component of the CRRRC and any facilities located adjacent to it.

In addition, the landfill component has to satisfy the requirements of O. Reg. 232/98 (MOE, 1998a), including a buffer between the landfill footprint and the property boundary to accommodate screening of the landfill from off-Site views, SWM/drainage, access around the landfill/Site perimeter, groundwater monitoring and implementation of contingency measures (if required). The diversion and other non-landfill components should also be set back from the property boundary by a suitable distance, both to separate them from adjacent land uses and to accommodate stormwater management.

Lastly, existing and future land use in the area around the Site was taken into consideration in preparation of alternative Site development concepts.

9.2.2 CRRRC Components

The following describes the assumed component conceptual design parameters that were used for the purpose of developing alternative Site development concepts. Additional information on the operational characteristics for these components is later described and quantified in Section 10.0 as part of the input to the impact assessment for the preferred Site development concept.

Site Access: The arrangement of the Boundary Road property was specifically planned to enable access to the Site off Boundary Road as close to Highway 417 as possible. This will minimize travel distance for Site-related traffic on Boundary Road between Highway 417 and the access location, and also adequately separate the access location from the intersections of Boundary Road with Mitch Owens Road and Devine Road further to the south. This location will provide the primary access for Site-related traffic. The 30 metre wide access road allowance will be planned to accommodate entrance and exit lanes, an area to ensure that truck queuing will take place off Boundary Road, appropriate geometry to accommodate turning at Boundary Road, and roadside drainage. The primary access road will be about 450 metres in length to the east of Boundary Road, at which point it enters the main part of the CRRRC property. A weigh scale(s) with associated scale house will be provided.

A secondary Site access/exit should also be provided for infrequent use by vehicles associated with Site operations, maintenance or emergency.

Administration Building: The CRRRC will require an administration building. It is anticipated that this will be a one storey building with a footprint of about a few hundred square metres.

Small Load Drop-Off: A typical grade-separated drop-off area for small loads brought to the Site from IC&I and C&D sources would be provided, with separate bunkers (somewhere between 6 to 10) to receive mixed loads and source separated materials and the associated vehicle access. Source separated leaf and yard materials would also be received in this area. All materials received in this area would be transferred internally to the appropriate CRRRC facility component.

Materials Recovery Facility: The MRF was assumed to be a slab-on-grade industrial building to house the diversion equipment and activities within it. The MRF will have a material processing capacity of approximately 50 tonnes/hour. Based on experience with design and operation of these types of facilities, the MRF was assumed to require an area of about 13,000 to 14,000 square metres including a small single storey attached building for employee services and mechanical/electrical system controls. The main building height is expected to be in the range of 13 to 14 metres. The building will be accessible to incoming material delivery vehicles and will be provided with a loading area for the outgoing recycled materials.

C&D Processing Facility: The C&D processing facility was also assumed to be a slab-on-grade industrial building to house the diversion equipment and activities within it. The C&D processing facility will have a material processing capacity of approximately 50 tonnes/hour. Considering the various types of materials to be processed and based on experience with design and operation of these types of facilities, the C&D processing facility was assumed to require an area in the range of 12,500 square metres including a small single storey attached building for employee services and mechanical/electrical system controls. The main building height is expected to be about 13 to 14 metres. The building will be accessible to incoming material delivery vehicles and be provided with a loading area for the outgoing recycled materials.

Organics Processing Facility: The organics processing facility was assumed to consist of five main components: a receiving and storage building; an area for the primary anaerobic digester cells; a secondary digester; a collected gas flaring and/or electrical generating facility; and a compost pad. The compost pad operations include the processing of leaf and yard waste.

The proposed BioPower process for anaerobic digestion of mixed organics from IC&I sources uses well known biological treatment processes, however this combination of processes has not been previously approved for full scale operation in Ontario. In accordance with MOECC preference for new technology, it is initially proposed to construct and operate an on-Site demonstration scale BioPower facility. The demonstration scale facility will be located within the Site area proposed for organics processing. The purpose of the demonstration scale project is to: confirm the effectiveness of the BioPower technology in treating organic waste; provide information to enhance and optimize the BioPower technology; and refine process design and operating parameters for operation on a full-scale commercial basis for implementation at the CRRRC Site. The demonstration will be performed by constructing and operating a facility that incorporates all of the processes and facilities associated with the BioPower technology. These facilities will subsequently be expanded as required and incorporated into the full-scale plant assuming successful completion of the demonstration phase.

In order to provide and enhance diversion of organics during the initial period of Site operation, it has been assumed that the CRRRC will have the capability to receive source separated organics from IC&I sources and pre-process them (size reduction and removal of physical contaminants via hydraulic squeezing) within the on-Site organics receiving building and then take the resulting organics slurry by tanker to approved off-Site farm based or other commercially available anaerobic digesters for processing. It is estimated that this initial operation could divert up to 20,000 tonnes/year of organics. Should this operation prove successful, Taggart Miller may elect to continue it for source separated organics, while operating the BioPower facility for organic streams for which that technology is more appropriate. The receiving and storage building, which is anticipated to serve for the demonstration, pre-processing and the full-scale receiving and storage, will have a footprint area of about 3,000 square metres and a height of about 12 metres.

Although subject to modification depending on the results of the demonstration scale project, it is anticipated that the BioPower primary reactor digester will consist of contained and covered cells that are excavated to shallow depth below grade and were assumed to have a height of about 6.5 to 7 metres and require a land area of about 5 hectares. This sizing is expected to handle up to 50,000 tonnes/year of organics.

The secondary reactor building will have dimensions of about 20 by 30 metres and a height of about 10 metres. Electrical generation equipment, if installed, would be housed in a series of individual metal containers occupying a surface area of approximately 12 by 45 metres with a height of about 10 metres. A separate maintenance building for the power generation area components would occupy a space of about 10 by 15 metres and be about 6 metres high. The buildings and power generation equipment would be located in close proximity to an enclosed flare and containerized engines within a total land area of about 4,000 square metres. The flare and the power generation area (if constructed) will receive gas from both the organics processing facility and the landfill. If the Province re-enters the electricity purchase arena on favourable commercial terms, the combined gas will fuel internal combustion engines that are coupled to generators and will export the electricity to the electrical distribution grid.

The compost storage and processing pad, to be used for final processing/curing of the processed organics, for windrow composting of leaf and yard materials, and wood grinding and chipping, will be constructed using granular fill materials with a paved surface and was assumed to require an area of approximately 3.5 hectares.

All the organics processing components were assumed to occupy an estimated 9.5 hectares in total of land area.

<u>Petroleum Hydrocarbon Contaminated Soil Treatment</u>: It was assumed that up to 25,000 tonnes per year of PHC contaminated soil could be received at the CRRRC. Many waste management facilities in Ontario are approved to accept PHC soils (that classify as solid non-hazardous waste) for use as daily cover material in the landfill. The proposed approach to PHC treatment at the CRRRC is to have an approved treatment process for use as required under current and future MOECC requirements for such soil use.

The proposed treatment approach is aerated static biopiles, which degrade the PHCs in the soil using aerobic biodegradation. The biopile is an engineered cell that creates a controlled environment to manage and control and contain the liquid and gas produced as the PHCs degrade. The biopiles would be a series of constructed lined and covered cells connected to a single treatment unit to control moisture, nutrients and air flow. The treatment unit would be modular to allow for increase in equipment as required. The collected liquid would be re-used to adjust the moisture content of the soil with any excess removed for treatment, while the gas would be treated using a biofilter, perhaps supplemented with an activated carbon system. To treat this quantity of soil annually, it is anticipated that some six to eight biopile cells may be required; the treatment process in the biopile could require four to eight months to complete, depending on the treatment objectives.

The proposed approach to treatment in the initial period of operation is to pre-treat PHC impacted soils using the biopile technique, as required, prior to use as daily cover in the landfill component of the CRRRC to prevent off-Site odour impacts. For purposes of such pre-treatment, it is estimated that the soil would remain in the biopile for up to 60 days.

If regulations are enacted at some time in the future requiring treatment of PHC soils prior to use as landfill daily cover, the objective using the biopile technique will then be to meet the regulated concentrations for PHCs in the soil, while capturing and treating the generated gas and recirculating the generated liquid.

The PHC soil needs to be conditioned with a bulking agent (such as wood chips or straw) and nutrients prior to being placed into a biopile cell. During the initial period of CRRRC operation, when the volume of soil to be treated is expected to be limited, this conditioning would take place on a concrete pad; this activity would involve the soils being temporarily covered with a low permeability tarp. During subsequent operations assuming soil treatment regulations are in effect, the conditioning would take place within a building having an area of about 1,500 square metres and provided with a biofilter to treat air emissions from the conditioning process.

It is anticipated that a total land area of about 6,000 square metres could be required for PHC soil treatment.

<u>Surplus Soil Management</u>: an area of about 1.5 hectares was set aside for the temporary storage and management of surplus uncontaminated soil received from construction projects, which would subsequently be re-used on the Site for various purposes. Other undeveloped areas of the Site could also be used for this purpose to suit Site operations. The management of surplus uncontaminated soil will be an ongoing activity at various locations on the Site, the operational details of which will change frequently depending on the quantities and types of materials that are available to be brought to the Site, and the Site requirements for materials for construction and operational purposes.

<u>Landfill Component</u>: As described previously, in order for there to be sufficient landfill capacity to support the diversion facilities for a planning period of 30 years, an on-Site landfill airspace of approximately 9.4 to 10.7 million cubic metres has been assumed to be potentially required. The conceptual design of the landfill component to provide this air space needs to consider the requirements of O. Reg. 232/98 (MOE, 1998a), as well as the Site-specific subsurface conditions that underlie the CRRRC property. Subsurface investigations have shown that the Site is underlain by about 1.2 to 1.5 metres of surficial silty sand or weathered silty clay, overlying about 30 metres of silty clay of marine origin, followed by glacial till and then bedrock. The groundwater table is high, being at or near the ground surface. The upper portion of the silty clay deposit is soft, and the geotechnical properties of the soil will be the primary factor that governs the design of the landfill geometry. A continuous silty layer having an average thickness of about 0.3 metres was encountered within the upper portion of the silty clay deposit at a depth of about 4.5 to 6 mbgs.

Based on these Site-specific characteristics and using the results of geotechnical analysis of landfill stability, the following assumptions were used in the conceptual design of the landfill component:

- The depth of excavation should be relatively shallow to keep the base of the landfill within the upper surficial sand and weathered clay zone as much as possible;
- To provide adequate stability for the landfill overlying the clay deposit, relatively flat sideslopes will be required. Based on stability analysis, as described in Volume III, a 3 to 3.5 metre high by about 35 metre wide perimeter berm will be required around the outside of the landfill area. Sideslopes of 14 horizontal to 1 vertical can be used up to a height of about 12 or 13 metres and then a 20 horizontal to 1 vertical slope up to the peak elevation. This will result in a very gradually sloped landform;
- The base of the landfill component would be provided with a leachate collection system as set out in O. Reg. 232/98 (MOE, 1998a);
- The requirements for leachate management, both for containment of leachate at the base of the landfill and the approach to design of the final cover, were determined after the preferred Site development concept was identified, as described in Section 10.8, following the analytical process for a Site-specific design set out in O. Reg. 232/98 (MOE, 1998a);
- For conceptual design purposes, the leachate collection system was assumed to have a total thickness of 0.65 metres as per O. Reg. 232/98 (MOE, 1998a). Conceptually it was anticipated that the leachate collection system would drain towards the central part of the landfill (which is where settlement of the underlying clay will be largest due to the waste being thickest in this part of the landfill) where it will be removed for treatment by pumping from manhole type structures. It was anticipated that some type of liner system would be constructed around the perimeter of the landfill to prevent leachate from entering the surficial silty sand layer and perimeter berm fill;
- Based on experience with other Sites overlying thick clay deposits and considering the design approach set out in O. Reg. 232/98 (MOE, 1998a), it was anticipated that a permeable soil final cover approach will be appropriate for the landfill at this Site. Consideration will be given to incorporation of drainage features in the detailed design of the final cover as part of the final closure plan to enhance surface water runoff and thereby somewhat reduce the quantity of leachate generated. For conceptual design an allowance of up to 1 metre for the final cover system was assumed. This will be subsequently confirmed following the analytical procedures set out in O. Reg. 232/98;
- The landfill component will be constructed and developed in phases; and
- A LFG collection and extraction system will be required and likely consist of a series of horizontal piping installed within the waste during filling and/or a network of vertical gas wells installed into the waste after the waste has been placed to its final contours. Together with the gas collected from the secondary organics digester, the extracted gas would be sent to a flare and/or a power generation area as described above.

Leachate Treatment: Leachate is the liquid that is produced as precipitation enters waste and dissolves constituents as it passes through it. Management and treatment of leachate generated from the landfill, as well as excess liquor generated from the organics processing, will be required. The preferred approach to leachate treatment that was subsequently determined is described in Section 12.0 of this EASR. The alternatives for leachate treatment range from full on-Site treatment for discharge to the local natural environment to exporting the leachate off-Site for treatment, with or without on-Site pre-treatment. Based on experience on other Sites, it is expected that the main treatment components will consist of an equalization/holding pond (or other containment structure) for the collected leachate prior to treatment, a treatment (or pre-treatment) plant and a treated effluent holding pond (or other containment structure).

The quantity of landfill leachate requiring treatment/pre-treatment on an annual basis depends on a number of factors, with the primary factors being the area of the landfill, the amount of precipitation that infiltrates into the waste and the type of final cover constructed over completed areas of the landfill. The quantity of leachate to be managed will increase over time as the landfill phases are constructed and put into use, and depending on which phases are active and those that have received their final cover. The preliminary sizing of the three main components was determined after initial sizing of the landfill using the parameters described above. Based on the approximate sizing of the landfill component as subsequently described in Section 9.3, and assuming a permeable final cover approach, it was estimated that the quantity of leachate to be managed could be about 20,000 cubic metres in the first few years, increasing to in the range of about 230,000 cubic metres per year when the whole landfill area is developed. The excess liquor from the organics processing could generate up to approximately an additional 30,000 to 35,000 cubic metres per year, depending on the amount of organics received and processed. The excess liquor from the organics processing would also be handled by the leachate treatment facility.

For Site concept layout purposes, the largest land area requirements were for full on-Site treatment for discharge to the local natural environment. Based on preliminary sizing of the three main components, it was anticipated that a land area of about 5 hectares could be required.

Ancillary Facilities/Components: Other facilities at the CRRRC considered in Site layout were a Maintenance Garage for servicing equipment (anticipated to be a single storey building having a size of about 900 square metres and 6 to 9 metre height); a Tire Wash Station to clean tires of trucks leaving the landfill area prior to them leaving the Site; an on-Site road network consisting of paved and unpaved roads; and an Employee Parking Area(s).

Buffers: For the purposes of conceptual Site layout, the minimum width of the buffer between the landfill and the property boundary was assumed to be 100 metres. A 50 metre setback between diversion facility structures/areas and the property boundary was generally assumed. SWM facilities will be mainly located within the buffer.

9.3 Rationale for and Description of Alternative Site Development Concepts

The preparation of alternative Site development concepts (alternative concepts) involved the arrangement on the property of all the diversion/ancillary components and the landfill component as described in Section 9.2 in ways that are functional in terms of Site operations.

As described in Section 9.2, access to the Site for any alternative concept will be from Boundary Road into the northern part of the property. Because the CRRRC's operations focus first on diversion of IC&I, C&D and organic materials, followed by landfilling of residuals from the diversion processes and materials that are not suitable for diversion, from an operational perspective the Site layout and internal road network should facilitate arriving waste vehicles to first access the diversion facilities.

For the landfill component, the objective of the design concept was to provide approximately 9.4 to 10.7 million cubic metres of landfill airspace volume considering the shape and land area of the overall property, the geotechnical requirements and giving consideration to the appearance of the CRRRC from off-Site locations.

Lastly, the presence of the Simpson Drain aligned west to east across the north central part of the Site is a constraining factor in Site layout.

There are a number of Site-specific factors that provide the rationale for preparation of site concept arrangements of the CRRRC components, as follows:

- The design objectives described above;
- The physical constraints imposed by such factors as the subsurface conditions, surface water drainage outlet locations, and the requirements of O.Reg. 232/98 Landfill Standards;
- The large number of components that comprise the CRRRC and the need to have certain components nearby each other for the CRRRC to be operationally functional; and
- Consideration of proximity to and types of neighbouring land uses.

The result of all these factors in combination was a limited number of reasonable alternative Site development concepts.

Two alternative Site development concepts for the CRRRC, Concept A and Concept B, were prepared by Taggart Miller and presented to the public at Open House #4 on June 5, 2013. At that time the CRRRC Site consisted of 184 hectares of land. Subsequently, Taggart Miller acquired an additional 8 hectare parcel of land adjoining the west central part of the property, increasing the total property area to 192 hectares. The acquisition of this additional land area allowed minor shifting of components within the alternative concepts, but did not change their general characteristics. Concepts A and B are shown in plan view on Figures 9.3-1 and 9.3-2, together with a cross-section through the landfill component on Figure 9.3-3. For the landfill component, the plans also illustrate the proposed location of the initial landfill cell area.

For both Alternative Concepts A and B, the proposed main Site access is from Boundary Road near the north end of the Site, minimizing the travel distance along Boundary Road from Highway 417 to the Site. Appropriate roadway modifications would be made along the section of Boundary Road approaching the access location and at the access location, based on the results of the traffic impact assessment and in accordance with City of Ottawa road design requirements. For Concept A the secondary Site access would be off Frontier Road, while for Concept B the secondary access would be off Devine Road.

PLOT DATE: June 26, 2014
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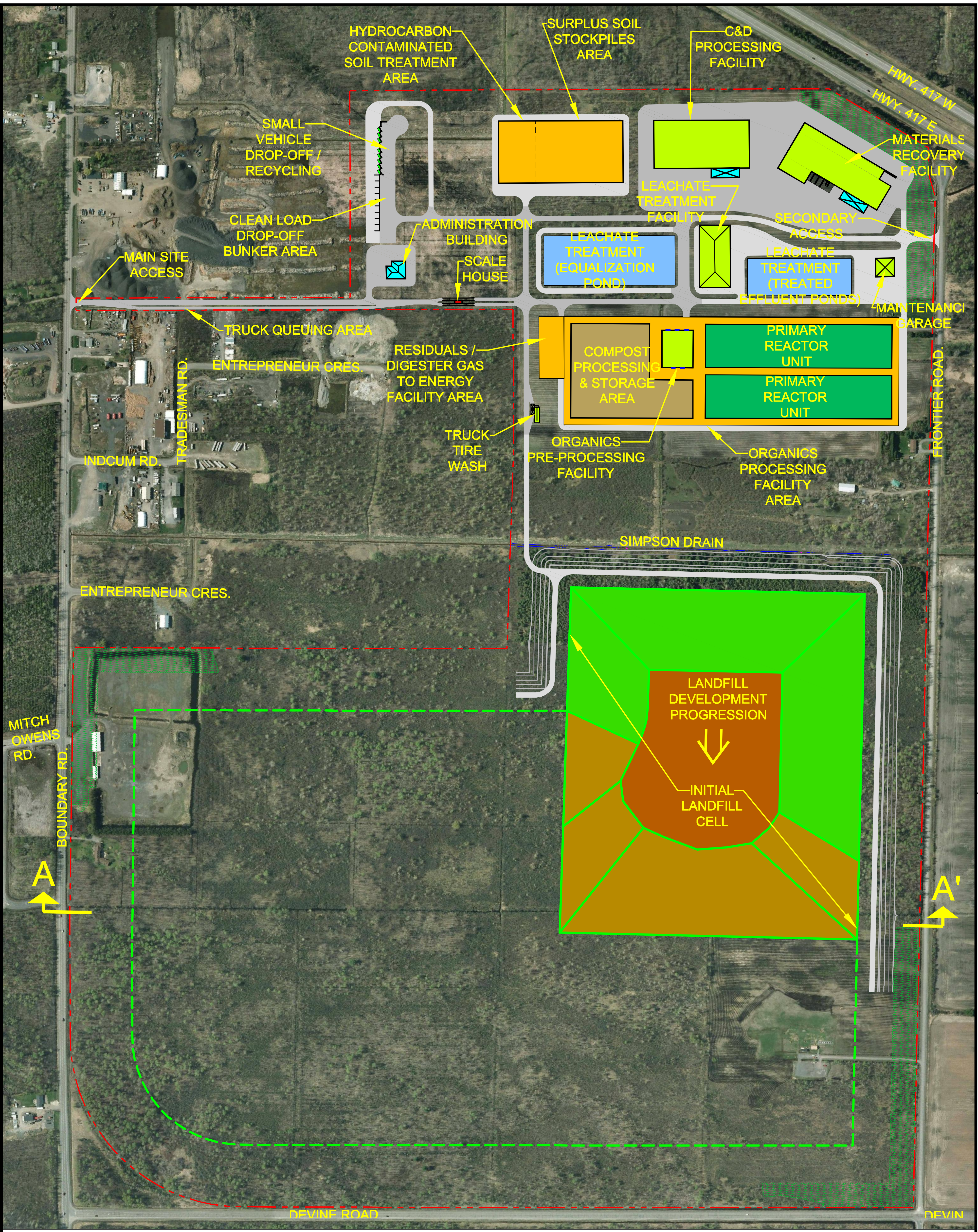


LEGEND

🟩	PROPOSED FACILITY BUILDING
🟦	PROPOSED ADMINISTRATION BUILDING
🟧	OUTDOOR DIVERSION AREA
▬	PAVED ROAD (ASPHALT)
▬	GRAVEL ROAD
– - –	PROPERTY LIMITS
▨	CONSTRUCTED SCREENING FEATURE
≡	PERIMETER BERM CONTOURS (interval 1.0 m)
―	LANDFILL AREA FOR YEARS 1 TO 10
- - -	FUTURE LANDFILL AREA

NOTE
THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT.

120 0 120 240
SCALE 1:6,000 METRES

Golder Associates
Ottawa, Ontario, Canada

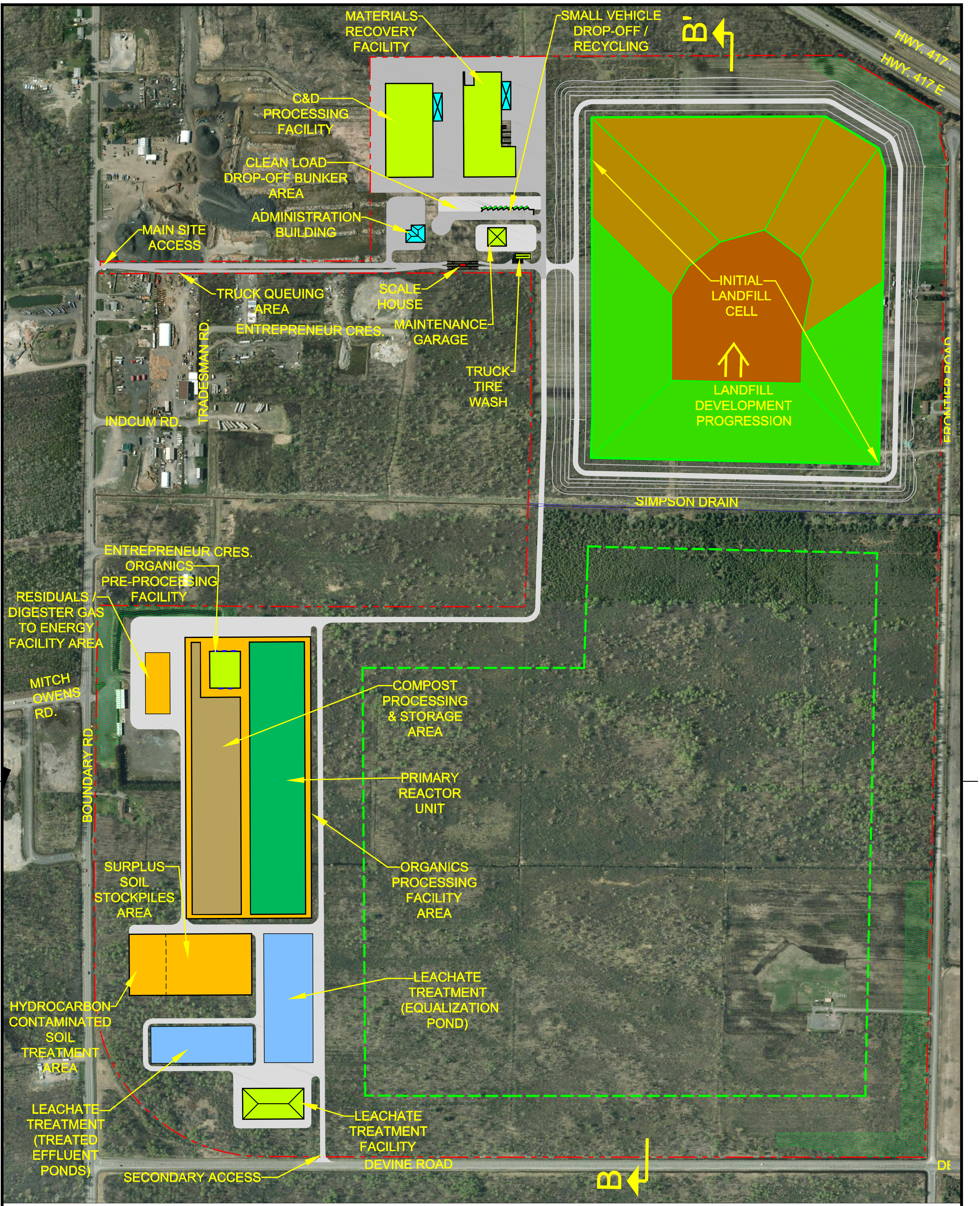
SCALE	AS SHOWN
DATE	7 Nov. 2013
DESIGN	M.L.F.
CAD	M.L.F.
CHECK	P.L.E.
REVIEW	P.A.S.

FILE No. 1211250045-V1-EAr-9.3-1.dwg
PROJECT No. 12-1125-0045 REV.

TITLE
ALTERNATIVE SITE DEVELOPMENT CONCEPT A

ENVIRONMENTAL ASSESSMENT OF THE
CAPITAL REGION RESOURCE RECOVERY CENTRE

FIGURE
9.3-1



LEGEND

🟩 PROPOSED FACILITY BUILDING

🟦 PROPOSED ADMINISTRATION BUILDING

🟧 OUTDOOR DIVERSION AREA

▬ PAVED ROAD (ASPHALT)

▬ GRAVEL ROAD

— - — PROPERTY LIMITS

▨ CONSTRUCTED SCREENING FEATURE

═ PERIMETER BERM CONTOURS (interval 1.0 m)

— LANDFILL AREA FOR YEARS 1 TO 10

– – FUTURE LANDFILL AREA

LEGEND

THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT.

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SCALE 1:6,000 METRES

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DATE	7 Nov. 2013		
DESIGN	M.L.F.		
CAD	M.L.F.		
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REVIEW	P.A.S.		

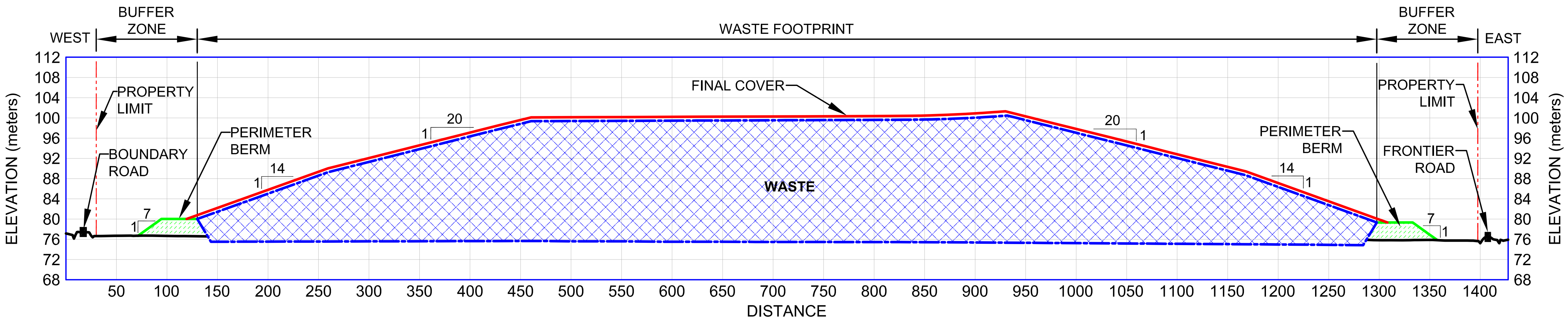
ALTERNATIVE SITE DEVELOPMENT CONCEPT B

FILE No. 1211250045-V1-EAr-9.3-2.dwg

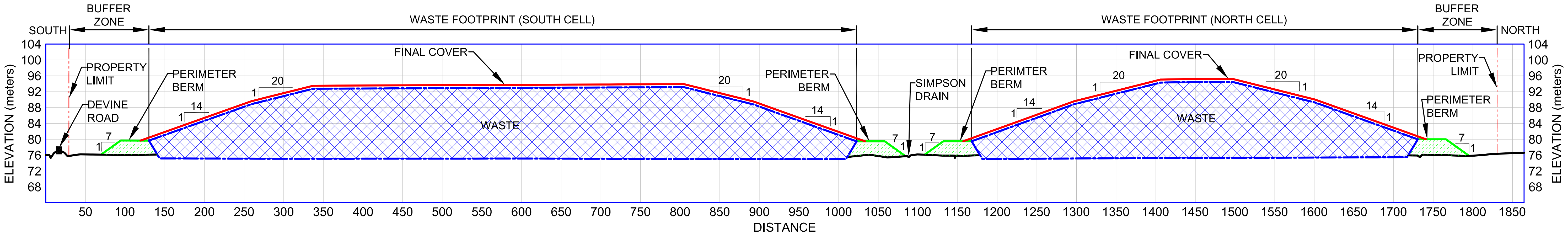
PROJECT No. 12-1125-0045 REV.

ENVIRONMENTAL ASSESSMENT OF THE
CAPITAL REGION RESOURCE RECOVERY CENTRE

FIGURE 9.3-2

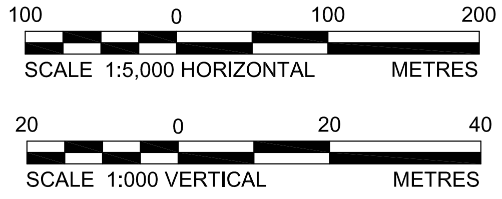


PROFILE A-A'



PROFILE B-B'

NOTE
1. VERTICAL SCALE EXAGGERATED 5 TIMES THE HORIZONTAL SCALE FOR PRESENTATION PURPOSES.
2. THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT.



Golder Associates
Ottawa, Ontario, Canada

FILE No. 1211250045-V1-EAr-9.3-3.dwg
PROJECT No. 12-1125-0045
REV. 0

SCALE AS SHOWN
DATE 7 Nov. 2013
DESIGN M.L.F.
CAD M.L.F.
CHECK P.L.E.
REVIEW P.A.S.

TITLE
LANDFILL SECTIONS

ENVIRONMENTAL ASSESSMENT OF THE CAPITAL REGION RESOURCE RECOVERY CENTRE

FIGURE
9.3-3

PLOT DATE: June 26, 2014
FILENAME: N:\Active\Spatial_IM\Miller_Paving_Ltd\CRRRC\ACAD\Vol 1 (Report Figures)\EA report\1211250045-V1-EAr-9.3-3.dwg

Alternative Concept A had all administration, small load drop-off, IC&I and C&D recycling and organics diversion and processing facilities, soil management and associated Site operational components in the northern part of the property, to the north of the Simpson Drain. The proposed landfill component occupied a single footprint in the southern part of the property, leaving a minimum 100 metre wide buffer between the landfill and the property boundary.

Alternative Concept B had administration, small load drop-off and IC&I and C&D recycling in the northwest part of the property. Organics processing, soil management and other Site operational components would be located in the southwest part of the property. The proposed landfill component had two separate footprints, a smaller one in the northeast part and a larger one in the southeast/south central parts of the property, as a result of the location of the Simpson Drain and the desire to have it remain in its current location. This concept also had a 100 metre wide buffer between the landfill and the property boundary. Table 9.3-1 presents the characteristics of the conceptual design of the landfill component for both Site development concepts.

Table 9.3-1: Landfill Component Conceptual Design Characteristics

Characteristic	Concept A	Concept B
Depth of excavation below ground	1 metre average	1 metre average
Perimeter berm	3 to 3.5 metres high, 35 metre top width	3 to 3.5 metres high, 35 metre top width
Landfill sideslopes	14H:1V up to about 12 to 13 metre height; 20H:1V top slope portion	14H:1V up to about 12 to 13 metre height; 20H:1V top slope portion
Maximum height above ground at peak	25 metres	North Mound - 20 metres South Mound - 25 metres
Total footprint area	90 hectares	93 hectares
Maximum airspace volume	11.5 million cubic metres	10.5 million cubic metres
Soil excavation volume	Approximately 900,000 cubic metres*	Approximately 930,000 cubic metres*
Daily cover	Imported material	Imported material

Note: * The excavated material is expected to be consumed in the construction of the landfill perimeter berms.

9.4 Identification of Preferred Site Development Concept

Taggart Miller solicited input on which Site development concept was preferred in several ways: 1) from the public at Open House #4; 2) by posting the two concepts on the CRRRC website; 3) through presentation of the two concepts to MOECC technical reviewers; and 4) through discussion with the Algonquins of Ontario and requests sent to other Aboriginal groups.

No attendees at Open House #4 indicated a preference for Alternative B; to the extent feedback was provided it was all in favour of Alternative A. Subsequent to Open House #4, the two alternatives were provided to and discussed with representatives of the MOECC; the MOECC preferred Concept A as it does not have the landfill split into two separate cells and because of the placement of the landfill footprint relative to the direction of groundwater flow (from a groundwater protection perspective). No comments on the preferred alternative were received in response to the CRRRC website posting. The concepts were also provided for comment to representatives of the Algonquins of Ontario and a meeting subsequently held to discuss them; there was no preference indicated for one concept over the other.

Since all components of the proposed CRRRC must be designed to meet MOECC standards at the property boundary, a primary factor considered by Taggart Miller to identify the preferred concept was compatibility of proposed Site operations with neighbouring land uses. Site operations themselves were also considered as secondary but important factors. The comparison is assumed common and standard in-design mitigation measures.

The following were the main considerations in comparing the two concepts:

- For both Concepts A and B, there were no sensitive receptors (houses) within 500 metres to the north, south or east of the property [Concepts Equally Preferred];
- To the west of the property there are nine sensitive receptors within 500 metres of the Site. Concept B would have greater potential for operational nuisance issues at the sensitive receptors when compared to Alternative A [Concept A Preferred];
- It was expected that Concepts A and B can be similarly screened from view from most off-Site viewpoints [Concepts Equally Preferred];
- The long term containment and management of leachate has to meet the requirements of O. Reg. 232/98 (MOE, 1998a). In the event of an unexpected release of leachate, since the groundwater flow direction is from west to east, in terms of natural protection of off-Site groundwater, a larger portion of the Concept A landfill footprint is located further from the eastern property boundary. This offered a greater degree of natural protection of off-Site groundwater [Concept A Preferred];
- Because Concept B has a larger total landfill footprint than Concept A, Concept B would produce a larger total volume of leachate to be managed [Concept A Preferred];
- As presented in Section 9.3 of the EASR (Table 9.3- 1), the characteristics of the landfill that affect the contaminating lifespan (subsurface conditions, footprint area, dimension of landfill perpendicular to groundwater flow, thickness of waste, approach to leachate management, leachate quality, type of final cover) are fairly similar for the two alternatives. As such, it was concluded that the contaminating lifespan for both would be similar. [Concepts Equally Preferred];
- If on-Site leachate treatment was later identified as the preferred leachate management approach, Concept A would have the treatment facilities in the northern part of the Site closer to the surface water discharge location, whereas Concept B would have the treatment in the southwest part of the property distant from the discharge location [Concept A Preferred];
- In terms of managing excavated materials, for both concepts the soil generated by the shallow landfill excavation would be mainly consumed in the construction of the perimeter landfill berms. Imported materials, including surplus soils from construction Sites and contaminated soil, as well as alternative materials, would be required for daily landfill cover [Equally Preferred];

- The available area in the north part of the Site with Concept A allowed greater flexibility in refining the Site layout compared to Concept B [Concept A Preferred];
- With all diversion components in the north part of the Site (Concept A), there would be less on-Site traffic movement associated with Concept A compared to Concept B where the diversion components are in two areas separated by about one kilometre of internal roadway [Concept A Preferred]; and
- With Concept A, the secondary Site access location is along a dead-ended Frontier Road that has very low traffic usage, compared to Concept B where the secondary access would be onto the more heavily travelled Devine Road [Concept A Preferred].

The main advantages for Concept A compared to Concept B, which also represent disadvantages for Concept B are provided in Table 9.4-1.

Table 9.4-1: Site Development Concept Advantages and Disadvantages

Concept A	Concept B
Advantage: Sources of operational nuisance potential related to diversion components located further from sensitive receptors located to the west of the Site.	Disadvantage: Diversion components located closer to sensitive receptors to the west of the Site and hence a higher potential for operational nuisance effects.
Advantage: The orientation of the landfill component of Concept A is more favourable in terms of potential off-Site impacts on groundwater quality.	Disadvantage: The orientation of the landfill component of Concept B is less favourable in terms of potential off-Site impacts on groundwater quality.
Advantage: The landfill footprint area covered by Concept A is less than Concept B, so will generate a smaller volume of leachate to be collected and managed.	Disadvantage: The landfill footprint area covered by Concept B is more than Concept A, so will generate a larger volume of leachate to be collected and managed.
Advantage: Concept A offers greater flexibility in subsequent refinement of the Site development plan layout, there will be less on-Site traffic movement required and the secondary site access location is onto a less travelled roadway.	Disadvantage: Concept B offers less flexibility in subsequent refinement of the Site development plan layout, there will be more on-Site traffic movement required and the secondary site access location is onto a more travelled roadway.

There were no advantages identified for Concept B compared to Concept A.

Considering all of the above, the study team and Taggart Miller identified Alternative Concept A as the preferred Site development concept for the CRRRC. As described below, the EA proceeded to refine this Site development concept in further detail and use it as the basis for the assessment of potential net effects from the CRRRC.

10.0 DETAILED DESCRIPTION OF PROPOSED CRRRC

This section provides a more detailed description of the proposed CRRRC which served as the basis for assessment of the potential CRRRC impacts for each of the environmental components. In this section: 1) the preferred Concept A has been refined to produce the final Site development plan; and 2) the Site construction and operations are further described. More detailed process and facility descriptions are provided in Volume IV of the EASR document package. Supporting geotechnical and hydrogeological information is provided in Volume III. This section incorporates the results of the comparative assessment of leachate management alternatives for the CRRRC, which is summarized below in Section 12.0, further detailed in TSD #10 and also described in Volume IV.

The resulting Site Development Plan is shown on Figure 10-1; cross-sectional views through the landfill component are shown on Figure 10-2;. All diversion and support facilities are in the north part of the property to the north of the Simpson Drain, while the landfill footprint and associated stormwater management components and perimeter buffers occupy the southern portion. The flow of waste material and products at the Site is shown on Figure 10-3. Additional diversion components may be added to the CRRRC over time, as technology and/or the end markets develop.

10.1 Site Access

The refinement of the primary Site access road resulted in a two way main road to the in-bound scale, the provision of a separate single out-bound lane to an out-bound scale and a separate truck queuing lane. Considering a queuing lane length of about 400 metres, as well as an in-bound lane length of another 450 metres, all queuing of waiting Site-related traffic will be on-Site and there will be no back up of incoming traffic onto Boundary Road. The main access road will be paved.

The secondary Site access/exit location remains near the northern end of Frontier Road.

10.2 Administration Building

The administration building remained in the same location, with an assumed footprint of about 200 square metres. This will house office functions for the CRRRC; staff and visitor access will be via a separate lane off the main access road prior to the in-bound scales. A paved parking and apron area will be provided around this building.

10.3 Small Load Drop-Off

The small load drop-off remained in the same location and configuration; the plan shows a maximum number of receiving bunkers. Vehicles will enter the Site over the in-bound scales and proceed to this facility to drop off their material in the appropriate bunker and then exit the Site. A separate road is provided for on-Site trucks to access the containers within the bunkers. The roadways associated with this facility will be paved.

PLOT DATE: November 17, 2014
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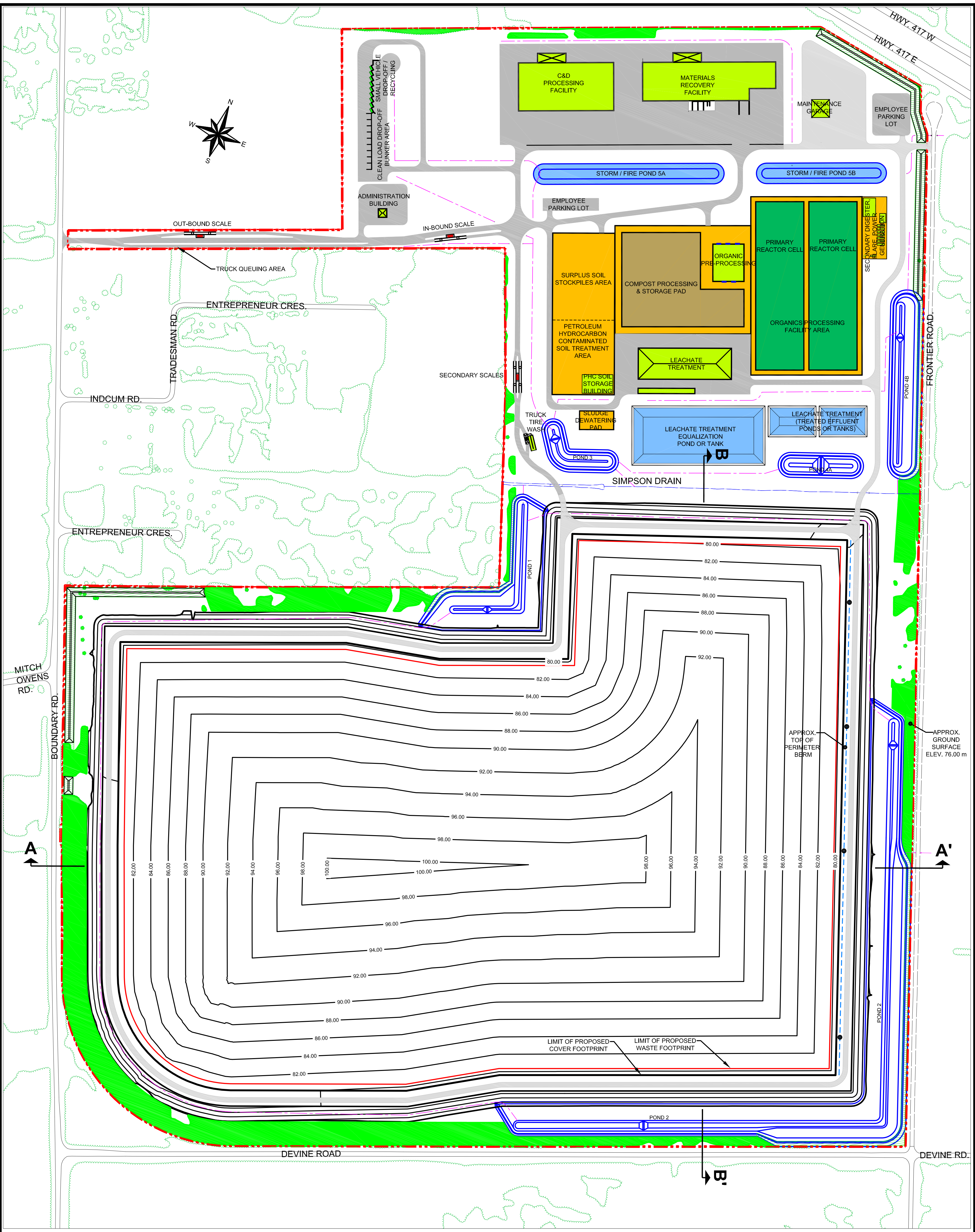

LEGEND

🟩 PROPOSED FACILITY BUILDING

🟧 OUTDOOR DIVERSION AREA

▬ PAVED ROAD (ASPHALT)

▬ GRAVEL ROAD

-·-·- PROPERTY BOUNDARY

🟩 EXISTING VEGETATION SCREENING

▨ CONSTRUCTED SCREENING FEATURE

≡ PERIMETER BERM CONTOURS (interval 1 m)

▭ STORMWATER MANAGEMENT PONDS

84.00 / 86.00 LANDFILL FINAL CONTOURS (interval 2 m)

NOTES:

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SCALE 1:6,000 METRES

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Ottawa, Ontario, Canada

FILE No.	1211250045-V1-EAr-10-1.dwg		
PROJECT No.	12-1125-0045	REV.	

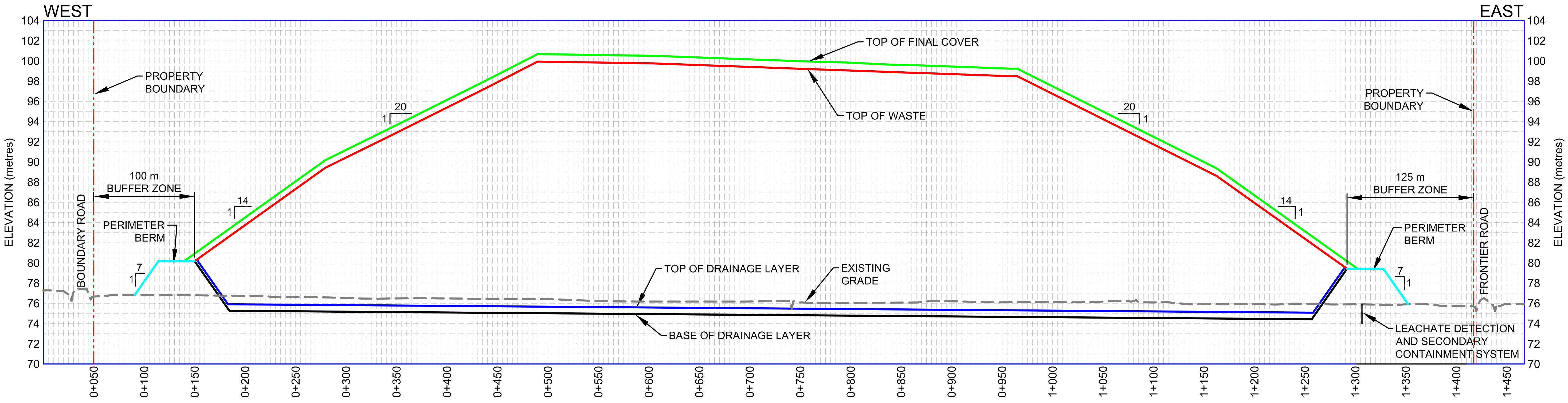
SCALE	AS SHOWN
DATE	7 Nov. 2013
DESIGN	M.L.F.
CAD	M.L.F.
CHECK	P.L.E.
REVIEW	P.A.S.

TITLE

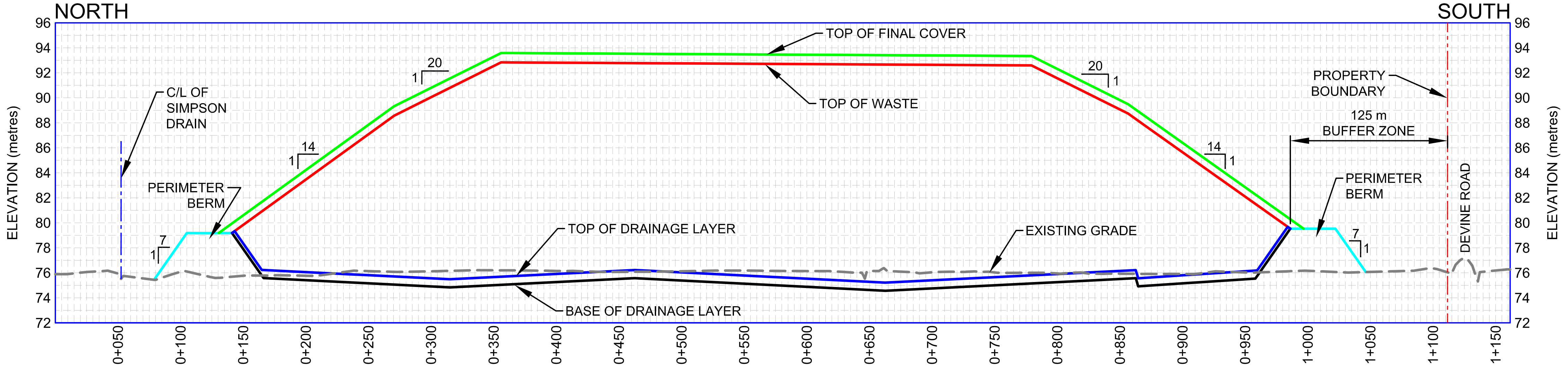
SITE DEVELOPMENT PLAN

ENVIRONMENTAL ASSESSMENT OF THE
CAPITAL REGION RESOURCE RECOVERY CENTRE

FIGURE
10-1



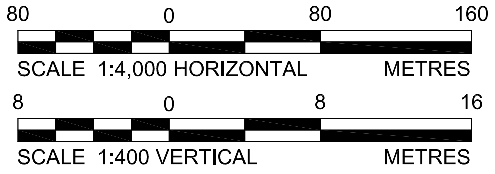
SECTION A-A'



SECTION B-B'

NOTES:

1. VERTICAL SCALE EXAGGERATED 10 TIMES THE HORIZONTAL SCALE FOR PRESENTATION PURPOSES.
2. THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT.



REV	DATE	DES	REVISION DESCRIPTION	CAD	CHK	RVW

PROJECT

ENVIRONMENTAL ASSESSMENT OF THE
CAPITAL REGION RESOURCE RECOVERY CENTRE

TITLE

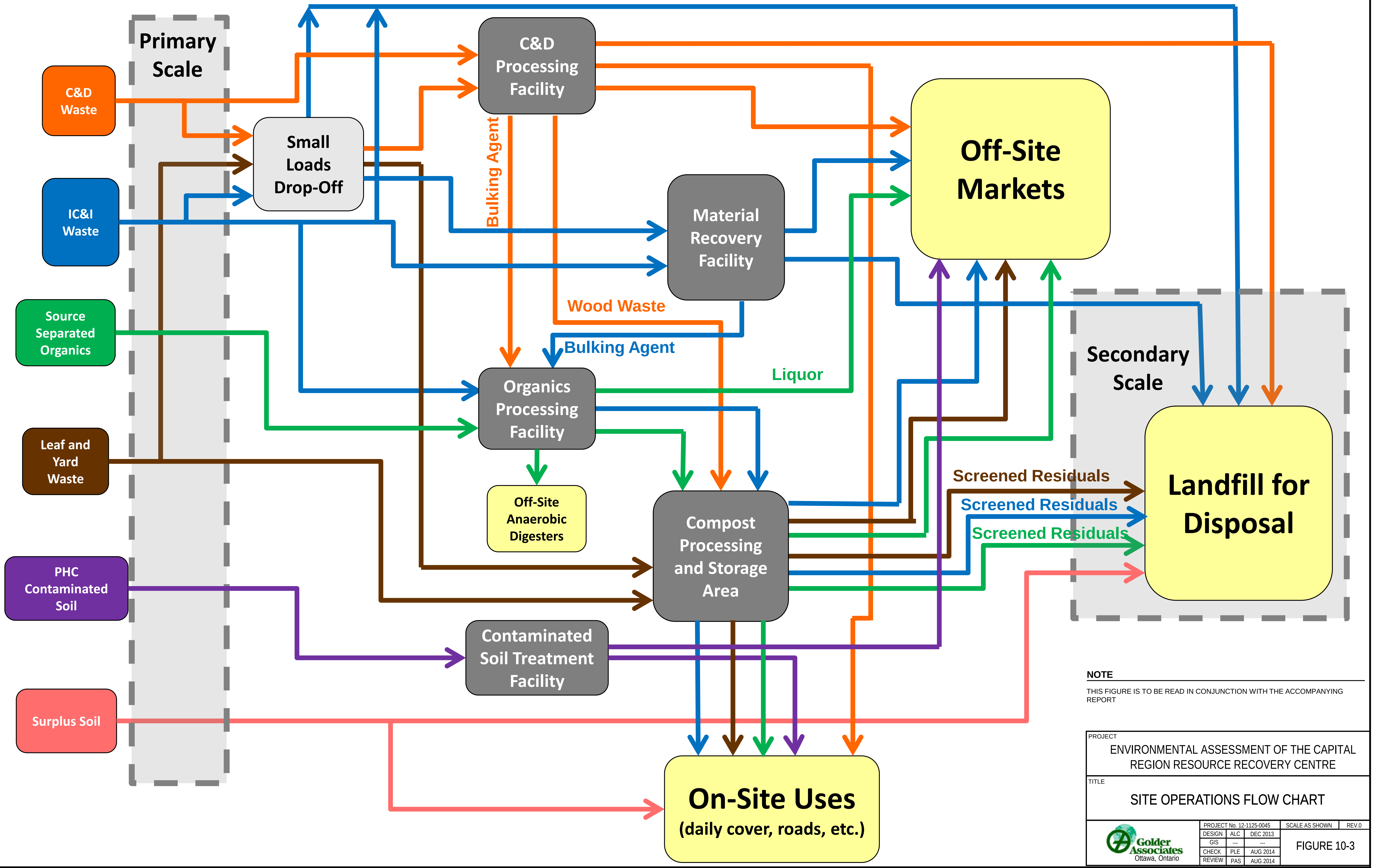
SECTIONS
A-A' and B-B'

Golder Associates
Ottawa, Ontario, Canada

PROJECT No.		12-1125-0045
DESIGN	M.K.F.	15 Oct. 2013
CAD	M.L.F.	15 Oct. 2013
CHECK	P.L.E.	Aug. 2014
REVIEW	P.A.S.	Aug. 2014

FILE No. 1211250045-V1-EAr-10-2.dwg
SCALE AS SHOWN REV. 0
DRAWING No.
Figure 10-2

PLOT DATE: November 6, 2014
FILENAME: N:\Active\Spatial_IM\Miller_Paving_Ltd\CRRRC\ACAD\Vol 1 (Report Figures)\EA report\1211250045-V1-EAr-10-2.dwg



NOTE

THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT

PROJECT
ENVIRONMENTAL ASSESSMENT OF THE CAPITAL
REGION RESOURCE RECOVERY CENTRE

TITLE
SITE OPERATIONS FLOW CHART

Golder Associates
Ottawa, Ontario

PROJECT No. 12-1125-0045			SCALE AS SHOWN	REV.0
DESIGN	ALC	DEC 2013	FIGURE 10-3	
GIS	---	---		
CHECK	PLE	AUG 2014		
REVIEW	PAS	AUG 2014		

10.4 Materials Recovery and Construction & Demolition Processing Facilities

The position of these two main diversion buildings was shifted slightly, into the north central part of the Site, closer to the Site entry point and somewhat further from Highway 417. The area of each building has been assumed to be approximately 13,000 square metres. Most truck traffic will enter and leave the buildings on the south side, such that the north side of the buildings closest to Highway 417 will rarely have truck traffic. The offices and employee facilities, including employee parking, will be on the north side of the main buildings. The area around and between the buildings will be paved.

Incoming vehicles containing materials destined for the MRF will enter the MRF building along the west part of the south side of the building and unload onto the floor. Clean (source separated) loads will be kept separate from mixed loads. These incoming materials will be loaded into a system of processing equipment that includes both mechanical recovery and manual sorting of materials. The recovered materials will generally consist of cardboard, paper, glass, plastics, ferrous and non-ferrous metals, wood and other fibres. The recovered materials will be baled and stored, and then loaded onto trucks along the eastern part of the south side of the building and hauled off-Site to end markets. Rejected and residual materials will be loaded onto trucks within the east end of the building and hauled for disposal in the on-Site landfill.

The C&D building will house mechanical processing equipment (crushing, screening, air and magnetic separation, shredding) and manual sorting in the west and northwest areas of the building, with the main recovered products consisting of shredded wood, ferrous and non-ferrous metals, mixed aggregate, shingles, cardboard and drywall, and process fines. Incoming trucks will enter the building from the south side and unload onto the building floor. The eastern and southern parts of the building will be mostly open space for receiving and other processing operations, such as chipping of recovered wood. The building will also be set up for loading of trucks within the building; this will consist of recovered materials to be sent to off-Site markets, recovered materials to be re-used on-Site, and rejected and residual materials to be hauled to the on-Site landfill.

Both buildings will use a fuel oil fired heating system. Each building will have a dust collection system that will discharge through a bag house and cyclone with the air vented through the roof.

10.5 Organics Processing Facility

The primary reactor cells were oriented north-south rather than west-east in the updated Site Development Plan in order to optimize use of land in the northern part of the Site.

As described in Section 9.0, it is initially proposed to construct and operate a demonstration scale BioPower facility within the overall organics processing facility area. The demonstration will be performed by constructing and operating a facility that incorporates all of the processes and facilities associated with the BioPower technology. These facilities will be expanded as required and incorporated into the full-scale plant following completion of the demonstration phase, depending on the results of the demonstration phase and market demand.

The principal facilities to be used in the course of the demonstration are:

- Organics pre-processing building;
- Biofilter for treatment of air from the organics pre-processing building;
- Primary reactor;
- Secondary reactor;
- Negative pressure extraction system;
- Flare;
- Equipment for blending organic materials, transportation and placement of blended material in primary reactor, installation of cover system, excavation and transportation of digested product, processing of digested product, curing of digested product, refurbishment of primary reactor for re-use; and
- Monitoring and analytical equipment.

It is intended that the demonstration facility be sized to accommodate up to 4,000 tonnes of organic waste per calendar month, not to exceed 23,400 tonnes/year. Operation of the demonstration unit will parallel the planned operation of a full-scale commercial facility. The demonstration will be performed for a minimum of one complete treatment cycle (filling primary reactor, anaerobic treatment of organics in primary reactor and liquor in secondary reactor, aerobic stabilization of material in primary reactor, emptying of primary reactor, screening and curing of digested product, and analysis of end-product quality). For planning purposes, it is anticipated that the demonstration will operate for a period of 24 to 36 months. Key operational parameters within the primary and secondary digesters will be monitored. Data will be analyzed and used to adjust operating conditions as appropriate. The monitoring program may be adjusted in response to ongoing data review and analysis. The character of material produced by the BioPower process will be monitored in accordance with MOECC compost guidelines. As the demonstration progresses, data will be gathered and the performance assessed from three perspectives: environmental, operational and economic. Part V EPA approval will be sought, depending on the results, for conversion of the system to full-scale commercial operation. The precise full-scale system requirements will be specified in the Part V application. Operationally, the transition from demonstration to full-scale is expected to be seamless, since the demonstration system will be fully incorporated into the commercial plant.

In order to ensure organics diversion capability during the demonstration period for the BioPower facility, and to meet market demand, it is proposed to provide capacity for source separated organics from IC&I sources and pre-process them (size reduction and removal of physical contaminants via hydraulic squeezing) within the on-Site organics receiving building and then take the resulting organics slurry by tanker to approved off-Site farm based (or other commercially available) anaerobic digesters for final processing. It is estimated that this initial operation could divert up to 20,000 tonnes/year of organics. Should this operation prove successful and there be continued interest/demand from farm digesters, Taggart Miller may elect to continue it for source separated organics, while operating the BioPower facility for organics streams for which that technology is more appropriate. The receiving and storage building, which is anticipated to serve for both the pre-processing and the full scale receiving and storage, has been assumed to have a footprint area of approximately 3,000 square metres and a height of about 12 metres.

Pre-processing of source separated organics to create an organics slurry for off-Site anaerobic digesters will occur on-Site in the building established for the receipt and storage of organics. Delivery trucks will tip the organics into a receiving pit within the on-Site building; they will then be fed to a pre-processing system that will provide particle size reduction, physical separation of physical contaminants and production of a pumpable organics slurry. The organics slurry will be pumped to an exterior, closed storage tank while the separated physical contaminants will either be sent to landfill or subjected to further processing depending on their organic content. The slurry will be pumped into tankers and sent for off-Site processing in approved anaerobic digesters. The organics receiving and storage building, as well as internal and external storage tanks, will be kept under negative pressure to reduce the potential for fugitive odour emissions and the air will be exhausted and treated through a biofilter. The building will be heated by heat recovered from the flare/generator or a biogas boiler or via a backup fuel oil heating system.

Although subject to modification depending on the results of the demonstration scale project, it is anticipated that the BioPower process will generally consist of the following activities:

- The source separated or mixed organics will be tipped from trucks into the organics building receiving area, where they will be mixed with a bulking agent (such as compost or wood chips from other Site operations) and carbon source (such as fibre from the MRF). This building, which would also contain the pre-processing system for production of the slurry described above, will be kept under negative pressure to reduce the potential for fugitive odour emissions and the air will be exhausted and treated through a biofilter. The building will be heated using fuel oil;
- The blended material will be removed from the building and placed in the primary reactor cells. The primary reactors will be built in stages and consist of an encapsulation design consisting of a shallow excavation with a geomembrane bottom liner, an underdrain system to remove the liquor generated by the digestion process, an upper insulating layer and a geomembrane cover. Piping will be placed within the organic material to allow recirculation of collected liquor and for extraction of biogas and odour control. The primary reactor cells will be built on an ongoing basis based on the quantity of material to be processed and are anticipated to ultimately consist of two main cells that are up to 70 metres wide by 300 metres long, with sloped sides and heights up to about 6.5 to 7 metres. The material will be temporarily covered when placed in the cell until additional material is placed in the adjoining area. The anaerobic digestion period within the cell could be about 12 to 18 months. The extracted biogas will be directed to an enclosed flare and/or power generation area. Once the anaerobic digestion is complete, air will be introduced to the digested product to turn the cell aerobic prior to removal of the cover to control potential odorous emissions; and
- The collected liquor will be sent to a secondary reactor within a building where it will be digested anaerobically and converted to biogas consisting primarily of methane and carbon dioxide. The biogas will be sent to an enclosed flare and or a power generation area where it will be combusted (in combination with collected LFG) and the combustion air treated prior to release. The flare will be sized to accommodate a total gas flow from the secondary digester and landfill of 3,000 cubic feet per minute, and have an approximate stack height of about 12 metres. In the initial period of Site operation, all collected gas will be flared. If there is enough gas generated and the economics are favourable, a power generation area would be utilized to generate electricity for export to the grid. Although the final approvals for a power generation

area would be pursued subsequent to EAA and EPA approval of the CRRRC, based on the estimated gas generation it is anticipated that up to seven generating sets (engines and generators) may be used to potentially generate up to 7 to 8 megawatts of electricity. As much liquor as possible will be recirculated into the primary reactor and the surplus will be considered for possible beneficial alternative off-Site uses such as farm nutrients or combined with landfill leachate for treatment. The flare and generation plant will be located near the northeast corner of the Site adjacent to the primary reactor.

The compost processing and storage pad will occupy an area of up to 3.5 hectares and will have a paved surface. The following activities will be carried out on the pad: 1) leaf and yard materials received will be ground, initially aerobically composted in open windrows/trapezoidal piles, and then transferred and reformed into open windrows/trapezoidal piles for final curing; 2) received clean wood will be ground and processed into chips; 3) the digested product from organics processing will be cured in windrows/trapezoidal piles; 4) these products will be screened and stored for subsequent use on- or off-Site; and 5) residual materials will be transferred for disposal.

It is also possible that an aerated pile composting process may be utilized on the pad, wherein air is introduced to the material to be composted in order to sustain elevated oxygen content within the material and thereby further assist/accelerate the pathogen kill and composting process. This could be desirable to enhance processing of leaf and yard waste or for additional processing of the digested product. If this process is to be utilized, the compost pad would be designed/equipped to supply the air and collect the liquid generated from this process; the liquid would be re-used to moisture-condition the material. The need for any further processing of the digested product and length of the curing period will be determined during the initial, demonstration scale operation of the BioPower organics processing facility.

Although not anticipated, if the demonstration scale BioPower facility described for processing organics in the mixed IC&I waste stream does not meet its design objectives or is otherwise not approvable for full scale use by the MOECC, then an alternative approach will need to be developed in order for the CRRRC to provide processing and diversion of mixed load organics. Because there is not currently to our knowledge another process in commercial use for processing organics in the mixed IC&I waste stream, at this time Taggart Miller proposes that organics diversion at the CRRRC would consist of the continuation of pre-processing source separated organics and sending the organic slurry to off-Site anaerobic digesters for processing. This would continue until such time as a process to digest organics in the mixed IC&I waste stream is proven and commercially viable.

If an alternative system for processing organics in the mixed IC&I waste stream becomes necessary and available and is proposed for the CRRRC, the following amending procedure would be followed:

1) Taggart Miller would notify the MOECC that an alternative mixed waste organics processing method was being pursued due to inadequate performance of the BioPower demonstration facility;

2) A revised D&O Report for the organics processing facility would be developed and the overall Site Development Plan would be modified as needed;

3) Within the revised D&O Report the potential sources of potential effects would be identified and compared to those for the previously evaluated BioPower organics processing facility. If necessary, the predictive

effects modelling would be re-run; an update to the overall Site Emission Summary and Dispersion Modelling (ESDM) and Acoustics Reports would be made; and

4) An ECA amending application would be made reflecting the proposed changes in the alternative organics processing facility.

10.6 Petroleum Hydrocarbon Contaminated Soil Treatment

The location of the PHC contaminated soil treatment area was shifted somewhat south in the updated Site Development Plan to the west central portion of the Site area north of the Simpson Drain. The overall area for this process was increased to about 1.2 hectares to allow for the construction and operation of up to 8 biopile cells and for an enlarged PHC soil receiving building.

As described in Section 9.2.2, the approach that will be taken in the initial period of operation is to pre-treat the PHC impacted soil using the biopile technique, as required, prior to use as daily cover in the landfill component of the CRRRC to prevent off-Site odour impacts. The incoming PHC soil would be placed on a concrete pad and temporarily covered with a low permeability tarp and stored until placed in a biopile cell. The concrete pad would be designed so that rainwater runoff and water draining from the PHC soil could be captured for re-use in the biopile or treated if required.

If the MOECC at some point requires treatment of PHC soils prior to using them in the landfill regardless of their odour-generating capability, the objective of the treatment using the biopile technique will then be to meet the required concentrations for PHCs in the soil, while capturing and treating the generated liquid and gas. The incoming soils would be received inside a building where they would be conditioned and stored until placed in a biopile cell; the air emissions from the conditioning process would be treated with a biofilter.

In addition to the process information provided in Section 9.2.2, it was assumed that each aerated static biopile cell could have an area of approximately 600 square metres with sloped sides and a height of about 2.5 metres, to provide a working volume of approximately 1,000 cubic metres. The cell base would be provided with a geomembrane liner to contain the liquid produced from the process. Piping would be provided in the base to both collect liquid and to both add and remove air from the soil; an irrigation piping system would be installed at the top of the soil to supply water, to provide amendments and nutrients, and recirculate the collected liquid. A central treatment unit would be provided to regulate and optimize the conditions within the biopile to achieve the pre-treatment or treatment. The extracted air would be managed through a biofilter before final polishing with an activated carbon filter.

10.7 Surplus Soil Management

The location of the surplus soil management area was shifted from near the north boundary to the west central portion of the Site area north of the Simpson Drain. The ongoing operation in this area, as well as other areas of the Site where surplus uncontaminated soil may be temporarily stored until such time that it is required for re-use, will basically consist of the dumping and dozing of incoming soil into a stockpile(s), and removal of this soil for re-use on-Site. It is anticipated that the temporary stockpiles could be up to about 5 metres in height.

10.8 Landfill Component

As described in Section 9.0, the landfill component of the CRRRC will require between approximately 9.4 and 10.7 million cubic metres of airspace volume for a period of 30 years. This is based on an assumed five year ramp up of waste receipts to a maximum of 450,000 tonnes/year and achieving an overall diversion rate in the range of 43 to 57% (including surplus soil for daily cover) over time. The landfill component presented as part of preferred Concept A satisfied this requirement. The landfill component design was further refined by considering: the buffer width needed around the landfill (as described in Section 10.12); additional geotechnical analysis of static and seismic stability; estimated settlement of the waste caused by consolidation of the underlying clay soil deposit under the weight of the waste; design of the landfill base grades and leachate collection system; leachate containment system requirements to provide groundwater protection as described in O. Reg. 232/98 (MOE, 1998a); and design of the LFG management system. These analyses are described in Volume III of the EASR document package and the designs with additional details are presented in Volume IV. An overview of the proposed landfill design is provided below and is illustrated on accompanying figures.

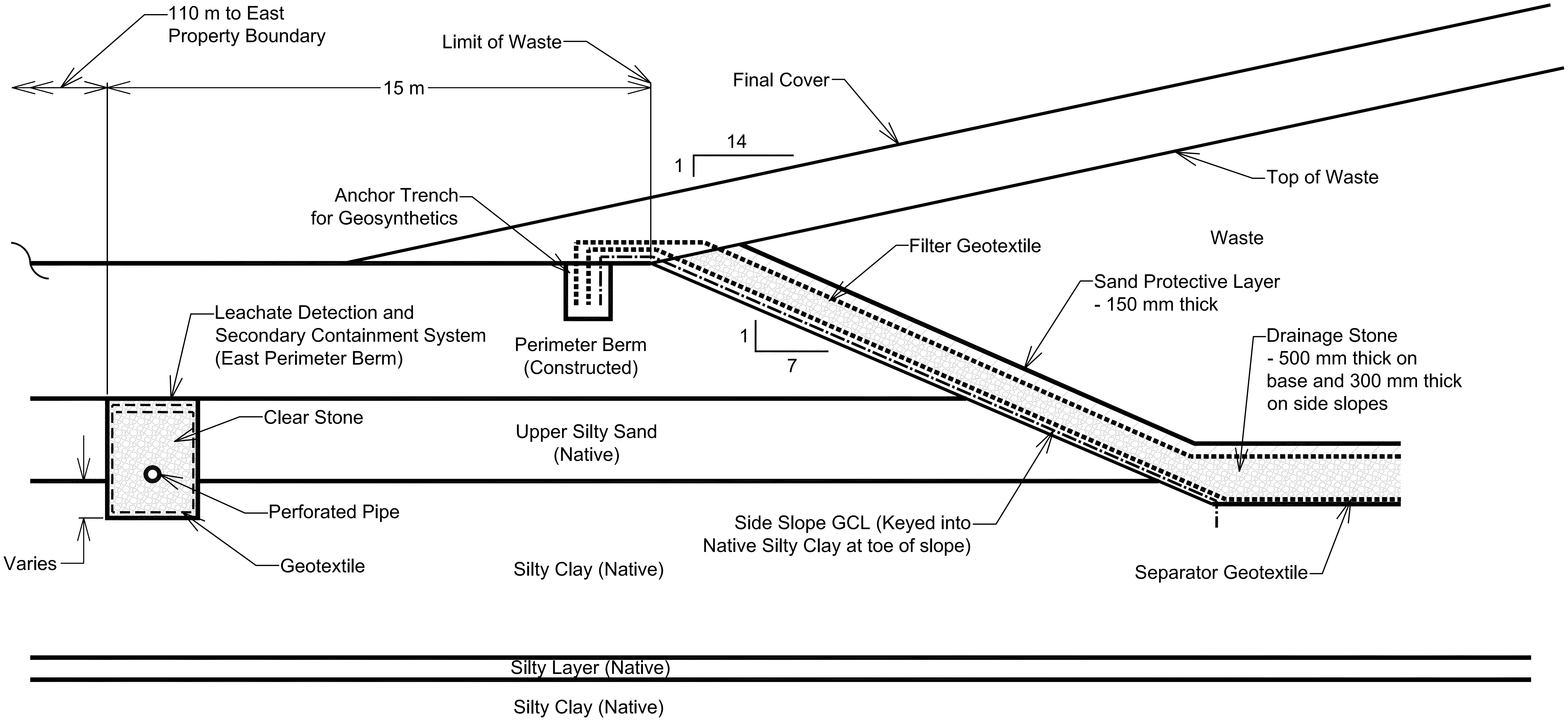
Landfill Base: The total landfill footprint is approximately 84 hectares. The landfill base will be excavated 1.5 to 2.5 metres below existing ground level and will be surrounded with a perimeter containment berm. The perimeter berm will be constructed to about 3.5 metre height using the excavated soils and/or similar types of imported materials. The perimeter berm will have a top platform width of around 35 metres to provide adequate overall landfill stability, with 7 horizontal to 1 vertical sideslopes. The berm will also accommodate a perimeter road, header piping for leachate and LFG and other service lines, and provide conveyance of runoff to the SWM system. An approximately 20 metre wide bench will be provided between the exterior toe of the perimeter berm and adjacent facilities within the buffer, providing both access and working area around the landfill.

The design of the leachate containment and leachate collection system will meet the requirements of O. Reg. 232/98 (MOE, 1998a), within the context of the Site-specific geological and hydrogeological setting, as follows:

- For leachate containment, a Site-specific design approach will be followed. The natural low permeability silty clay deposit will provide the low permeability bottom liner for the landfill. The perimeter berm will incorporate a constructed low permeability hydraulic barrier (a GCL) extending the full height of the berm and down through the surficial silty sand layer or weathered clay zone and keyed into the underlying upper silty clay. This would cut off the potential pathway for off-Site leachate migration via the berm fill and surficial silty sand layer. A typical cross-section showing the perimeter leachate containment is shown on Figure 10.8-1.
- The design of the landfill base recognizes that consolidation settlement of the silty clay deposit will occur and that the largest settlements will be below the central portion of the landfill where the waste thickness is greatest. As such, the landfill base will be shaped to provide drainage of leachate from the perimeter of the landfill towards the centre; the leachate will be conveyed through a system of perforated and non-perforated leachate piping and a granular drainage blanket. Leachate sumps (manholes) will be provided within the landfill; they will be located at the lowest points of the base grading, both when constructed initially and allowing for the longer term consolidation of the clay as the waste is placed. The leachate collection system design will accommodate the expected settlement. As the settlement of the clay occurs, the slope of the base and piping will increase from that originally constructed, thereby

enhancing the transmission of leachate to the interior leachate sumps. Leachate removal from each sump will be by means of submersible pumps and via piping to a forcemain that will convey the collected leachate for treatment (as described in Section 10.9). The layout of the base is shown on Figure 10.8-2. Cleanout access for inspection and flushing/cleaning of the leachate collection piping system will be provided, both from the exterior of the landfill and by cleanouts provided from within the landfill.

A leachate detection and secondary containment system (LDSCS), shown on Figure 10.8-2, will be positioned beneath the perimeter berm on the hydraulically downgradient (eastern) side of the landfill. As shown on Figure 10.8-1, the LDSCS, which will be a granular filled trench completed in the surficial silty sand layer, will allow for the monitoring of the performance of the landfill's leachate containment system (the natural clay deposit, the leachate collection system, and perimeter berm with the GCL) and provide secondary containment in the unlikely event that leachate enters the surficial silty sand layer outside of the landfill footprint.



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NOTES:

THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT.

PROJECT

ENVIRONMENTAL ASSESSMENT OF THE
CAPITAL REGION RESOURCE RECOVERY CENTRE

TITLE

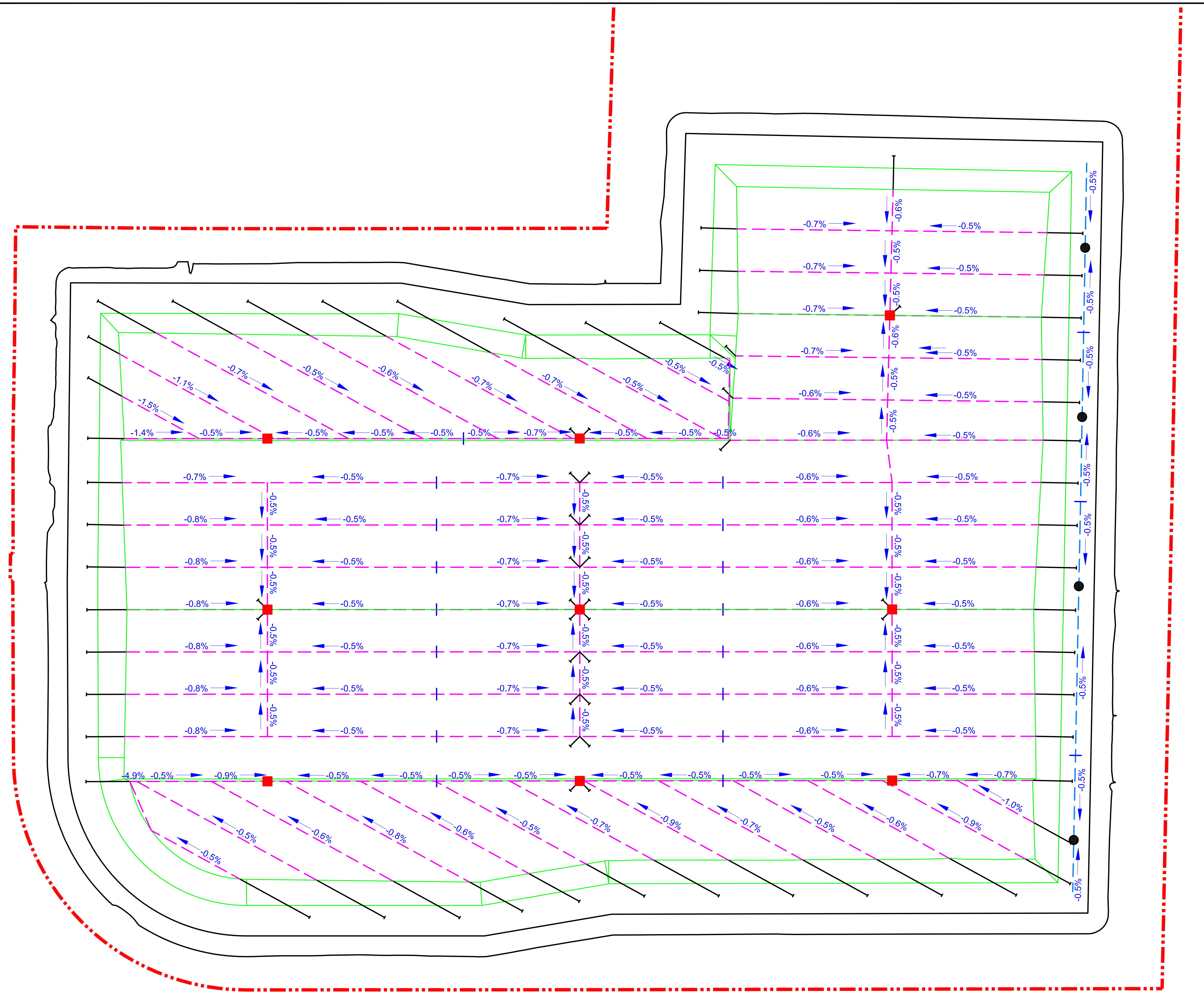
TYPICAL PERIMETER LEACHATE CONTAINMENT CROSS-SECTION

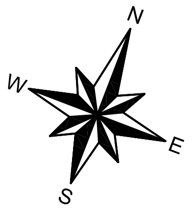
Golder Associates
Ottawa, Ontario, Canada

PROJECT No.		12-1125-0045	FILE No. 1211250045-V1-EAr-10.8-1.dwg	
DESIGN	M.K.F.	15 Oct. 2013	SCALE AS SHOWN	REV. 0
CAD	M.L.F.	15 Oct. 2013	DRAWING No.	
CHECK	M.K.F.	Aug. 2014	Figure 10.8-1	
REVIEW	P.A.S.B.	Aug. 2014		

PLOT DATE: November 5, 2014
FILENAME: N:\Active\Spatial_IM\Miller_Paving_Ltd\CRRRC\ACAD\Vol 1 (Report Figures)\EA report\1211250045-V1-EAr-10.8-1.dwg

PLOT DATE: November 10, 2014
FILENAME: N:\Active\Spatial_IM\Miller_Paving_Ltd\CRRRC\ACAD\Vol 1 (Report Figures)\EA report\1211250045-V1-EAr-10.8-2&3.dwg





LEGEND:

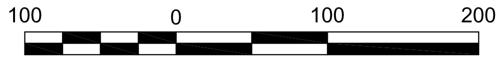
- PROPERTY BOUNDARY
- -0.5% LEACHATE COLLECTION PIPE SLOPE (initial)
- 🟥 LEACHATE MANHOLE (nts)
- CLEAN OUT LOCATION (nts)
- PIPE GRADE BREAK POINT
- LEACHATE COLLECTION PIPE
- MAIN SUBGRADE SLOPE BREAK POINTS
- PERIMETER BERM SLOPE BREAK POINTS
- ● LEACHATE DETECTION AND SECONDARY CONTAINMENT SYSTEM MANHOLE (nts)
- LEACHATE DETECTION AND SECONDARY CONTAINMENT SYSTEM COLLECTION PIPE

NOTE:

THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT.

REFERENCES:

PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83
COORDINATE SYSTEM: UTM ZONE 18



SCALE 1:5,000 METRES

REV	DATE	DES	REVISION DESCRIPTION	CAD	CHK	RVW
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PROJECT
ENVIRONMENTAL ASSESSMENT OF THE
CAPITAL REGION RESOURCE RECOVERY CENTRE

TITLE
LEACHATE COLLECTION AND LDSCS PIPING LAYOUT PLAN

Golder Associates
Ottawa, Ontario, Canada

PROJECT No.		12-1125-0045
DESIGN	M.K.F.	15 Oct. 2013
CAD	M.L.F.	15 Oct. 2013
CHECK	M.K.F.	Aug. 2014
REVIEW	P.A.S.B.	Aug. 2014

FILE No. 1211250045-V1-EAr-10.8-2&3.dwg
SCALE AS SHOWN REV. 0
DRAWING No.
Figure 10.8-2

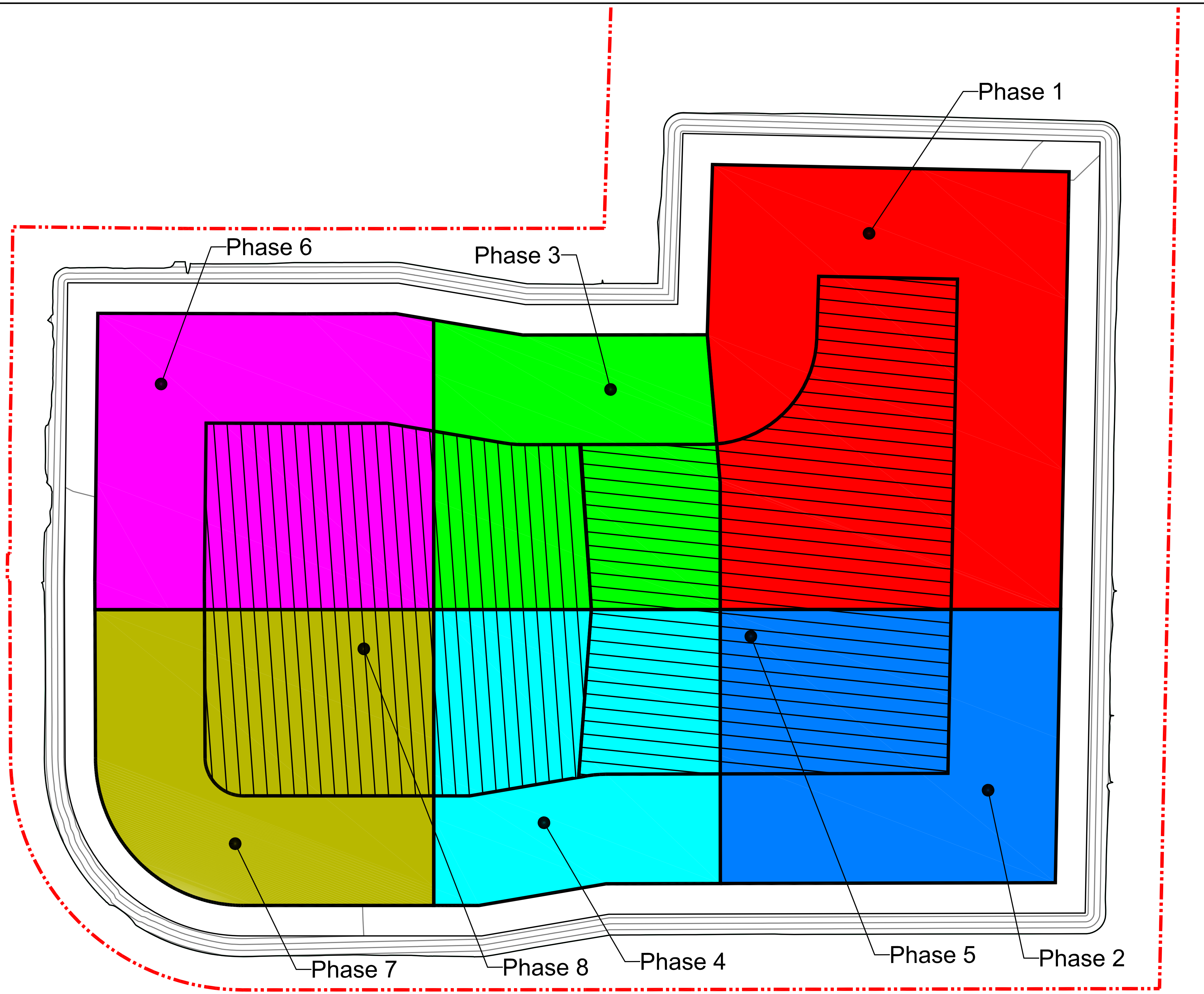
- Landfill Development: The landfill component has been planned to be developed in eight phases. The phase divisions recognize the layout of the base grades and the leachate collection system, and will allow for sequential construction of the overall landfill footprint. The proposed phasing is shown on Figure 10.8-3 and filling will generally progress from northeast to southwest within the landfill footprint. Sequential filling in Phases 1 through 4 will progress up to a height of about 12 to 13 metres above ground level (approximate elevation 89 masl). Phase 5 waste will be placed on part of the top of Phases 1 through 4 up to its final elevation. Phases 6 and 7 will then be filled similar to Phases 1 through 4 and Phase 8 filling will take place on top of Phases 6 and 7 (and Phases 3 and 4) to complete the landfill. The area of each stage varies from about 11 to 21 hectares and it is estimated will provide airspace for operating periods ranging from about 2 to 6 years. The operating period for each Phase is variable because certain Phases have to be initially built with relatively flat temporary interior waste sideslopes on two sides (thereby reducing the available airspace above the footprint of that Phase), while filling in others involves the placement of waste above the temporary sideslopes within the previous adjacent Phase(s) footprints. The phasing is described in Table 10.8-1.

Table 10.8-1: Landfill Phasing

Phase	Footprint Area (hectares)	Estimated Years of Operation
1	21.6	4.5
2	12.9	3.6
3	11.0	2.3
4	11.3	4.8
5	On top of Phases 1 to 4	1.7
6	13.9	3.2
7	13.3	6.6
8	On top of Phases 3 to 7	3.3
Totals	84.1	30

As part of the EA approval, Taggart Miller has assessed the potential impacts from the total proposed landfill airspace. Recognizing that the rate of landfill airspace consumption will depend on the annual tonnage received and the diversion performance of the CRRRC over time (including the development of end markets), it is proposed that the landfill airspace be approved under the EPA in stages. Considering the proposed phasing shown on Figure 10.8-3, the practical approach is to split the landfill into two stages so that, as described above, the first stage of the landfill can be built to a completed configuration prior to starting to fill the second phase. The two stages are:

- Stage 1 consisting of Phases 1 through 5, which corresponds to approximately 5.7 million cubic metres of airspace and an estimated operating life of about 17 years; and
- Stage 2 consisting of Phases 6 through 8, which corresponds to approximately 4.4 million cubic metres of airspace and an estimated operating life of about 13 years based on the assumptions used in this EASR.



LEGEND:

-·-·-	PROPERTY BOUNDARY
═	PERIMETER BERM CONTOURS (interval 1.0 m)

NOTE:

THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT.

REFERENCES:

PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83
COORDINATE SYSTEM: UTM ZONE 18

100 0 100 200
SCALE 1:5,000 METRES

REV	DATE	DES	REVISION DESCRIPTION	CAD	CHK	RVW

PROJECT

ENVIRONMENTAL ASSESSMENT OF THE
CAPITAL REGION RESOURCE RECOVERY CENTRE

TITLE

LANDFILL PHASING PLAN

Golder Associates
Ottawa, Ontario, Canada

PROJECT No.		12-1125-0045
DESIGN	M.K.F.	15 Oct. 2013
CAD	M.L.F.	15 Oct. 2013
CHECK	M.K.F.	Aug. 2014
REVIEW	P.A.S.B.	Aug. 2014

FILE No. 1211250045-V1-EAr-10.8-2&3.dwg
SCALE AS SHOWN REV. 0
DRAWING No.

Figure 10.8-3

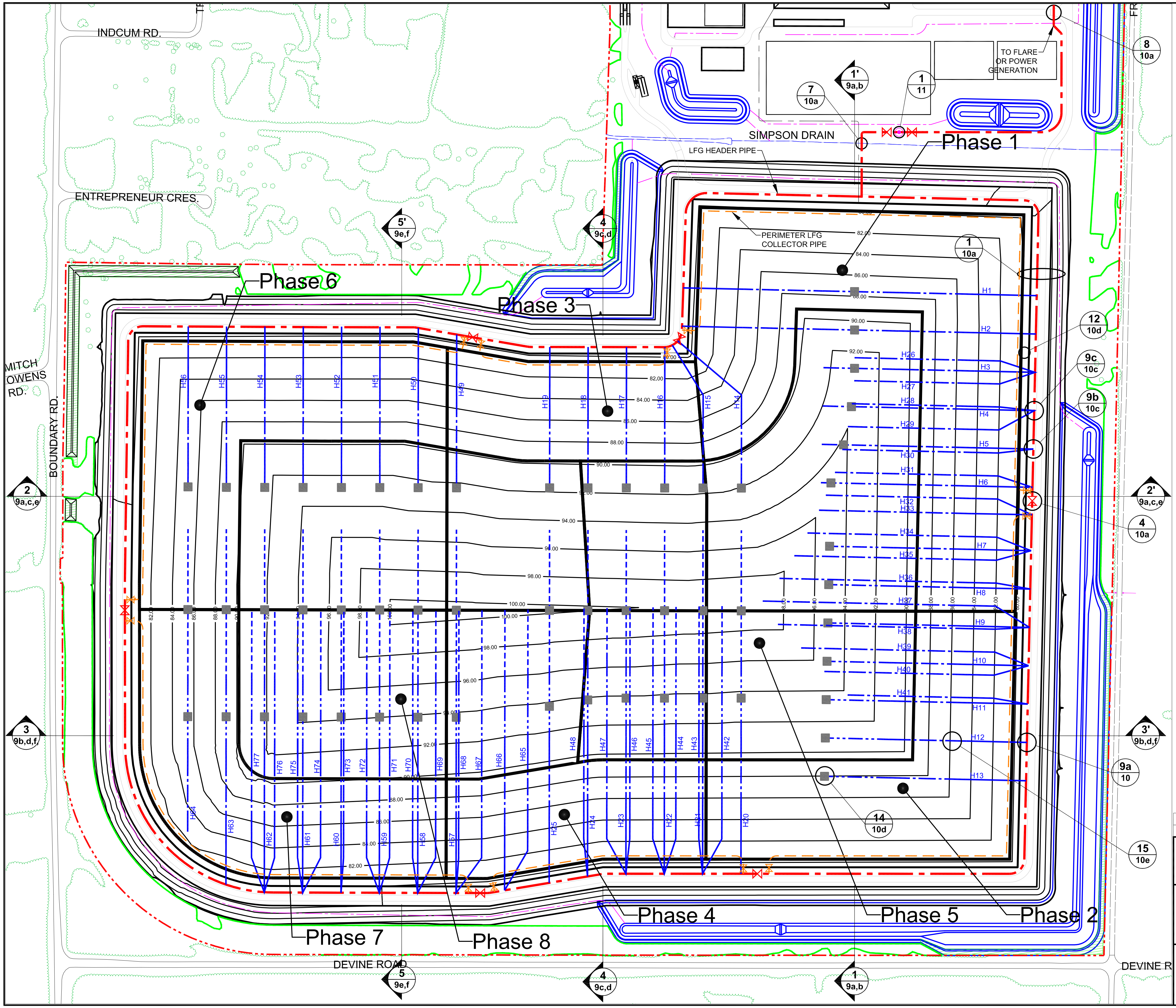
PLOT DATE: September 4, 2014
FILENAME: N:\Active\Spatial_IM\Miller_Paving_Ltd\CRRRC\ACAD\Vol 1 (Report Figures)\EA report\1211250045-V1-EAr-10.8-2&3.dwg

Landfill Gas Management: The proposed LFG management system will be designed in accordance with the requirements of O. Reg. 232/98 (MOE, 1998a). Given the contemplated diversion of IC&I organics from disposal to the extent practical, landfill gas and odour associated with decomposition of organics within the landfill will be reduced. The proposed LFG management system is an active collection system consisting of horizontal collector piping installed in two layers within the waste as the waste is placed, and header piping around the perimeter of the landfill and extending to the on-Site condensate management facilities, vacuum extraction plant and enclosed flare. This collection system will also be able to supply a possible power generation facility. The layout of the proposed LFG management system is shown on Figure 10.8-4.

The proposed LFG collection system will conform to the most recent version of B149.6-11 Code for Digester Gas and Landfill Gas Installations (CSA, 2011), which has been adopted by the Technical Safety and Standards Authority (TSSA) for use in Ontario as of December 2012. The LFG collection system has also been designed for the predicted clay foundation settlement.

Due to the presence of clay soils beneath and in a large area beyond the Site, the presence of a high groundwater table in the area and the proposed low permeability barrier through the surficial sand layer around the landfill perimeter, the potential for off-Site migration of LFG through the subsurface is negligible. In addition, there is a minimum 100 metre wide buffer between the landfill footprint and the Site property boundaries; and there are ditches and drains that would interrupt the movement of any LFG in the unlikely event that it had migrated away from the landfill through the thin unsaturated zone.

Based on the analysis of landfill performance in terms of compliance with the groundwater protection requirements of O. Reg. 232/98 (MOE, 1998a), it is currently proposed that a permeable soil final cover be used on the landfill. An allowance for up to a 1 metre thick final soil cover has been provided, although the final soil cover is likely to have a total thickness of approximately 0.75 metres. Final cover construction will take place after filling in a part of the landfill is complete.



LEGEND:

🟥	HDPE LFG HEADER PIPE
🟧	HDPE LFG PERIMETER COLLECTOR PIPE
🟦	HDPE NON-PERFORATED LFG HORIZONTAL CONVEYANCE PIPE
🟦	HDPE PERFORATED LFG HORIZONTAL COLLECTOR (PERFORATION SPACING - 500 mm)
🟦	HDPE PERFORATED LFG HORIZONTAL COLLECTOR (PERFORATION SPACING - 250 mm)
🟦	HDPE PERFORATED LFG HORIZONTAL COLLECTOR (PERFORATION SPACING - 125 mm)
■	HORIZONTAL COLLECTOR DRAIN
⋈	VALVE
◉	CONDENSATE TRAP
0/10 0/10	SECTION LINES
X/X	REFERENCE DETAIL OR SECTION REFERENCE DRAWING SHEET

NOTES:

1. DETAILS AND DIMENSIONS SUBJECT TO MODIFICATION DURING DETAILED DESIGN.
2. WELLHEAD / VALVE AT DOWNSTREAM END OF HORIZONTAL COLLECTOR IS NOT SHOWN.
3. SECTIONS AND DETAILS ARE PROVIDED IN THE D&O REPORT.
4. THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT.

100 0 100 200

SCALE 1:5,000 METRES

REV	DATE	DES	REVISION DESCRIPTION	CAD	CHK	RVW
△						

PROJECT

ENVIRONMENTAL ASSESSMENT OF THE
CAPITAL REGION RESOURCE RECOVERY CENTRE

TITLE

LANDFILL GAS COLLECTION SYSTEM PLAN

Golder Associates
Ottawa, Ontario, Canada

PROJECT No.		12-1125-0045
DESIGN	A.M.H.	29 Nov. 2013
CAD	M.L.F.	03 Dec. 2013
CHECK	M.K.F.	Aug. 2014
REVIEW	P.A.S.B.	Aug. 2014

FILE No. 1211250045-V1-EAr-10.8-4.dwg

SCALE AS SHOWN REV. 0

DRAWING No.

Figure 10.8-4

PLOT DATE: October 9, 2014
FILENAME: N:\Active\Spatial_IM\Miller_Paving_Ltd\CRRRC\ACAD\Vol 1 (Report Figures)\EA report\1211250045-V1-EAr-10.8-4.dwg

Landfill Capacity: As described in Section 9.2.2, the presence of the clay deposit beneath this Site requires relatively flat sideslopes in order that the landfill has adequate stability. The landfill design has 14 horizontal to 1 vertical sideslopes above the perimeter berm up to about elevation 89 masl or 12 to 13 metres above ground level and then a 20 horizontal to 1 vertical slope up to a central peak or ridge area. The maximum height of the designed final landfill contours, as illustrated by the contours and cross-section on Figures 10-1 and 10-2, respectively, is about 25 metres above ground level. This corresponds to an airspace volume of about 10,170,000 cubic metres for waste and daily cover, without accounting for settlement.

As described in Volumes III and IV of this EASR submission, the clay beneath the landfill will consolidate under the weight of the waste. As a result, the elevation to which waste is placed will decline as the clay below it consolidates, some of which will occur during the period that filling is ongoing. Because the stability of the landfill is dependent on the thickness of waste, the thickness will be monitored and will be used to determine the remaining thickness of waste that can be placed. Although the overall final shape of the landfill will be similar to the design, it is expected that the landfill will not actually reach the maximum ridge/peak elevation presented in the design. In this regard, it is expected that the final contours for Phases 5 and 8 (the two periods of filling the upper part of the landfill above previously filled areas) may be somewhat lower than, but within the approved landfill landform contours. As the clay consolidates over time its shear strength will increase; this increase in shear strength will be considered in consultation with the MOECC in determining the total achievable waste thickness and the final contours for Phases 5 and 8. The final shape will also provide positive drainage runoff.

Landfill Operations: As required by O. Reg. 232/98 (MOE, 1998a), landfill operations are described in Volume IV of this EASR document package. This includes procedures for receiving, placing, compacting and covering waste as well as for controlling potential nuisance effects associated with landfill operations.

10.9 Leachate Treatment

In the Site Development Plan, the location of leachate treatment was shifted somewhat southward to the land area north of the Simpson Drain. This was mainly a result of preparing a preliminary design of the Site drainage system including room for the required SWM system components.

An assessment of leachate management alternatives is presented in TSD #10. The preferred leachate management system was identified as off-Site treatment and discharge at the City of Ottawa wastewater treatment plant Robert O Pickard Environmental Centre (ROPEC). On-Site pre-treatment will be required for this option. The leachate will be pre-treated as required to comply with the City of Ottawa Sewer Use By-law requirements as set out in the required discharge agreement between the City of Ottawa and Taggart Miller.

The proposed leachate pre-treatment facility consists of an equalization tank, leachate storage pond, liquor storage tank, boilers and heat exchangers, chemical precipitation contingency to reduce elevated metals toxic to the biological treatment if they occur, Sequencing Batch Reactor (SBR) system, effluent storage pond, truck filling station and sludge management system. It will pre-treat both leachate from the landfill and liquor from the on-Site organics processing facility.

Considering that implementation of this preferred leachate management option requires Taggart Miller to enter into agreement with the City of Ottawa to accept the wastewater from the CRRRC at ROPEC, if the City of Ottawa option proves not to be available, it will be necessary to treat the wastewater using another approach.

In that case, the following amending procedure would be followed:

1) MOECC would be notified that it was not possible to conclude an agreement with the City to accept the CRRRC pre-treated wastewater at ROPEC;
2) The other alternatives assessed in the evaluation would be re-visited, including the on-Site wastewater treatment and discharge option, and any possible additional alternatives available at that time would be identified and included in an updated comparative evaluation, to decide on the preferred wastewater treatment option to be pursued;
3) Appendix J to the D&O Report (Leachate Management Plan) would be revised to describe the proposed option for which provincial approval is to be sought. For example, assuming that no other alternatives are identified, Appendix J would be revised to describe on-Site wastewater treatment and discharge option. The Site Development Plan would also be modified as required to accommodate the proposed option;
4) The potential sources of potential effects would be identified and compared to those for the preferred option; if necessary the predictive effects modelling would be re-run; and the ESDM and Acoustics Reports would be modified; and
5) An ECA application would be modified to reflect the proposed changes in wastewater treatment.

10.10 Ancillary Facilities/Components

In the Site Development Plan, the location of the maintenance garage was shifted to the northeast corner of the property; an employee parking lot has been located adjacent to it, primarily for the use by staff working at facilities other than the MRF and C&D processing buildings.

Secondary scales are proposed along the internal access/exit road to/from the landfill. The truck tire wash is located along the exit road from the landfill.

Some minor adjustments were made to the internal road network to accommodate shifting of components and facilitate Site operations. As shown on Figure 10-1, all on-Site roads north of the Simpson Drain will be paved, except for the internal road along the east side of the Site leading from the landfill to the maintenance garage; this road has to remain gravel surfaced for use by equipment associated with landfill operations such as compactors, dozers, etc.

10.11 Surface Water Management

Design of drainage requirements for the CRRRC is shown on Figure 10-1. The approach to system design was to closely match post-development flows to pre-development flows by providing the required retention time in on-Site ponds and by doing so also provide an Enhanced Level of total suspended solids (TSS) removal (MOE, 2003b). The approach also aimed at dividing up the Site into three drainage areas that are similar in size to the three pre-development drainage areas leading to the three surface water discharge locations from the Site. The three discharge locations, which all flow eastward and enter Shaw's Creek, are to the Regimbald Municipal Drain to the northeast, to the Simpson Municipal Drain in the central portion and to an existing ditch in the southern portion leading to the Wilson-Johnston Municipal Drain. The system consists of Site grading, ditching and culverts leading to five linear stormwater ponds or pairs of ponds; one of the ponds will receive stormwater drainage from a portion of the diversion areas to provide a large fire pond (as per the building code) to provide water for firefighting purposes, if required. Oil-water separators will be used in the vehicle maintenance garage and reversed slope outlet pipes will be used for stormwater management ponds that receive drainage from vehicle parking areas. Also, it is envisioned that the tire wash station will be a recirculating system with a solids interceptor.

10.12 Buffers

To refine the preferred Site development concept, additional geotechnical analysis of landfill stability was completed to further assess the geometrical requirements of this landform, including its interaction with the required stormwater ponds, Simpson Drain, leachate management and other Site features. The requirements for perimeter screening were also further considered, to determine where constructed screening features (earth berms 2 to 3 metres high with trees transplanted on them) were required and their geometry, and where the screening could be provided by leaving an adequate width (15 to 20 metres) of existing tree cover around the perimeter of the property. Constructed screening will be required at the northeast and southeast corner areas and along a portion of the west central Site boundary. It is noted that a portion of the constructed screening proposed at the northeast corner could be replaced by transplanting trees in the gap in the existing tree line at the north end of the Frontier Road cul-de-sac. This would also effectively screen the view of the Site for persons travelling along Highway 417.

The result of this design and analysis was to increase the width of the buffer area adjacent to the east side, the east half of the south side and the northwest corner of the landfill from 100 metres to 125 metres. Around the remainder of the landfill the perimeter buffer would be 100 metres, as per the O. Reg. 232/98 (MOE, 1998a).

10.13 Operating Hours

It is proposed that the Site will be open for material and waste receipts between 6:00 a.m. and 6:00 p.m. Monday through Saturday. Operating hours for the MRF and C&D processing facilities will be between 7:00 a.m. and 11:00 p.m. Monday through Saturday, although it is expected they will generally operate between 7:00 a.m. and 5:00 p.m. The evening hours provide the flexibility to run two shifts during high demand periods. Landfill operations, organics processing in the building, composting and PHC soils treatment are proposed to be 6:00 a.m. to 7:00 p.m. Monday through Saturday. Organics processing at the primary reactor cells will occur between 7:00 a.m. and 7:00 p.m. Monday through Saturday. The Site is expected to operate between 300 and 312 days per year.

11.0 PREDICTION AND ASSESSMENT OF ENVIRONMENTAL EFFECTS

This section of the EASR corresponds to Task 3 and Task 4 of the methodology described in Section 2.3 and summarizes the results of the assessment of effects of the proposed CRRRC on the environment. The completion of Task 3 is summarized in Sections 11.2 to 11.8 while Task 4 is in Section 11.9. The assessments were conducted following the methodology described in the workplans in the approved TOR (Appendix A to the EASR) for each of the environmental components. The assessment was based on the description of the project in Section 10.0 and further detailed in Volume IV D&O Report. The assessment for each of the components is provided in TSDs #2 to #9 that accompany the EASR, for the Geology, Hydrogeology and Geotechnical component in Volume III and for the Surface Water component in Appendix A to the Volume IV D&O Report. In general, the predicted effects of the project are compared to the relevant provincial regulations, standards and guidelines; for those components where these do not exist, the predicted effects are assessed qualitatively.

11.1 In-Design Mitigation Measures and Best Management Practices

In order to ensure that the CRRRC operates in accordance with MOECC and other regulatory requirements and standards, a number of in-design mitigation measures were incorporated. In-design mitigation measures are those that are considered integral to the design and include best management practices for various project components and phases of project activities. These in-design mitigation measures have been assumed in completing the effects assessment and, as such, all the predicted effects described represent the net effects.

Table 11.1-1 lists the mitigation measures and best management practices that were assumed to be incorporated into the design of the CRRRC and considered in the impact assessment. These measures are also intended to be adaptive in the event that alternative mitigation approaches, which achieve the same objective more efficiently, are identified.

Table 11.1-1: In-Design Mitigation Measures and Best Practices

Environmental Component	In-Design Mitigation Measures	Best Management Practices
Atmosphere	▪ Maximize drive-through road patterns on-Site to minimize need for use of back-up alarms ▪ Paved roads in the northern part of the Site ▪ Berms to attenuate noise as required, i.e., from the active face of the landfill, as required ▪ Use equipment that complies with appropriate emission standards ▪ Truck waiting area inside the Site ▪ Maintain existing vegetation in buffer around Site perimeter or, where required construct perimeter screening berms with plantings on top ▪ Receiving of organics and materials at the MRF and C&D processing, inside buildings ▪ Biofilters on the exhaust of air from within the organics processing and PHC contaminated soil treatment facilities ▪ Dust collection system consisting of a bag house and cyclone on exhaust air from the	<u>Air Quality</u> ▪ Place compacted granular materials and, if required, surface sealing on regularly used Site construction roads ▪ Use of typical best management practices for dust suppression, (e.g., covering vehicle loads, use of water or other suppressants, etc.) ▪ Minimize idling of vehicles on-Site <u>Noise</u> ▪ Restrict the use of heavy equipment to daytime hours as best possible ▪ Maintain vehicles and equipment, and ensure they have noise suppression equipment ▪ Control speed limit for traffic on-Site <u>Odour</u>

Environmental Component	In-Design Mitigation Measures	Best Management Practices
	MRF and C&D processing buildings ▪ Low permeability cover of organics primary reactor cells and PHC contaminated soil treatment cells ▪ Flare for combustion of biogas captured from the organics processing and from the landfill ▪ LFG collection system approach using horizontal collection from within the waste, installed during the filling period ▪ Truck tire wash for vehicles leaving the landfill area	▪ Time the frequency of turning of compost piles to avoid development of anaerobic conditions ▪ Introduction of oxygen into the anaerobically digested organics reactors to establish aerobic conditions prior to uncovering them ▪ Manage the working face of the landfill effectively to minimize potential for odorous emissions ▪ Apply appropriate daily cover on landfill ▪ Minimize the area of uncovered waste ▪ Placement of final cover progressively on completed portions of the landfill component ▪ Implement odour control measures for leachate holding and treated effluent ponds, if required, i.e., aeration system, cover, misting system, chemical addition
Geology and Hydrogeology (Groundwater)	▪ Engineered leachate/liquid containment for the landfill, leachate ponds, and organics processing and PHC treatment cells ▪ Perimeter liner system cut-off for the landfill, together with leachate collection system ▪ Adequate buffer width between landfill component and property boundary	▪ Provide construction quality control on all liner and collection system installations ▪ Provide monitoring and maintenance of leachate collection system components ▪ Inspect construction and operating equipment regularly and repair promptly if found to be leaking ▪ Geotechnical monitoring of landfill settlement
Surface Water	▪ Design surface water management systems to separate leachate and liquids from processing from clean surface water runoff ▪ Divert clean runoff to swales, ditches and ponds ▪ Design ditch systems to convey design storm flows ▪ Control post-development discharge flows to match pre-development conditions as close as possible ▪ Enhanced sediment removal in SWM system design ▪ Sedimentation and erosion control measures ▪ Design and construct the component liners and leachate/liquid collection systems to safeguard surface water resources	Surface Water Quality ▪ Implementation of a sediment and erosion control plan during construction and operations ▪ Re-vegetate final landfill cover ▪ Provide monitoring and maintenance of stormwater ponds; provide valve(s) on ponds, where necessary depending on ongoing water quality monitoring, to be able to batch-discharge water from the ponds ▪ Provide monitoring and maintenance of leachate /liquid collection systems ▪ Use standard best management practices for erosion control until vegetation cover is established Surface Water Quantity ▪ Manage surface water on-Site; control off-Site stormwater discharge Accidental Spills ▪ Operate, store and maintain (e.g., re-fuel, lubricate) all equipment and associated

Environmental Component	In-Design Mitigation Measures	Best Management Practices
		materials in an area away from surface water features in a manner that minimizes the potential for the entry of any deleterious substance into water bodies ▪ Inspect construction and operating equipment regularly and repair promptly if found to be leaking ▪ Develop a spill response plan
Biology	▪ Maintain existing perimeter vegetative buffers where possible	▪ Remove vegetative cover progressively in sequence with Site development ▪ Stabilize and re-vegetate (or use other materials appropriate to Site conditions) areas of soil disturbed/exposed during construction ▪ Ongoing review of condition of revegetation and maintenance ▪ Apply best management practices in applying chemical dust suppressants, fertilizers, pesticides and herbicides and minimize their use to the extent possible ▪ Conduct all vegetation clearing activities outside the breeding bird season where possible ▪ To the extent practical, limit the extent of disturbed areas and soil stockpiles, control their orientation (with respect to prevailing wind directions), and for piles to be left in place for a prolonged period of time seed to establish vegetation ▪ Schedule construction activities to minimize area and duration of soil exposure, to the extent practical ▪ Worker awareness program to avoid harm to milksnake (a species of concern), if they are in the Site-vicinity ▪ Manage waste effectively to avoid attracting nuisance wildlife and pests, control the nuisance wildlife populations as permitted and required, and conduct periodic inspections to monitor effectiveness of the pest control
Land Use & Socio-economic **and** **Agriculture**	▪ Maintain appropriate buffer between proposed on-Site activities and off-Site land uses ▪ Maintain perimeter vegetative buffers where possible; construct screening features where there is not already a significant stand of trees ▪ Provide Property Value Protection Plan and possibly other community benefits	▪ Control off-Site nuisance emissions, i.e., air, odour, dust in accordance with MOECC standards ▪ Purchase goods and services locally as best possible ▪ Prevent the on-Site generation and accumulation of litter ▪ Use litter fencing to control windborne trash

Environmental Component	In-Design Mitigation Measures	Best Management Practices
		from leaving Site ▪ Regularly clean up litter both on-Site and in the Site-vicinity ▪ Establish procedure to register and address complaints ▪ Use best efforts to establish a community liaison committee
Culture and Heritage Resources	▪ N/A since low potential for on-Site archaeological resources	▪ Should any archaeological resources be discovered, cease all alteration of the Site immediately and engage a licensed consultant archaeologist to carry out archaeological fieldwork ▪ Should any human remains be discovered, the police or coroner and the Registrar of Cemeteries at the Ministry of Consumer Services must be notified ▪ If during the process of development any archaeological resources or human remains of potential Aboriginal interest are encountered, the Algonquins of Ontario Consultation Office will be contacted
Traffic	▪ Provide required intersection improvements at the Site access location off Boundary Road ▪ Provide on-Site queuing area of sufficient capacity to avoid truck queuing on Boundary Road	

11.2 Atmosphere

The atmosphere environment component consists of two sub-components: noise/air quality and odour. The assessment of potential effects of the proposed CRRRC on each is described below.

11.2.1 Noise

The details of the noise assessment are provided in TSD #2.

The noise assessment was carried out at the most sensitive off-Site receptors (PORs) and potential vacant land receptors (VLs) in the Site-vicinity and near the haul route (refer to Figures 8.4.1-1 and 8.4.1-2, respectively). All POR and VL locations identified in this study are best described as being located in a Class 1 area as defined by the MOECC, which is an area with an acoustical environment typical of a major population centre, where the background noise is dominated by the road traffic, often referred to as urban hum (MOE, 2013b). Daytime, evening and nighttime hours for a Class 1 area are defined as follows:

- Daytime – 0700 to 1900 hours;
- Evening – 1900 to 2300 hours; and
- Nighttime – 2300 to 0700 hours.

The proposed operating hours of the landfill, compost facility, hydrocarbon contaminated soil treatment facility, and organics pre-processing are 0600 to 1900 hours. Outdoor activities for the organics processing at the primary reactor cells are limited to 0700 to 1900 hours. The proposed operating times for indoor operations for the MRF and C&D facility are from 0600 to 2300 hours. As such, under normal operations, the assessment for nighttime operations focused on the one hour period from 0600 to 0700 hours. Essential equipment associated with bio-gas, leachate and power generation is required to operate 24 hours per day 365 days of the year. As such, essential equipment has been assessed separately and focused on the period from 2300 to 0600 hours.

Landfill: The methodology was based on the MOECC publication “Noise Guidelines for Landfill Sites” (MOE, 1998c). This guideline outlines the sound level limit criteria for evaluating landfilling operations and ancillary facilities (i.e., stationary noise sources). The sound level limits for landfilling operations are 55 decibels (dBA) and 45 dBA during daytime and nighttime hours, respectively. Should the environment be dominated by noise sources such as industry, commerce or road transportation, which produce sound in excess of the above limits, the higher sound levels may be used as the limit. This guideline also outlines the protocol for evaluating off-Site haul road truck traffic. The assessment first considered the noise emissions associated with the landfilling operations of the CRRRC landfill component. Table 11.2.1-1 provides a summary of the overall sound power data for each noise source considered in the assessment of landfilling operations.

Table 11.2.1-1: Sound Power Data for Landfilling Operations Noise Sources

Source	Quantity	Overall Sound Power Level (dBA)
Loader	1	109
Excavator	1	103
Backhoe	1	92
Grader	1	116
Dozer D6	1	110
Dozer D8	1	114
Compactor	1	108
Water Truck	1	107
Haul Trucks	35 (total peak in and out)	103

Table 11.2.1-2 provides a summary of the maximum landfilling operations noise modelling results for the identified PORs and VLs in the Site-vicinity.

Noise predictions were carried out for each of the eight phases within the landfill (as shown on Figure 10.8-3). Specifically, source locations and elevations were selected to ensure that the predicted Site-vicinity noise levels would result in the worst-case noise predictions at all receptor locations. The corresponding phase within the landfill is presented with the maximum predicted noise level.

Table 11.2.1-2: Landfilling Operations Noise Predictions (dBA)

Receptor	Existing Minimum Noise Levels (0600 to 0700 hours)	Existing Minimum Noise Levels (0700 to 1900 hours)	Maximum Predicted Landfilling Operations Noise Levels (Phase)	Compliant with MOECC Noise Guidelines
POR01	63	65	54 (6)	Yes
POR02	56	58	53 (6)	Yes
POR03	56	58	55 (7)	Yes
POR04	63	65	53 (6)	Yes
POR05	63	65	50 (6)	Yes
POR06	63	65	48 (6)	Yes
POR07	63	65	48 (6)	Yes
POR08	63	65	47 (6)	Yes
POR09	63	65	46 (6)	Yes
POR10	58	58	43 (6)	Yes
VL01	63	65	51 (3)	Yes
VL02	56	58	56 (3)	Yes
VL03	45	55	45 (1)	Yes

As noted above, in order to meet MOECC noise standards, in-design mitigation in the form of berms to attenuate noise are required. As a result of an existing POR, these landfill berms are required during filling of Phases 6, 7 and 8 of the landfill. For VL02 and VL03, berms could be required during filling of Phases 1 and/or 3 if a noise sensitive building is developed in these areas in the interim.

Diversion and Other Facilities: The noise assessment for the other proposed Site components included the MRF, C&D processing facility, organics processing facility, PHC soil treatment, surplus soil management, leaf/yard materials composting, flare, power generation area, maintenance facility, leachate pre-treatment facility, exhaust fans and heating, ventilation and air conditioning (HVAC) equipment. For these facilities, the noise level limits are defined in "NPC-300 Environmental Noise Guideline – Stationary and Transportation Sources – Approval and Planning" (MOE, 2013b).

Table 11.2.1-3 provides a summary of the overall sound power data for each noise source considered in the assessment of the above ancillary facilities.

Table 11.2.1-3: Sound Power Data for Ancillary Facilities Noise Sources

Source	Quantity	Overall Sound Power Level (dBA)
HVAC	17	83
Large Exhaust	19	87
Ventilation Openings	24	83
Dust Collector	2	102
Welding Fume Hood	1	91
Biofilter	2	90
Pump	1	106
Diesel Generator	1	117
Loader[3]	5	109
Chipper	1	118
Conveyor	2	94
Compost Turner	1	111
Screen	1	104
Air Classifier	1	111
Compost Aerator Fan[1]	4	95
Waste Truck Movements	47 (total peak hour in and out)	103
Truck Idling	5	98
Flare[1]	1	104
Dump Truck	1	108
Grader	1	116
Dozer	1	110
Leachate Truck Movements[1]	2	104
Leachate Truck Pumping[1]	1	111
Excavator[4]	2	103
Skid-steer	1	92
Electrical Generator[1, 2]	7	105

Notes:

[1] Equipment operates 24 hours per day, 365 days per year.

[2] Generators will be equipped with silencers and they will be housed in containers. Generator containers designed not to exceed 55 dBA at 10 m.

[3] The number of loaders modelled is 5, though a total of 4 loaders are shared by ancillary facilities and may operate at one time.

[4] The number of excavators modelled is 2, though 1 excavator is shared by ancillary facilities and may operate at one time.

As the facility operations would begin daily at 0600 hours, Tables 11.2.1-4, 11.2.1-5 and 11.2.1-6 provide, respectively, a summary of the maximum ancillary facilities noise modelling results for daytime (0700 – 1900), evening (1900 – 2300) and nighttime (0600 – 0700) compared to the minimum 1-hour L_{eq} monitored. For the existing PORs and vacant lots VL01 and VL02, the existing minimum 1-hour L_{eq} has been determined by noise monitoring. For the vacant lot VL03, the existing minimum 1-hour L_{eq} due to road traffic has been calculated. Table 11.2.1-7 provides a summary of the maximum noise modelling results for essential equipment for nighttime (2300 to 0600 hours).

Table 11.2.1-4: Daytime (0700 to 1900) Ancillary Facilities Noise Predictions (dBA)

Receptor	Existing Minimum Noise Levels	Maximum Predicted Ancillary Facilities Noise Levels	Compliant with MOECC Noise Guidelines
POR01	65	52	Yes
POR02	58	44	Yes
POR03	58	43	Yes
POR04	65	51	Yes
POR05	65	51	Yes
POR06	65	49	Yes
POR07	65	49	Yes
POR08	65	49	Yes
POR09	65	49	Yes
POR10	58	45	Yes
VL01	65	59	Yes
VL02	58	56	Yes
VL03	57	51	Yes

Table 11.2.1-5: Evening (1900 to 2300) Ancillary Facilities Noise Predictions (dBA)

Receptor	Existing Minimum Noise Levels	Maximum Predicted Ancillary Facilities Noise Levels	Compliant with MOECC Noise Guidelines
POR01	61	39	Yes
POR02	54	32	Yes
POR03	54	29	Yes
POR04	61	38	Yes
POR05	61	36	Yes
POR06	61	35	Yes
POR07	61	35	Yes
POR08	61	35	Yes
POR09	61	35	Yes
POR10	56	31	Yes
VL01	61	46	Yes
VL02	54	46	Yes
VL03	55	47	Yes

Table 11.2.1-6: Nighttime (0600 to 0700) Ancillary Facilities Noise Predictions (dBA)

Receptor	Existing Minimum Noise Levels	Maximum Predicted Ancillary Facilities Noise Levels	Compliant with MOECC Noise Guidelines
POR01	63	52	Yes
POR02	56	44	Yes
POR03	56	43	Yes
POR04	63	50	Yes
POR05	63	50	Yes
POR06	63	49	Yes
POR07	63	49	Yes
POR08	63	49	Yes
POR09	63	49	Yes
POR10	58	44	Yes
VL01	63	58	Yes
VL02	56	56	Yes
VL03	54	50	Yes

Table 11.2.1-7: Nighttime (2300 to 0600) Essential Equipment Noise Predictions (dBA)

Receptor	Existing Minimum Noise Levels	Maximum Predicted Ancillary Facilities Noise Levels	Compliant with MOECC Noise Guidelines
POR01	50	38	Yes
POR02	47	31	Yes
POR03	47	27	Yes
POR04	50	36	Yes
POR05	50	34	Yes
POR06	50	31	Yes
POR07	50	31	Yes
POR08	50	30	Yes
POR09	50	29	Yes
POR10	47	25	Yes
VL01	50	45	Yes
VL02	47	45	Yes
VL03	45	45	Yes

Off-Site Haul Route Traffic Noise: The primary off-Site haul route is along Boundary Road from Highway 417. A maximum of 271 trucks were assumed to come and go from the Site per day. Assuming 10 hours per day and applying a 1.45 peaking factor to all trips to account for random arrivals, the total number of peak hour trips are:

- 271 trips per day/10 hours per day x 1.45 peaking factor = 40 trips per hour entering and exiting

In addition, three leachate trucks per hour were assumed making 43 total trips entering or exiting the Site. Sound energy exposures were determined using STAMSON v5.04 – ORNAMENT, the computerized road traffic noise prediction model of the MOECC. The STAMSON model was calibrated to provide results consistent with the monitored levels. The model was used to predict future traffic noise levels by adding the peak hour number of trucks associated with the Site.

Table 11.2.1-8 provides a summary of the maximum predicted change in noise levels along the haul route (Highway 417 to Boundary Road to Site entrance) based on 86 trucks (43 trips) in a one hour period. As the traffic volume data presented in Table 11.2.1-8 is based on information obtained in 2011, the traffic volume in the analysis was adjusted to account for a growth factor of 2% per year to 2013, to coincide with the year in which the noise measurements were obtained.

Table 11.2.1-8: Change in Noise Levels Due to Off-Site Haul Route

Receptor	Maximum Predicted Change in Noise Level (dB)
POR01, POR04 – POR09, VL01 and VL02	4.9
POR02	1.7
POR03	0.7
POR10	2.8
VL03	N/A*

Note: *VL03 is not located near to the off-Site haul route, therefore no change in noise level is expected.

Table 11.2.1-9 below is provided by the MOECC to assess the effect of off-Site vehicles on the existing noise environment.

Table 11.2.1-9: Effect of Off-Site Vehicles

Sound Level Increase (dB)	Qualitative Rating
1 to 3 inclusive	Insignificant
3 to 5 inclusive	Noticeable
5 to 10 inclusive	Significant
10 and over	Very significant

In accordance with MOECC noise guidelines, the maximum predicted sound level increase of 4.9 dB results in a qualitative rating of ‘noticeable’ for sensitive receptors along Boundary Road and ‘insignificant’ elsewhere in the Site-vicinity.

Summary: While predicted noise increases along the approximate 800 metres of Boundary Road from Highway 417 to the Site would be noticeable, the assessment of noise effects has not identified the need for additional mitigation measures.

11.2.2 Air Quality and Odour

The details of the air quality and odour assessment are provided in TSD #3. The methodology for assessing potential effects to air quality and odour resulting from the proposed CRRRC involved three steps:

1) Calculating representative emission rates;

2) Dispersion modelling to predict resulting concentrations of indicator compounds in the environment; and

3) Comparison of predicted concentrations to MOECC standards and guidelines.

The emission estimation methods used followed accepted MOECC practices including where applicable, guidance in the Ontario MOECC document “Procedure for Preparing an Emission Summary and Dispersion Modelling Report” Version 3.0 (MOE, 2009c) (MOECC ESDM Procedure Document).

Models were used to predict ground-level concentrations of indicator compounds. The results were then compared to the relevant regulatory standards. The AERMOD-PRIME (AERMOD) dispersion model (Version 13350) was used for the air dispersion modelling. AERMOD was developed by the United States Environmental Protection Agency (U.S. EPA). This model has also been adopted in Ontario as the regulatory model recommended by the MOECC (MOE, 2009b).

To determine potential effects of the proposed CRRRC on air quality and odour, the predicted concentrations of indicator compounds were compared to MOECC standards and guidelines. The MOECC has point-of-impingement (POI) and ambient air quality criteria (AAQC) for various compounds. The AAQC are commonly used in assessments of general air quality in a community, whereas the POI criteria under O.Reg 419/05 are used to assess specific impacts of an individual facility.

In addition, a working group of provincial, territorial and federal environment ministers has established the Canada-Wide Standards (CWS) for ambient air quality for a number of air contaminants. The CWS are intended to be adopted by the provinces, which have primary regulatory authority over air quality.

The key assumptions used in the assessment are as follows:

- The flare destruction efficiency ranges from 98-99% depending on the contaminant. This assumption is based on typical values provided in Chapter 2.4 of the US EPA AP-42. (US EPA, 2008);
- The electrical generation plant and flare, when in operation, will be operated for 24 hours a day and the LFG and biogas will be directed to either the engines or the flare, with potential excess gas being flared during the ramp up period of the CRRRC operations;
- A collection efficiency of 75% of the LFG and biogas was applied. This is based on typical values provided in Chapter 2.4 of the US EPA AP-42;
- All non-road vehicles will meet Tier 3 standards for non-road compression-ignition engines;
- The proposed CRRRC will employ best management practices to mitigate fugitive road dust; a mitigation factor of 85% is applied on fugitive road dust emissions from paved and unpaved roads;
- Truck traffic at the Site will be limited to 7:00 a.m. to 7:00 p.m.;
- The weight of empty collection trucks is 3 or 10 tonnes depending on the type, while the weight of full collection trucks is 6 or 20 tonnes;
- The maximum flow rate of the biofilter for the petroleum hydrocarbon (PHC) impacted soil treatment area is 15,000 actual cubic meters per hour (Am^3/hr) and for the organics processing building is 72,000 Am^3/hr; and
- The flow rate of the dust collector for the MRF and C&D processing facilities is 15,000 actual cubic feet per minute (acfm).

In addition to assessing air quality and odour effects of the proposed CRRRC, the potential greenhouse gas (GHG) effects were also assessed using the methodology described in the section above, with the exception of the dispersion modelling step. For predicting the potential GHG effects, no dispersion modelling was required.

The emission estimation methods used follow accepted practices for conducting environmental assessments and, where appropriate, guidance in the Ontario MOECC document "*Guideline for Greenhouse Gas Emissions Reporting*" (MOE, 2012c).

The GHG compounds are associated with biogas and LFG combustion from the flare, the power generation area as well as from diesel combustion from tailpipe emissions, vehicle exhausts, and the proposed buildings stationary combustion equipment such as boilers and heaters. Emissions of these compounds are also the result of breakdown of waste material within the landfill and the composting area.

In addition to assessing the potential air quality effects of the proposed CRRRC, and hence the ability of the proposed waste management facility to comply with the requirements of O. Reg. 419/05 (MOE, 2013a), air quality predictions were also used for assessing the potential effect of changes in air quality on other disciplines (i.e., biology and land use & socio-economic). In calculating these emissions, all potential sources of the proposed CRRRC were considered.

11.2.2.1 Potential Air Quality and Odour Effects

Identification of emission sources

Table 11.2.2-1 outlines the activities (i.e., sources of emissions) that have been assessed as part of the air quality assessment.

Air and Odour Emissions

Table 11.2.2-2 summarizes the emission rates in grams per second (g/s) for each activity at the facility.

Mitigation Measures

In determining the air emissions associated with the CRRRC works and activities, consideration was given to those mitigation measures that were considered to be integral to the design and implementation of the works and activities. These mitigation measures, which are considered to be typical and consistent with best practices, were assumed for the purposes of the emission estimates presented above and therefore were incorporated in the effects predictions presented. The in-design mitigation measures that were included in the air quality and odour assessment have been summarized in Table 11.2.2-3.

Table 11.2.2-1: Summary of Sources Assessed for the Air Quality & Odour Assessment

Source Information		Significant (Yes or No)?	Modelled (Yes or No)?	Rationale
General Location	Source			
Flare and/or Electrical Generation Plant	Enclosed LFG and biogas flare and/or engines	Yes	Yes	—
Construction and Demolition Processing Facility	Dust collector	Yes	Yes	—
Materials Recovery Facility	Dust collector	Yes	Yes	—
Organics Processing Facility	Biofilter	Yes	Yes	—
	Organics processing operations (material handling)	Yes	Yes	—
	Organics processing operations (tailpipe emissions)	Yes	Yes	—
Composting	Composting, curing and post processing (material handling)	Yes	Yes	—
	Composting, curing and post processing (tailpipe emissions)	Yes	Yes	—
PHC contaminated Soil Treatment Area	Biofilter	Yes	Yes	—
	PHC soil treatment operations (material handling)	Yes	Yes	—
	PHC soil treatment operations (tailpipe emissions)	Yes	Yes	—
Landfill	Landfill Cap	Yes	Yes	—
	Landfill operations (material handling)	Yes	Yes	—
	Landfill operations (tailpipe emissions)	Yes	Yes	—
Leachate Pre-Treatment Facility	Leachate pre-treatment	Yes	Yes	—
	Leachate holding ponds	Yes	Yes	—
Paved Roads	Vehicle exhaust and fugitive road dust	Yes	Yes	—
Unpaved Roads	Vehicle exhaust and fugitive road dust	Yes	Yes	—
Emergency Generator	Diesel emergency power generator used to provide electricity during power outages	Yes	No	The emergency power equipment only operates periodically (rather than continuously) and therefore produces emissions that are negligible relative to the overall emissions from the CRRRC. Additionally, the emergency power generator will not be operating at the same time as any other equipment and therefore is not a part of the worst-case scenario.
Support Activities	Operational support activities, such as maintenance activities (including welding, compressor, diesel fire pump, lights)	No	No	These activities are considered to be negligible in comparison to the other activities occurring on-Site.
	Stationary fuel combustion for comfort heating	Yes	Yes	Emissions from these sources occur seasonally (i.e., do not occur at all times during a year) and are very small compared to mobile combustion sources. For this assessment, only nitrogen oxide emissions were modelled.

Table 11.2.2-2: Summary of Emissions during Operation of the CRRRC

Facility	Activity	Contaminant (g/s)								
		SPM	PM_{10}	$PM_{2.5}$	NO_x/NO_2 (1)	SO_2	CO	H_2S	C_2H_3Cl	Odour (OU/s)
Flare and/or Electrical Generation Plant	Enclosed LFG flare and/or LFG and biogas to energy engines	0.1309	0.1309	0.1309	0.4404	0.1018	4.6546	0.0031	0.0002	—
Construction and Demolition Processing Facility	Dust collector	0.0708	0.0708	0.0708	—	—	—	—	—	—
Materials Recovery Facility	Dust collector	0.0708	0.0708	0.0708	—	—	—	—	—	—
Organics Processing Facility	Biofilter	—	—	—	—	—	—	—	—	10,000
	Organics processing operations (material handling)	0.0043	0.0021	0.0003	—	—	—	—	—	—
	Organics processing operations (tailpipe emissions)	0.0278	0.0278	0.0278	0.4472	0.00001	0.4777	—	—	—
Composting	Composting, curing and post processing (material handling)	0.0046	0.0022	0.0003	—	—	—	—	—	309
	Composting, curing and post processing (tailpipe emissions)	0.0559	0.0584	0.0584	1.1572	0.00002	0.9882	—	—	—
PHC contaminated Soil Treatment	Biofilter	—	—	—	—	—	—	—	—	2,083
	PHC contaminated soil treatment operations (material handling)	0.0104	0.0049	0.0007	—	—	—	—	—	—
	PHC contaminated soil treatment operations (tailpipe emissions)	0.0025	0.0025	0.0025	0.0433	0.000001	0.0429	—	—	—
Landfill	Landfill cap	—	—	—	—	—	—	0.0047	0.0004	1,046
	Landfill operations (material handling)	0.0166	0.0078	0.0012	—	—	—	—	—	1,347
	Landfill operations (tailpipe emissions)	0.0618	0.0618	0.0618	1.0799	0.00002	1.0717	—	—	—
Leachate Pre-treatment Facility	Leachate pre-treatment	—	—	—	—	—	—	—	—	6,944
	Leachate equalization ponds	—	—	—	—	—	—	—	—	0.9250

Facility	Activity	Contaminant (g/s)								
		SPM	PM_{10}	$PM_{2.5}$	NO_x/NO_2[1]	SO_2	CO	H_2S	C_2H_3Cl	Odour (OU/s)
	Leachate effluent pond	—	—	—	—	—	—	—	—	0.9250
Paved Roads	Fugitive road dust	0.6332	0.1215	0.0294	—	—	—	—	—	—
	Vehicle exhaust	0.0013	0.0013	0.0011	0.0315	0.0001	0.0073	—	—	—
Unpaved Roads	Fugitive road dust	0.2880	0.0778	0.0078	—	—	—	—	—	—
	Vehicle exhaust	0.0001	0.0001	0.0001	0.0025	0.0000	0.0006	—	—	—
Emergency Generator[2]	Diesel emergency power generator	0.0004	0.0004	0.0004	0.1446	0.0708	0.0152	—	—	—
Support Activities	Operational support activities, such as maintenance activities (including welding, compressor, diesel fire pump, lights)	These activities are considered to be negligible in comparison to the other activities occurring on-Site.								
	Stationary Fuel Combustion	—[3]	—[3]	—[3]	0.0387	—[3]	—[3]	—	—	—

Notes:

[1] NOx emissions were assumed to be all NO_2

[2] The emergency power generator was evaluated separately as it is used to provide electricity during power outages when other equipment is not in operation.

[3] Other than NOx, compounds from this activity are considered to be negligible in comparison to the other activities occurring on-Site.

— Compound not emitted from that source
SPM = Suspended particulate matter
PM_{10} = Particles nominally smaller than 10 micrometres (µm) in diameter
$PM_{2.5}$ = Particles nominally smaller than 2.5 µm in diameter
SO_2 = Sulphur dioxide
CO = Carbon monoxide
H_2S = Hydrogen sulphide
C_2H_3Cl = Vinyl chloride

Table 11.2.2-3: Summary of In-Design and Best Practice Mitigation Incorporated in the Air Quality and Odour Assessment

Mitigation Measure	Mitigation Specifics	Works and Activities Affected	Compound Affected by Mitigation Measure	Project Phase where Mitigation is being Considered
Dust suppressant on paved and unpaved roadways	Application of dust suppressant on unpaved roads on a routine basis	■ Vehicle movements related to Base, Construction, Waste Excavation, Waste Placement	■ SPM ■ PM_{10} ■ $PM_{2.5}$	■ Construction ■ Operation
Paved road entrance	Sweep the roads to avoid track out and use of a truck tire wash station	■ Vehicle movements	■ SPM ■ PM_{10} ■ $PM_{2.5}$	■ Construction ■ Operation
Maintenance of on-Site vehicles and equipment	On-Site vehicles and equipment engines will meet Tier 3 emission standards and be maintained in good working order	■ On-Site Vehicles	■ NO_2 ■ CO ■ SO_2 ■ SPM ■ PM_{10} ■ $PM_{2.5}$	■ Construction ■ Operation
Minimize idling of vehicles on-Site	Minimize idling of vehicles on-Site	■ On-Site vehicles	■ NO_2 ■ CO ■ SO_2 ■ SPM ■ PM_{10} ■ $PM_{2.5}$	■ Construction ■ Operation
Minimize working face/daily cover	Site is restricted to 1500 m^2 working face, daily cover is required	■ Landfill	■ H_2S ■ C_2H_3Cl ■ Odour	■ Operation
Use of dust collectors, where applicable	—	■ C&D processing facility ■ MRF	■ SPM ■ PM_{10} ■ $PM_{2.5}$	■ Operation
Use of biofilters or other odour control (misting system, aeration, scrubber), where applicable	—	■ Organics Processing ■ PHC contaminated Soil Treatment ■ Leachate Treatment Building ■ Leachate holding pond and treated effluent pond	■ H_2S ■ C_2H_3Cl ■ Odour	■ Operation ■ Post-closure (leachate treatment only)
Capping of Landfill	Landfill will be capped	■ Landfill	■ H_2S ■ C_2H_3Cl ■ Odour	■ Post-closure

Ontario Regulation 419/05

Compliance with O. Reg. 419/05 (MOE, 2013a) is based on achieving the appropriate standards in the natural environment at a POI located at or beyond the property boundary. Table 11.2.2-4 lists the maximum predicted POI concentrations against the relevant O. Reg. 419/05 standards. As noted therein, all of the maximum POI concentrations meet the relevant standards. The CRRRC regulated sources would include LFG, combustion processes and materials handling emissions. The mobile equipment does not need to be considered for permitting under O. Reg. 419/05 when a best management practice is in place. However, for the purpose of this assessment, all outdoor mobile equipment was included in the assessment of compliance with O. Reg. 419/05.

Table 11.2.2-4 presents the maximum concentrations of the indicators along the proposed CRRRC property boundary. The assessment indicates that the proposed facility will be in compliance with O. Reg. 419/05 (MOE, 2013a).

Table 11.2.2-4: Predicted Compliance Air Quality Concentrations at POI

Indicator	Averaging Period	Air Quality Criteria (µg/m³)	Maximum Concentration at POI (µg/m³) (1)	Percentage of Limit (%)
SPM (24-hr)	24-hour	120	98.23	82%
PM_{10} (24-hr)	24-hour	50	23.30	47%
$PM_{2.5}$ (24-hr)	24-hour	25	20.16	81%
NO_X (1-hr)	1-hour	400	68.90	17%
NO_X (24-hr)	24-hour	200	37.15	19%
NO_2 (1-hr)(2)	1-hour	400	68.90	17%
NO_2 (24-hr)(2)	24-hour	200	37.15	19%
SO_2 (1-hr)	1-hour	690	15.91	2%
SO_2 (24-hr)	24-hour	275	8.54	3%
CO (1/2-hr)	½-hour	6000	860.01	14%
H_2S (24-hr)	24-hour	7	0.26	4%
H_2S (10-min)	10-min	13	0.79	6%
C_2H_3Cl (24-hr)	24-hour	1	0.021	2%
Odour (10-min)	10-min	1(3)	0.58	58%

Notes:

µg/m³ – micrograms per cubic metre

(1) Represents the maximum predicted concentrations at POI locations within the lands within the Site-vicinity.

(2) A conservative concentration conversion value of 100% of NO_x was applied to NO_2.

(3) The 99.5th percentile predicted concentration at discrete receptors.

11.2.2.2 Potential Greenhouse Gas Effects

In its comments on the TOR, the City of Ottawa requested an inventory of potential GHG emissions from the CRRRC to assist its efforts in creating an up to date City inventory.

Table 11.2.2-5 summarizes the predicted GHG emission rates in tonnes per year for each activity at the proposed CRRRC for the maximum operating scenario.

Table 11.2.2-5: Summary of Estimated GHG Annual Emission Rates during Operation of the CRRRC

Facility	**Contaminant (tonnes)**		
	CO_2	**CH_4**	**N_2O**
Electrical Generation Plant and/or Flare	34,002	0.62	0.06
C&D Processing Facility	*GHG already accounted for in the stationary fuel combustion*		
Materials Recovery Facility	*GHG already accounted for in the stationary fuel combustion*		
Organics Processing Facility	*GHG already accounted for in the stationary fuel combustion*		
Composting/Curing Pad Activities	18,480	200	15.0
PHC contaminated Soil Treatment Building	*GHG already accounted for in the stationary fuel combustion*		
Leachate Pre-Treatment Facility	*GHG already accounted for in the stationary fuel combustion*		
Landfill	2,983	1,082	—
Stationary Fuel Combustion(1)	1,627	0.08	0.24
Mobile Equipment	12,414	0.70	5.13
Tailpipe (Hauling Trucks)(2)	227	—	—

Notes:

(1) Stationary fuel combustion includes heating of the CRRRC buildings.

(2) Tailpipe emissions include the hauling and leachate trucks.

CO_2 = Carbon dioxide

CH_4 = Methane

N_2O = Nitrous oxide

A comparative life cycle assessment of the proposed CRRRC project was carried out. It compares the diversion from landfill of a portion of the incoming waste to landfilling all of the waste. The model used for the assessment was the GHG Calculator created by Environment Canada (Government of Canada, 2013), and its supporting technical document prepared by ICF Consulting (ICF, 2005). The calculation uses as its reference point, or Functional Unit, 100,000 tonnes of waste received; the output, or Environmental Intervention, is CO2eq. The result is a comparison of net GHG emissions of the proposed CRRRC (using the target diversion ranges in Table 9.1-1) compared to simply landfilling all the waste.

For the present analysis, landfilling of all the IC&I waste received was compared to two levels of diversion: the low and high ends of the target range in Table 9.1-1. The diversion rates used for the following materials: newsprint, mixed paper, cardboard, aluminium, ferrous metals, glass, HDPE, PET and mixed plastics, were 11% (lower end) and 26% (higher end). The diversion rates used for organic waste, to be composted or digested, were 60% (lower end) and 80% (higher end). Excluded were most of the C&D waste and all of the soils (the model does not make provision for their inclusion, presumably because they have little GHG impact).

The estimates of the composition of IC&I and C&D waste were obtained from a report written by Genivar/Kelleher Environmental for the City of Ottawa in 2007 (City of Ottawa, 2007b). The model was set up on the assumption that the landfill component of the CRRRC has a gas recovery rate of 75% and the recovered gas is flared. The system boundaries were chosen to include only on-Site activities; the impact of transportation, for example, was assumed to be the same for all diversion rates.

The results were as follows; at the lower diversion rates for all materials the aggregate GHG reduction (compared to landfill alone) was found to be 29,000 tonnes CO2eq. per 100,000 tonnes of waste received and, at the higher diversion rates, 66,000 tonnes CO2eq. per 100,000 tonnes of waste received. Based on the assumed receipt of a maximum of 450,000 tonnes of all waste/soils at the CRRRC in a given year, once operating at capacity, this equates to an annual GHG emission reduction of between 113,000 tonnes and 257,000 tonnes CO2eq, compared to straight landfilling of these same wastes. If the composition of the incoming waste differs from that shown in Table 9.1-1 of this EA, the reduction in GHG emissions could be higher or lower. Because of various assumptions built into the model, these figures are inherently conservative.

It is quite clear from the analysis that the diversion of IC&I waste as proposed in in relation to the CRRRC has a significant and positive impact on GHG reduction.

11.3 Geology, Hydrogeology & Geotechnical

The sub-components assessed were potential geological impacts, potential hydrogeological impacts (i.e., effects on groundwater quantity and quality) and geotechnical requirements for Site design. The technical details (modelling software, analytical methods, input parameters and detailed results) are provided in the Volume III Geology, Hydrogeology and Geotechnical Report.

The geological and seismic impact assessments were completed by experts in these fields, from both consulting and academia. Acknowledgement of the individuals involved in these assessments, as well as the hydrogeological and geotechnical sub-components, is provided in the Volume III Geology, Hydrogeology and Geotechnical Report.

11.3.1 Potential Geological Impacts

The assessment of potential geological impacts considered the evidence of and potential for movement along bedrock faults in the regional area within which the CRRRC Site is located, the potential for fault rupture at the CRRRC Site and the potential for subsurface settlement from earthquake ground shaking (liquefaction).

Evidence of Movement along Faults in the Regional Area: Published studies at a number of Southern Ontario locations present evidence for vertical offsets in glacial deposits and the underlying basement bedrock. Authors of these studies have concluded that the observed faults are either associated with co-seismic fault movement in the period from about 130,000 years ago to present or they are associated with response to localized pre-Holocene (last 11,700 years) glacial ice movement. Based on detailed analysis and re-interpretation of Rouge River sediments, Godin et al. (2002) concluded that because the deformation features in the glacial sediments and the underlying bedrock are relatively shallow, they were generated by regional and local glacial ice flow, and not deep seated tectonic stress and co-seismic faulting (Godin et al., 2002).

Review of published geologic and seismic information for the region surrounding Ottawa-Gatineau carried out as part of the CRRRC studies found no evidence that mapped bedrock faults have ruptured to the ground surface since the retreat of glacial ice and the Champlain Sea from the Ottawa valley. While there are expected to be high surface stresses at some locations (e.g., Adams and Fenton, 1994), there is no clear association between surficial stress relief and the generation of large local earthquakes. Studies to date, i.e., Aylsworth et al., (2000) indicate that even when larger earthquakes have occurred in the recent past, they may not be of sufficient magnitude (energy) to generate movement or displacement within the bedrock fault to propagate rupture to the ground surface. Furthermore, where evidence of surface faults has been found in local bedrock outcrops, it can usually be explained as resulting from local ice deformation or landslides rather than by the rupture of a major through-going surface or near surface tectonic fault. This conclusion does not preclude the possibility that vertical and/or horizontal fault movements have occurred in the region but are as yet undetected. Based on available information, however, there is no indication of surface ruptures from historical earthquakes at the proposed CRRRC Site or its immediate vicinity.

Joints and faults within the Ottawa-Bonnechere Graben often contain calcite, indicating that they have been cemented after the formation and lithification of the basement rocks (Rimando and Benn, 2005; Adams and Fenton, 1994). Unpublished dates from near-surface (2 mbgs) calcite within multiphase, joint-controlled veins in the Ordovician limestone (Pat Smith, University of Toronto, personal communication) indicate ages of about 100 million years ago and about 50 million years ago for the time of calcite cementation. These ages for episodes of calcite vein filling coincide approximately with the relative age of the youngest of the three deformation phases with the Paleozoic rocks identified by Rimando and Benn (2005). The presence of calcite within most of the fault planes and their early Paleogene (40 to 65 million years ago) and older crystallization ages suggests that there has been no Quaternary movement (including the Holocene Epoch of the past 11,700 years) along calcite-bearing faults and joints in the bedrock in the vicinity of the CRRRC Site.

Potential for Fault Rupture at the CRRRC Site: Fault rupture at the ground surface is a potential geological hazard because the surface fault rupture causes localized differential displacements that can adversely affect engineered structures and facilities. A fault is a planar fracture in the earth along which displacement occurs in response to stresses that accumulate in crustal rocks. Faults can have both vertical and horizontal displacements, although one type of movement is usually dominant. Faults with larger total displacements (100s of metres) have moved repeatedly along the same plane.

To identify the potential for fault rupture at the ground surface of a site, the important faults are those that are accumulating strain in the present-day tectonic strain field. Empirical studies indicate that only the larger faults generate displacements at the ground surface and it is these larger faults that can present a significant hazard to engineered structures. For example, most surface fault ruptures occur in geologically active areas, have single-event horizontal and/or vertical surface displacements that range from about 100 millimetres to 10 metres and are associated with moderate to large earthquakes (moment magnitude $M \geq 6$). Further, these surface rupturing faults usually show repeated displacements in the same location over thousands to millions of years.

The identification of "active" faults and/or lineaments that could intersect the footprint of the CRRRC is based in tectonic geomorphology – the interactions between tectonic and surface processes that shape the landscape. Tectonic geomorphic processes operate in regions of ongoing deformation and at time scales ranging from days to millions of years. An understanding of the geomorphic characteristics and landforms generated by movement at active faults is critical for the evaluation of the fault rupture potential at the CRRRC Site. Fault rupture produces distinctive tectonic geomorphology and landforms such as linear valleys, aligned offset stream channels, linear scarps, aligned linear ridges, faceted ridge spurs and linear vegetation patterns. If these distinctive tectonic geomorphologic landforms can be recognized at the CRRRC Site, then the presence, location, nature, type and activity of the fault or lineament may be evaluated.

Similarly, abrupt offsets or a change in orientation of subsurface geologic layers often indicates that near-surface faults are present at a site. Thus, if tectonic geomorphic features and/or the subsurface layers at the CRRRC Site show abrupt elevation changes, then a fault may be indicated.

Golder Associates Ltd.'s analysis of topography and interpretation of aerial imagery of the CRRRC Site indicate that the Site is essentially horizontal at an elevation of about 76 to 77.5 masl. Neither topographic interpretation nor imagery analysis revealed the existence of tectonic geomorphic features crossing the Site. While that lack of tectonic geomorphology indicates no recently active fault features, it remains possible that anthropogenic modification or localized erosion may have removed diagnostic surface fault features.

Figure 8.5.1-6 provides a generalized west-east cross section through the CRRRC Site, and Figures 8.5.1-7 and 8.5.1-8 are more detailed west-east and north-south cross sections, respectively. A key layer for the evaluation of the potential for past surface fault rupture at this Site is the 0.1-metre to 0.6-metre thick silty layer about 4 to 6 mbgs. This relatively thin silty layer represents a short duration change in the sedimentary depositional environment in the Champlain Sea about 10,000 years ago, perhaps because of a minor change in water depth/sea level or sediment source. This marker bed within the upper part of the silty clay deposit is sub-horizontal; the bottom elevation of the silty layer varies between about elevation 70.5 and 71.5 masl, while the top surface elevation varies between about elevation 71 and 72 masl. Because the silty layer was encountered and identified in all 25 borehole locations advanced in a grid pattern beneath the Site, it is reasonable to interpret that the silty layer is continuous across the CRRRC Site (as illustrated on Figures 8.5.1-7 and 8.5.1-8, as well as on Figure 3-17 in Volume III). The largely consistent elevation and lateral continuity indicates that this layer has not been offset in any significant way by vertical fault displacements at the CRRRC Site. It is reasonable to conclude, therefore, that there has been no surface fault rupture at the CRRRC Site since at least the deposition of the silty layer (i.e., in the past 8,000 to 10,000 years). Further, the evidence from the surrounding geological structure indicates that recent fault movements are unlikely to have occurred within the bedrock underlying the Site and surrounding area.

Considering the regional, local and Site geological conditions within the CRRRC Site and surrounding area, and the nature of "active" faults as described above, it is reasonable to conclude that the probability of future fault movement resulting in large differential displacements at the surface or shallow subsurface at or in the vicinity of the CRRRC Site is negligible. For the reasons discussed in Section 11.3.3 below, even if smaller scale differential displacements were to occur, they are of no engineering significance for the development of the CRRRC Site.

Potential Subsurface Settlement from Ground Shaking: The GSC has studied the effects of possible prehistoric (Holocene) earthquakes on the marine clay deposits in eastern Ontario. Published information on this topic was reviewed and integrated with Site-specific investigation of the clay deposit that underlies the CRRRC Site. The purpose of the review was to assess if the clay deposit beneath or in the area of the Site is likely to have been disturbed by earthquake shaking in eastern Ontario.

Based largely on Aylsworth and Lawrence (2003), following the deposition of the marine clay soils in eastern Ontario about 10,000 years ago, a number of channels (called Paleo-channels) were cut into the clay deposit between about 10,000 and 8,000 years ago by flowing water prior to the development of the present-day alignment of the Ottawa River channel. Four wide channels formed across eastern Ontario. Three channels were oriented northwest to southeast and one connecting these three oriented west to east. By about

8,000 years ago, the Ottawa River established itself in its current course, abandoning these deep, former channels. The western end of one the channels is presently occupied in part by the Mer Bleue to the northwest of Carlsbad Springs. The location of the CRRRC Site is beyond (south of) the area of Paleo-channels.

Analysis of aerial photos and field observations indicate past landslide activity along the margins of the Paleo-channels. Radiocarbon dating of organic materials buried by a number of landslides indicates a common date of about 4,550 years BP. Aylsworth et al. (2000) and Aylsworth and Lawrence (2003) interpreted the age concordance of the large landslide to indicate that they were triggered by a large earthquake event about 4,550 years BP. They estimated the earthquake to have a M greater than 6.2 and probably at least M 6.5.

There are also three large areas of flat-lying low-relief terrain underlain by marine clay soils, located beyond the Paleo-channels that have been found to be highly disturbed. These are located at Treadwell, Wendover and Lefaivre, about 30 to 50 kilometres northeast of the Site. Based on field studies, Aylsworth et al. (2000) interpreted this disturbance as further evidence of a large earthquake of at least M 6.5 about 7,060 years BP. Evidence of disturbance by earthquake shaking is indicated by an irregular, hummocky ground surface in an area that is otherwise flat and underlain by sub-horizontal sediment layers. Layering of the sand and clay soils that underlie the hummocky ground is deformed and in some cases faulted. There is also evidence of sand liquefaction and its upward flow through overlying clay layers. Subsurface investigations of these disturbed areas have included geophysical imaging, test trenching and borehole drilling and sampling programs, and description of the continuous soil cores where the presence of deformation of the subsurface materials was evident.

Key evidence cited by Aylsworth et al. (2000) and Aylsworth and Lawrence (2003) to explain why these three areas experienced disturbance and other areas did not are: 1) the clay deposit is very thick, greater than 100 metres; 2) uncommonly thick layers of liquefiable sand (greater than 10 metres to 20 metres thick) are present within the clay deposit; and 3) the areas are located within deep, locally steep-sided bedrock basins that could amplify earthquake ground shaking. The investigation work in the zone immediately adjacent to the disturbed area showed that where the clay deposit is only 38 metres thick and no thick sand layers were present (i.e., conditions similar to that underlying the CRRRC Site) there was no evidence of sedimentary deformation or disturbance.

The CRRRC Site is located in an area of flat-lying terrain without topographic irregularities and the Site is not in an area inferred to have been disturbed by past earthquakes or landslides. The silty clay underlying the Site is about 30 to 35 metres thick, anomalously thick sand layers are not present within or underlying the clay deposit; and the Site is not located within a deep bedrock depression. That is, none of the factors identified by Aylsworth et. al. (2000) are present at the CRRRC Site.

Although these Site-specific subsurface conditions strongly suggest the absence of amplified earthquake shaking and soft sediment deformation, the soils underlying the Site were also evaluated for any evidence of disturbance. The evaluation was completed using continuous soil cores recovered from the boreholes drilled across the Site. The soil cores were examined for evidence of deformed, tilted or sheared bedding patterns indicative of sand liquefaction and flow. Evidence of sediment disturbance was not observed.

As described above, subsurface investigation of the CRRRC Site identified a continuous silty layer within the upper part of the silty clay deposit. This silty layer is a marker bed throughout the subsurface deposited about 10,000 years ago. The presence of a flat-lying surface topography and the lower horizontal subsurface silty layer supports the conclusion that any strong earthquake shaking during the past 10,000 to 8,000 years has not resulted in liquefaction or other disturbance of the Holocene stratigraphy beneath the Site.

In summary, based on the available regional and Site-specific information, the large pre-historic earthquakes (4,550 and 7,060 years BP) inferred by Aylsworth et al. (2000) and Aylsworth and Lawrence (2003) have not resulted in large scale deformation of the silty clay deposit that underlies the Site. There is no evidence of deformation or displacement in the continuous samples recovered from the Site boreholes completed as part of the EA/EPA investigation. While it is possible that there has been smaller-scale deformation that is not apparent from the Site investigation program, differential settlement associated with strong earthquake shaking (liquefaction),is not considered to be a hazard at the CRRRC Site, nor for the reasons discussed in Section 11.3.3 below to be of engineering significance in any event.

11.3.2 Potential Hydrogeological Impacts

Quantitative assessments of the potential impacts of the CRRRC development on off-Site groundwater quantity and quality were carried out using standard groundwater flow and groundwater contaminant modelling.

Groundwater Quantity: This assessment modelled the potential for the Site development to lower off-Site groundwater levels and thereby affect water supply to off-Site shallow dug wells or to off-Site surface water features. A regional groundwater flow model was constructed using the regional and Site subsurface information. The work considered previous groundwater modelling completed for the Raisin Region – South Nation Source Water Protection study program (Logan et al., 2009; Raisin Region-South Nation Source Protection Region, 2012; WESA, 2010; WESA and EarthFX, 2006; Golder, 2004). The modelling also included the time-dependent effects of consolidation of the clay deposit that underlies the CRRRC Site, which will generate upward hydraulic gradients from the subsurface towards the landfill component for between 25 to 50 years after the waste is placed; the formation of a 'settlement bowl' in the clay beneath the landfill; and the reduction in vertical hydraulic conductivity of the clay as a result of consolidation.

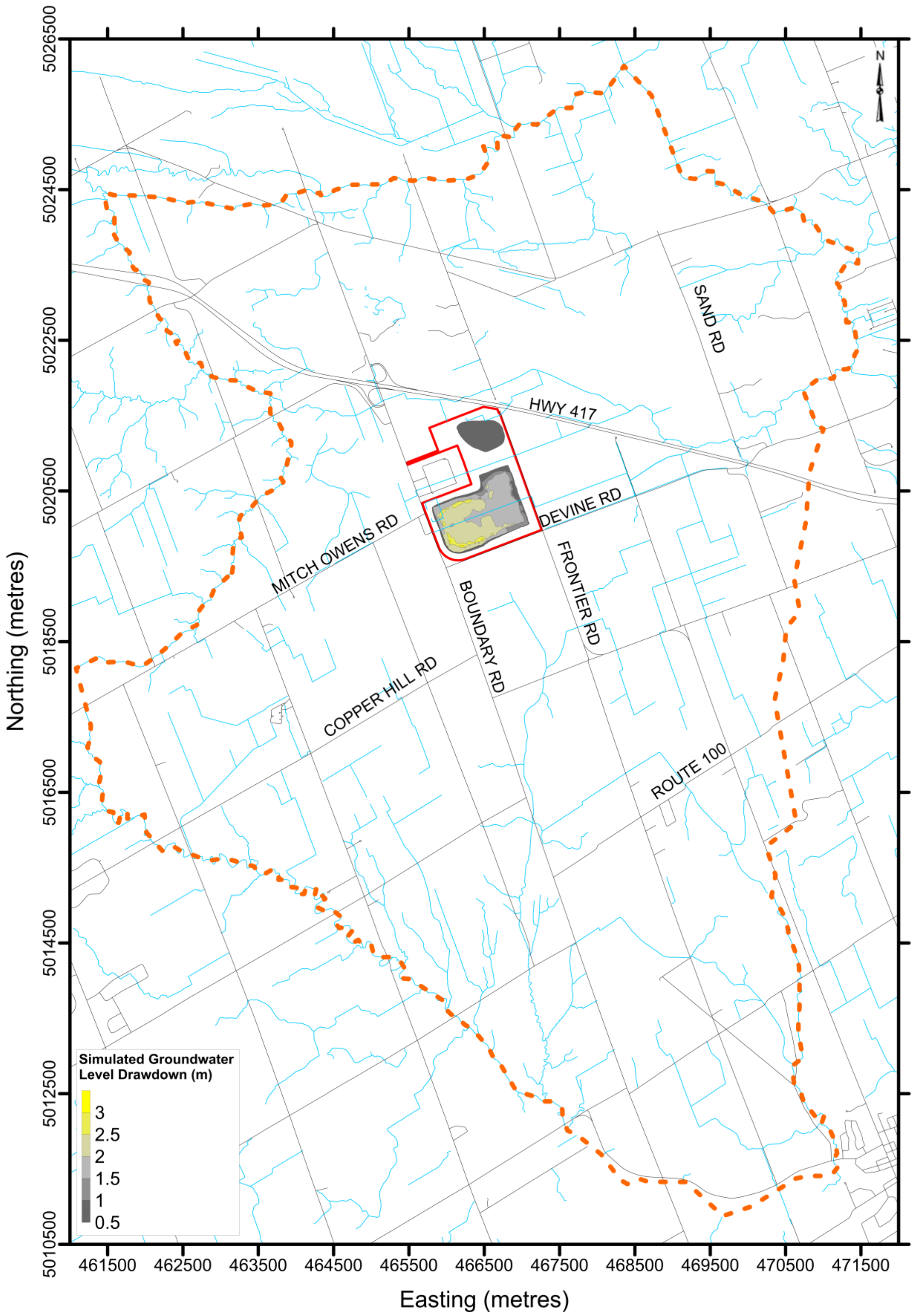
The regional groundwater flow model was bounded by the Bear River Municipal Drain in the west, Bear Brook Creek to the north, the Castor River to the south and the bedrock ridge to the east. The model was calibrated by comparing simulated steady-state groundwater elevations to measured groundwater elevations. Predictive simulations were completed to represent steady-state conditions both with an operating leachate collection system and following failure of the leachate collection system that was assumed to occur after 100 years of operation (as per the MOECC Landfill Standards (MOE, 1998b)).

The predictive model was used to estimate pseudo-steady state seepage rates and groundwater levels for the following scenarios:

- **Predictive Scenario (PS1):** Operating leachate collection system, pre-settlement, operational conditions;
- **Predictive Scenario (PS2):** Operating leachate collection system, post-settlement, closure conditions; and
- **Predictive Scenario (PS3):** Failed leachate collection system, post-settlement, closure conditions.

Groundwater drawdown provides an indication of the extent to which the landfill could potentially affect off-Site groundwater quantity. Groundwater drawdown was calculated for each pre-failure scenario relative to the calibrated pre-development conditions. Groundwater drawdown will be most significant while the leachate collection system is in operation; as such, scenarios PS1 and PS2 represent the greatest potential for groundwater lowering. Figure 11.3.2-1 and Figure 11.3.2-2 show the drawdown iso-contours at steady state for PS1 and PS2, respectively. As shown on the figures, the simulated drawdown does not extend beyond the property boundary for any of the scenarios. Therefore the proposed Site development is not predicted to have any measurable impact on groundwater quantity (and off-Site dug well supply) outside of the property boundary.

Failure of the leachate collection system would result in mounding of leachate within the landfill component. The effect of this mounding on groundwater elevations is shown on Figure 11.3.2-3 for PS3. The predicted effect of the Site on groundwater levels post-failure does not extend beyond the property boundary.



LEGEND

- WATERBODIES
- ROADS
- PROPERTY BOUNDARY
- MODEL DOMAIN

NOTE

THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT

REFERENCE

LAND INFORMATION ONTARIO (LIO) DATA PRODUCED BY GOLDER ASSOCIATES LTD. UNDER LICENSE FROM ONTARIO MINISTRY OF NATURAL RESOURCES, © QUEENS PRINTER 2011. PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 18

PROJECT

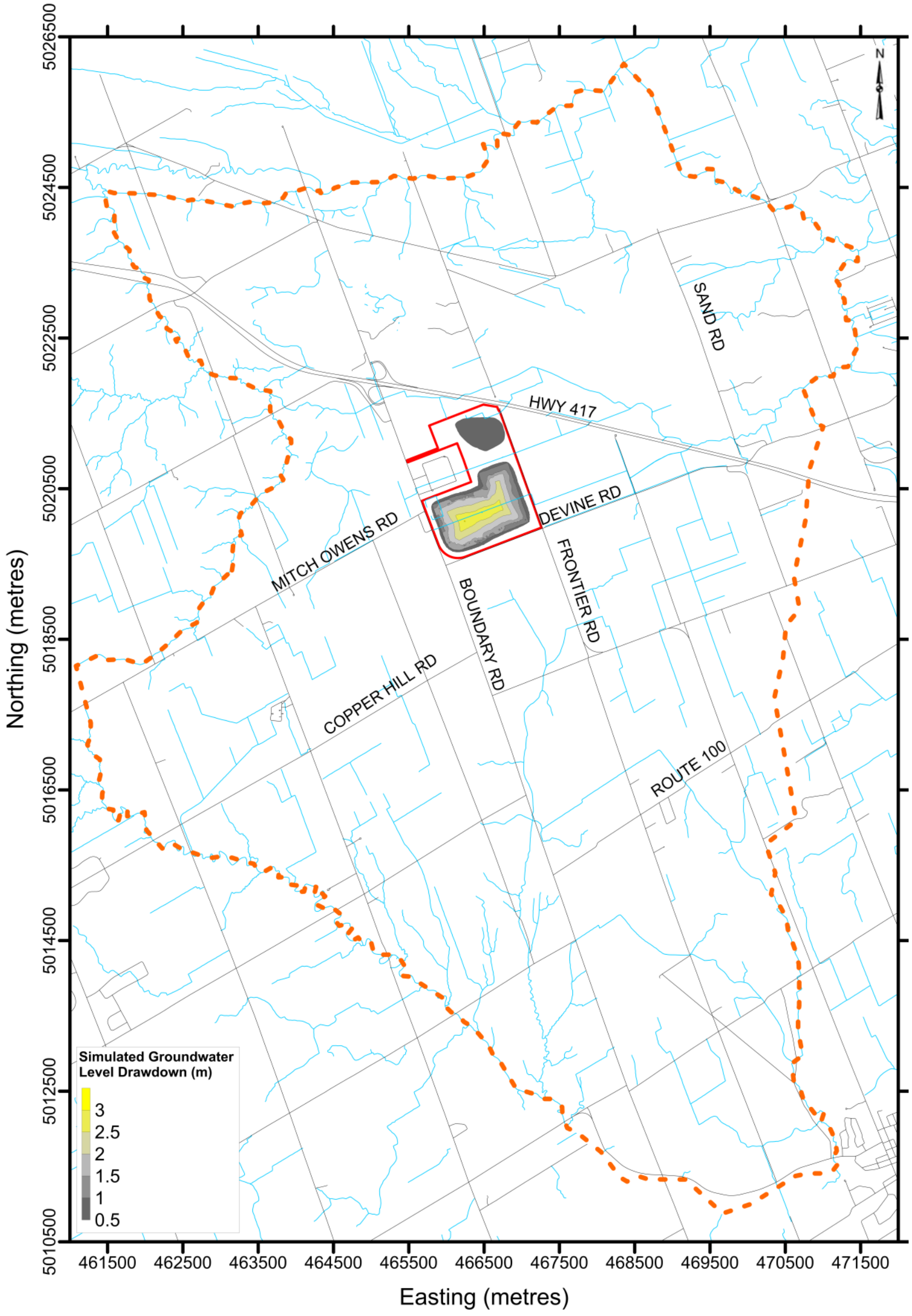
ENVIRONMENTAL ASSESSMENT OF THE
CAPITAL REGION RESOURCE RECOVERY CENTRE

TITLE

SIMULATED PRE-FAILURE GROUNDWATER
DRAWDOWN (PS1: PRE-SETTLEMENT)

Golder Associates

PROJECT No. 12-1125-0045			PHASE No. 4500
DESIGN	MIB	Nov. 2013	SCALE AS SHOWN — REV.0
GIS	--	--	
CHECK	PLE	Aug. 2014	FIGURE 11.3.2-1
REVIEW	PAS	Aug. 2014	



LEGEND

- WATERBODIES
- ROADS
- PROPERTY BOUNDARY
- MODEL DOMAIN

NOTE

THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT

REFERENCE

LAND INFORMATION ONTARIO (LIO) DATA PRODUCED BY GOLDER ASSOCIATES LTD. UNDER LICENSE FROM ONTARIO MINISTRY OF NATURAL RESOURCES, © QUEENS PRINTER 2011. PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 18

PROJECT

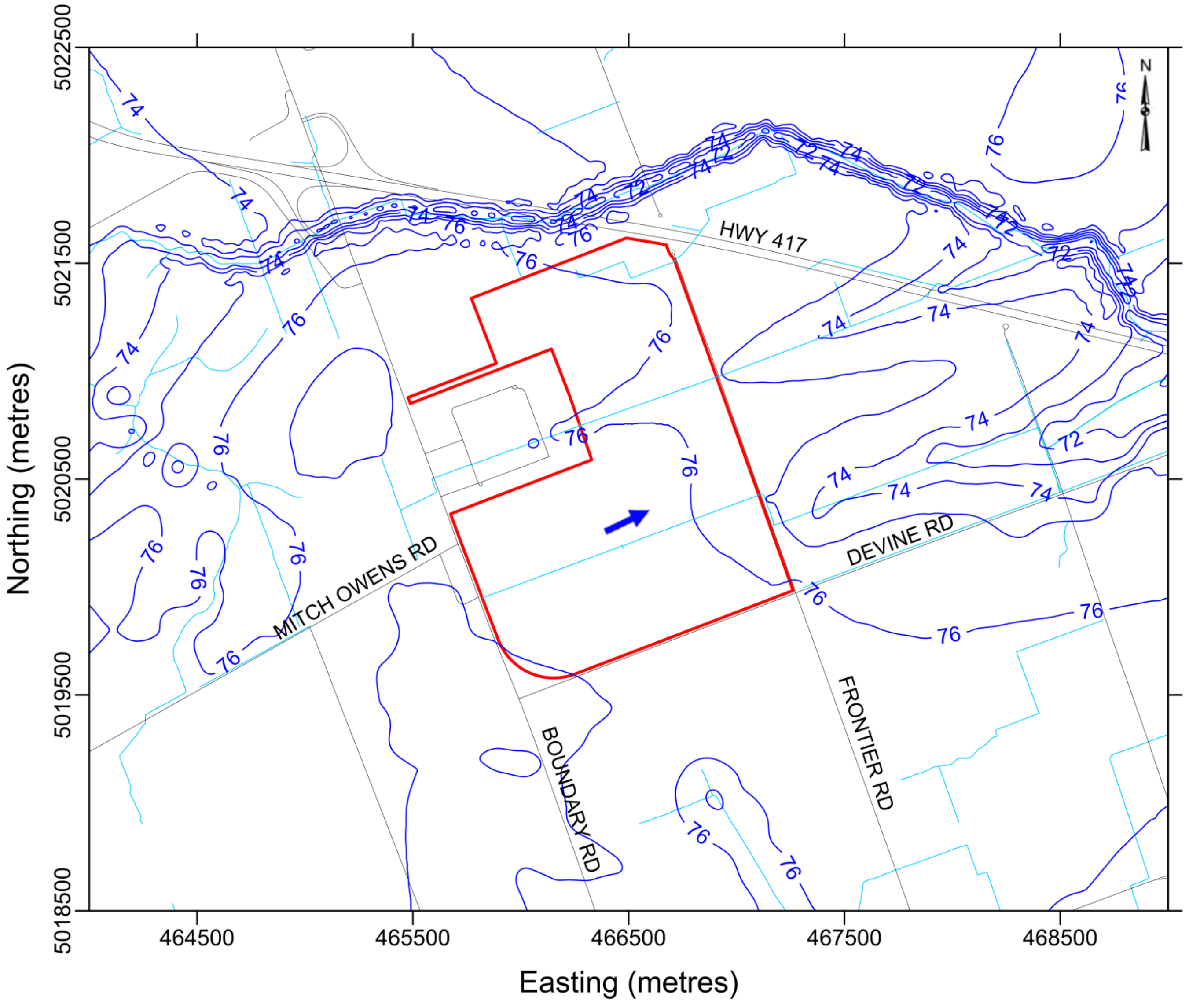
ENVIRONMENTAL ASSESSMENT OF THE
CAPITAL REGION RESOURCE RECOVERY CENTRE

TITLE

SIMULATED PRE-FAILURE GROUNDWATER DRAWDOWN (PS2: POST-SETTLEMENT)

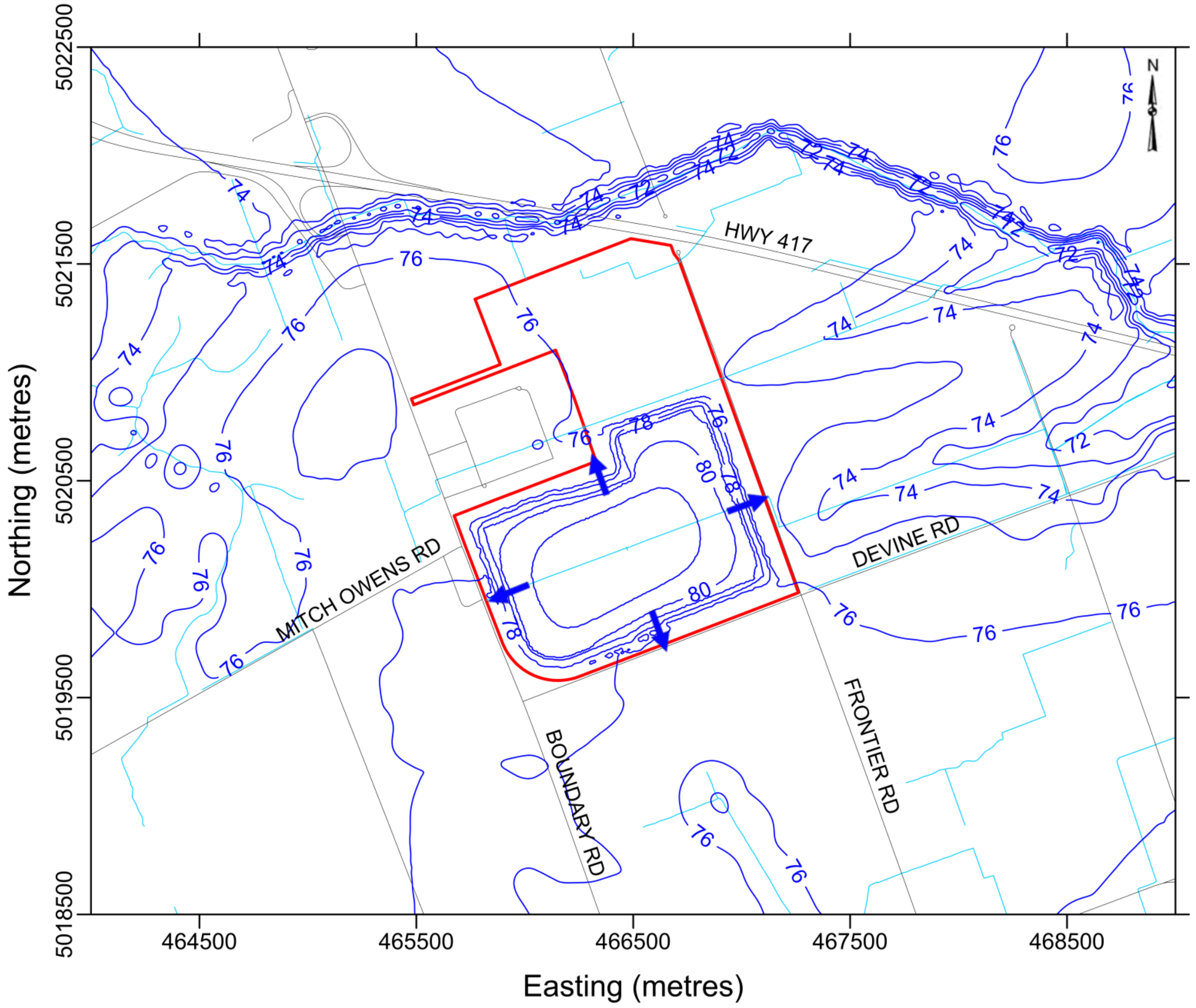
Golder Associates

PROJECT No. 12-1125-0045			PHASE No. 4500	
DESIGN	MIB	Nov. 2013	SCALE AS SHOWN	REV.0
GIS	--	--	FIGURE 11.3.2-2	
CHECK	PLE	Aug. 2014		
REVIEW	PAS	Aug. 2014		



CALIBRATED PRE-DEVELOPMENT CONDITIONS

SLICE 3: SURFICIAL SILTY SAND AND CLAY



STEADY-STATE POST-FAILURE CONDITIONS

SLICE 3: SURFICIAL SILTY SAND AND CLAY

LEGEND

—	WATERBODIES
—	ROADS
—	PROPERTY BOUNDARY
–75–	GROUNDWATER ELEVATION (metres ABOVE SEA LEVEL) (1 metre contour interval)
➡	INTERPRETED GROUNDWATER FLOW DIRECTION

NOTE

THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT

REFERENCE

LAND INFORMATION ONTARIO (LIO) DATA PRODUCED BY GOLDER ASSOCIATES LTD. UNDER LICENSE FROM ONTARIO MINISTRY OF NATURAL RESOURCES, © QUEENS PRINTER 2011. PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 18

PROJECT
ENVIRONMENTAL ASSESSMENT OF THE CAPITAL
REGION RESOURCE RECOVERY CENTRE

TITLE
SIMULATED POST-FAILURE GROUNDWATER
ELEVATION (PS3: POST-SETTLEMENT)

Golder Associates
Ottawa, Ontario

PROJECT No. 12-1125-0045			SCALE AS SHOWN	REV.0
DESIGN	MIB	Nov. 2013	FIGURE 11.3.2-3	
GIS	----	----		
CHECK	PLE	Aug. 2014		
REVIEW	PAS	Aug. 2014		

Hydraulic head contours for the silty layer and the glacial till/bedrock contact zone are shown on Figure 11.3.2-4 for the PS3 scenario. These results show that groundwater seepage in the silty layer will flow radially away from the Site until it enters the local flow regime. Groundwater seepage in the glacial till/bedrock contact will be as under existing pre-development conditions and generally flow towards the northeast.

The travel time for particles released under steady-state conditions following failure of the leachate collection system and representative of the first arrival of a conservative tracer at the glacial till/bedrock contact is on the order of 500 years.

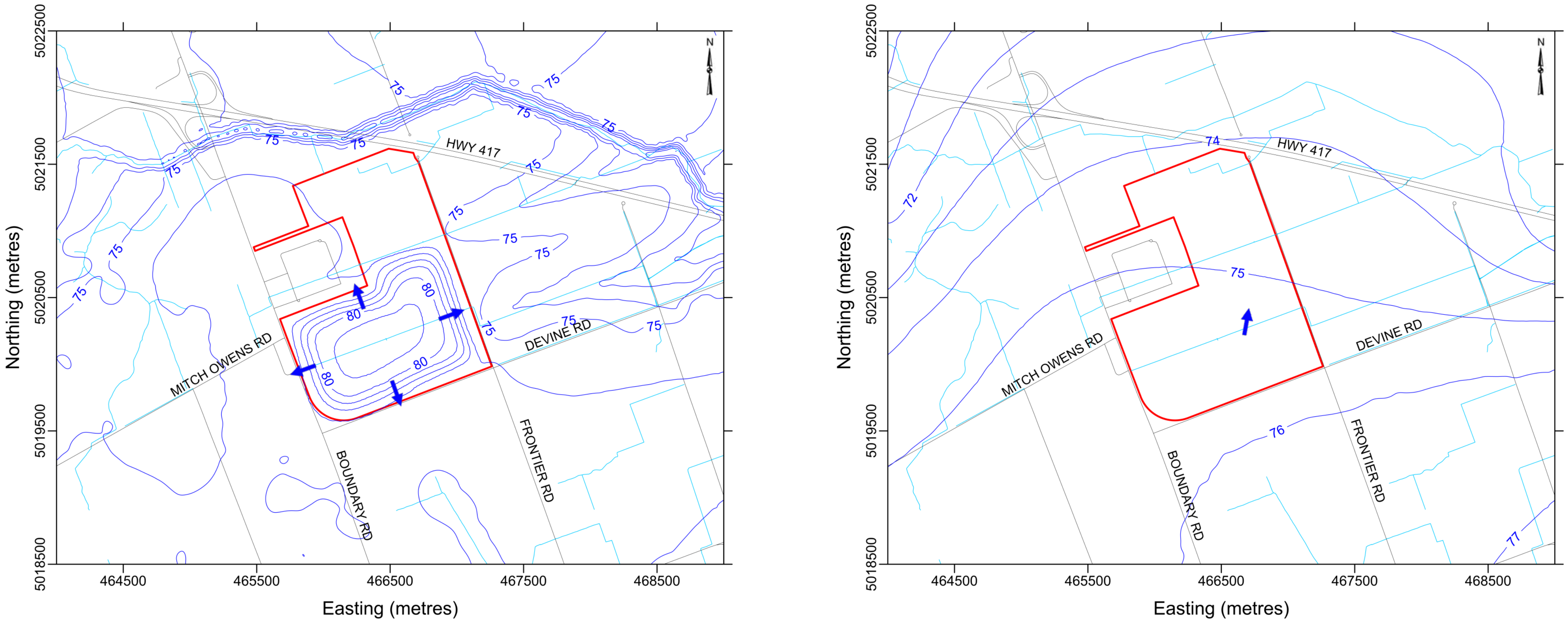
In addition to the predictive modelling, a dug well monitoring and pumping test program was carried out to better understand how dug wells in the vicinity of the Site function. The following summarizes the findings relating to dug well water supply in the vicinity of the Site:

- The dug wells obtain water primarily from the surficial silty sand layer;
- The sustainable pumping rate is approximately 4 Litres per minute; and
- Under typical use, the radius of influence of a dug well (i.e., area of drawdown associated with the water taking) is interpreted to be less than 10 metres. That is, the dug wells are recharged locally (i.e., from the silty sand close to the well).

Groundwater Quality: Modelling of long-term groundwater quality impacts for new or expanding landfill sites is required under O. Reg. 232/98 (MOE, 1998a) to demonstrate that the proposed design will meet the requirements of MOECC Guideline B-7 (MOE, 1994b). The Reasonable Use Guideline B-7 establishes a quantitative benchmark for protecting off-Site groundwater quality for drinking water purposes.

In terms of any engineered facilities the Landfill Standards: A Guideline on the Regulatory and Approval Requirements for New or Expanding Landfilling Sites (Landfill Standards) (MOE, 1998b) makes the following statement regarding the basis for evaluation of the acceptability of proposed engineered facilities at landfills:

> *"An engineered facility which is to be constructed at a landfilling site for purposes of controlling leachate, groundwater, surface water or landfill gas should be designed such that: the service life of the engineered facility exceeds the period of time during which contaminants may be generated by the site and need to be controlled by the engineered facility to prevent an unacceptable impact; or the engineered facility can be replaced, or an alternative engineered facility can be constructed, as necessary to enable the combined service lives of the engineered facilities to exceed the period of time during which contaminants may be generated by the site and need to be controlled by the engineered facility to prevent an unacceptable impact."*



SLICE 11: SILTY LAYER

SLICE 16: GLACIAL TILL / BEDROCK CONTACT

LEGEND

—	WATERBODIES
—	ROADS
—	PROPERTY BOUNDARY
—75—	SIMULATED HYDRAULIC HEAD (metres) (one metre contour interval)
➡	INTERPRETED GROUNDWATER FLOW DIRECTION

NOTE

THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT

REFERENCE

LAND INFORMATION ONTARIO (LIO) DATA PRODUCED BY GOLDER ASSOCIATES LTD. UNDER LICENSE FROM ONTARIO MINISTRY OF NATURAL RESOURCES, © QUEENS PRINTER 2011. PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 18

PROJECT

ENVIRONMENTAL ASSESSMENT OF THE
CAPITAL REGION RESOURCE RECOVERY CENTRE

TITLE

SIMULATED POST-FAILURE HYDRAULIC HEAD
(PS3: POST-SETTLEMENT)

Golder Associates
Ottawa, Ontario

PROJECT No. 12-1125-0045			SCALE AS SHOWN	REV.0
DESIGN	MIB	Nov. 2013	FIGURE 11.3.2-4	
GIS	----	----		
CHECK	PLE	Aug. 2014		
REVIEW	PAS	Aug. 2014		

The contaminant transport modelling for the proposed landfill was carried out using POLLUTE (Rowe, et al., 1994). POLLUTE is a one-dimensional, analytical contaminant transport model, which can account for contaminant migration from a landfill situated on a multi-layered soil deposit. The model predicts concentrations in the aquifer unit at the down-gradient edge of a landfill. For the hydrogeological conditions at the CRRRC landfill, advection/dispersion and bio-chemical decay are the primary transport processes in the sandy silt and till layers, whereas diffusion is the primary transport process in the upper and lower silty clay layers, with the advection, adsorption and bio-chemical decay playing lesser roles. The boundary condition used for contaminant source concentrations in the landfill is that of a depleting contaminant concentration with time from an initial representative peak value that occurs at the closure of the landfill component. The model and approach used to evaluate groundwater quality impacts was extended for 1,000 years beyond the time that waste filling was assumed to commence. As described in Section 10.8, the landfill component of the CRRRC will be surrounded by a constructed GCL hydraulic barrier keyed into the silty clay, which will cut off the horizontal flow to the surficial silty sand layer and perimeter berm fill. While the silty layer does not convey a substantial amount of water, it was conservatively used in the modelling to represent the groundwater resource that is the most susceptible to landfill leachate impacts. For the purpose of the contaminant transport modelling, the subsurface conditions were simplified as shown on Figure 11.3.2-5 with two distinct silty clay layers of uniform thickness separated by a 0.3 metre silty layer. During operation of the landfill the average thickness of the silty clay deposits below the landfill are 3.3 metres and 23.3 metres for the silty clay above the silty layer and below the silty layer, respectively.

In accordance with O. Reg. 232/98 (MOE, 1998a), the key leachate contaminants modelled for municipal solid waste to address long-term compliance with MOECC Guideline B-7 (MOE, 1994b) are: benzene, cadmium, chloride, lead, 1,4-dichlorobenzene, dichloromethane, toluene and vinyl chloride. Although it is not proposed that the CRRRC receive residential waste[1], and much of the organic component of the waste/residual stream should be able to be diverted from landfill (thus reducing some parameter concentrations in the leachate), utilizing these leachate contaminants and their proposed source concentrations is a conservative approach to impact assessment. In addition to the key leachate contaminants associated with municipal solid waste, boron was also used in consultation with the MOECC based on boron being a typical leachate indicator for IC&I waste.

As described in Section 10.8, a granular drainage blanket will be constructed below the waste and, together with a piping system, will convey the leachate to sumps where it will be removed from the landfill for treatment. It is proposed that the design for the granular drainage layer meet the requirements of Schedule 1 provided in O. Reg. 232/98 (MOE, 1998a). Based on this regulation, the service life of a leachate collection system that meets the requirements in Schedule 1 can be taken as 100 years starting from either year 10 or the mid-point of the landfilling period, whichever is less. For the GCL hydraulic barrier, which derives its hydraulic resistance through natural mineral soils, a service life of greater than one thousand years (as per O. Reg. 232/98) is reasonable.

The results of the hydrogeologic/contaminant transport modelling are presented on Figure 11.3.2-6 that shows the predicted key leachate contaminant parameter concentration variations with time at the downgradient edge of the landfill (100 to 125 metres from the property boundary).

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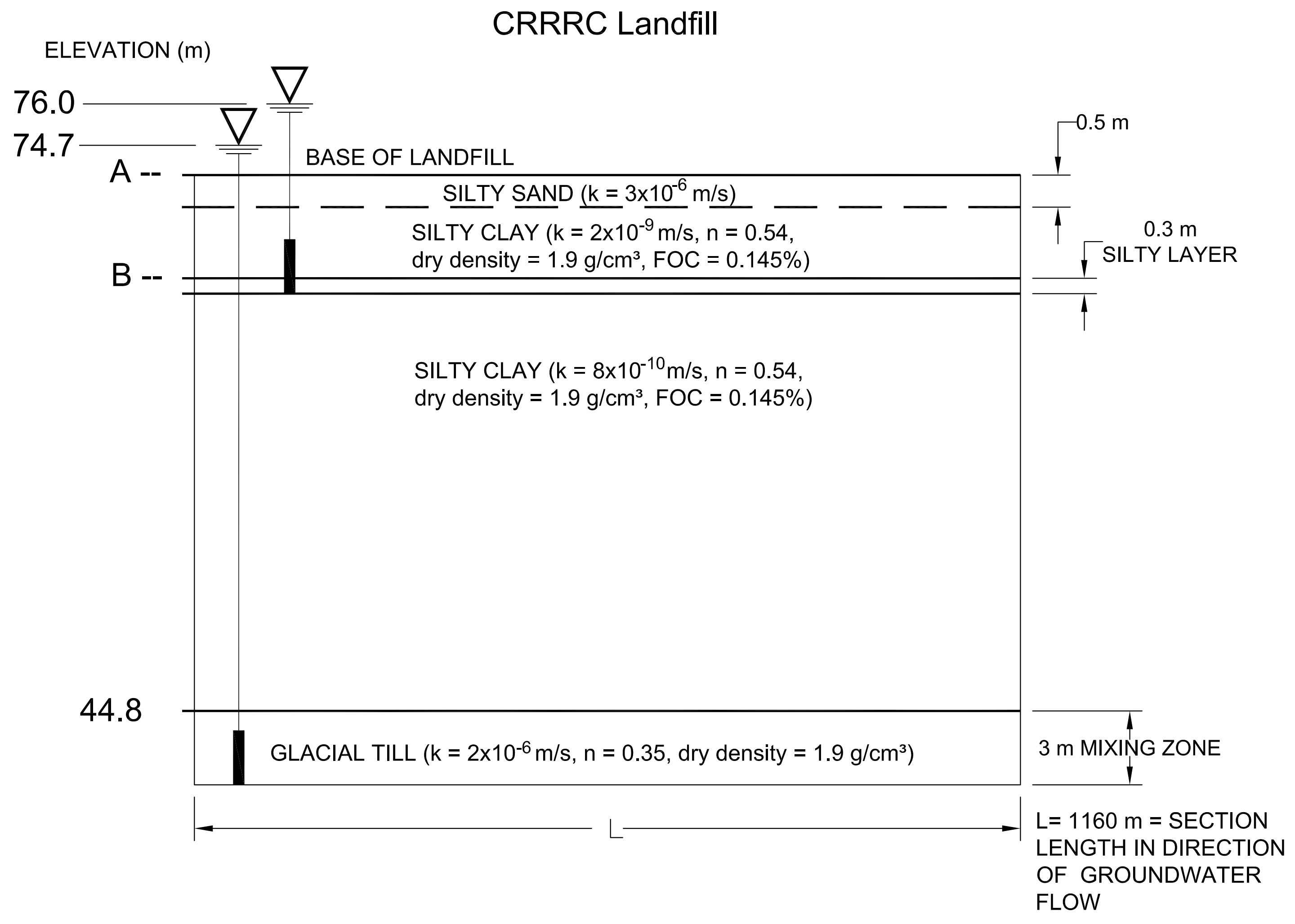
[1] Recyclables from multi-residential developments will be received at the CRRRC if available.



Years Past Closure	A (m ASL)	B (m ASL)
0 YEARS (CLOSURE)	74.4	71.1
10 YEARS	71.5	69.4
50 YEARS	70.4	68.3
80 YEARS * (FAILURE OF LEACHATE COLLECTION SYSTEM)	70.2	68.1

* Used 100 year settlement numbers at this time to be conservative

NOTES:

1. THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT.

REV	DATE	DES	REVISION DESCRIPTION	CAD	CHK	RVW
△						

PROJECT

ENVIRONMENTAL ASSESSMENT OF THE
CAPITAL REGION RESOURCE RECOVERY CENTRE

TITLE

SIMPLIFIED CROSS-SECTIONS FOR CONTAMINANT TRANSPORT MODEL

Golder Associates
Ottawa, Ontario, Canada

PROJECT No.		12-1125-0045
DESIGN	M.K.F.	27 Nov. 2013
CAD	M.L.F.	27 Nov. 2013
CHECK	P.L.E.	Aug. 2014
REVIEW	P.A.S.	Aug. 2014

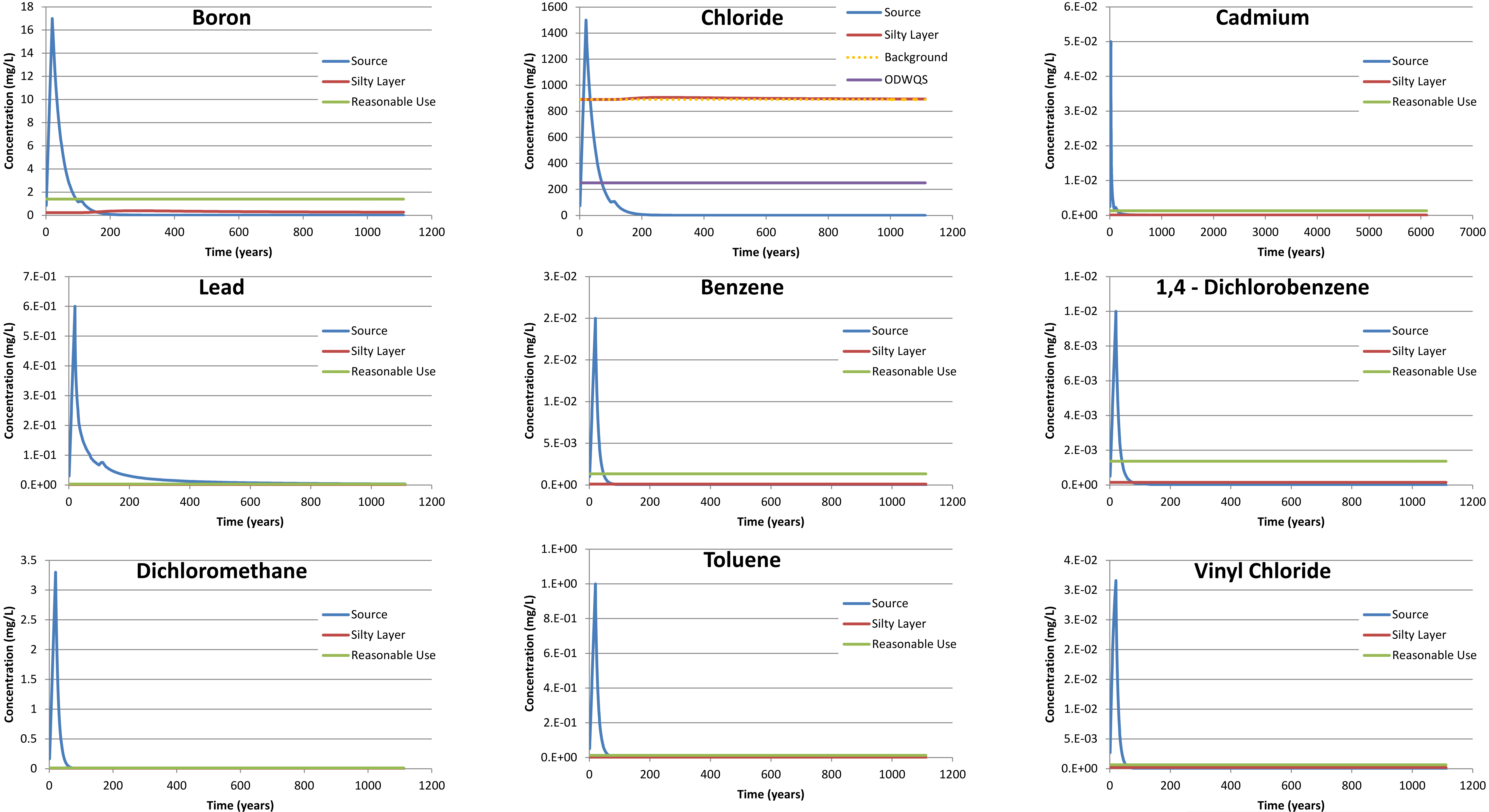
FILE No. 1211250045-V1-EAr-11.3.2-5.DW

SCALE N.T.S. REV. 0

DRAWING No.

Fig. 11.3.2-5

PLOT DATE: June 26, 2014
FILENAME: N:\Active\Spatial_IM\Miller_Paving_Ltd\CRRRC\ACAD\Vol 1 (Report Figures)\Chapter 11\1211250045-V1-EAr-11.3.2-5.DWG



NOTE

THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT

PROJECT

ENVIRONMENTAL ASSESSMENT OF THE
CAPITAL REGION RESOURCE RECOVERY CENTRE

TITLE

RESULTS OF CONTAMINANT
TRANSPORT MODEL

Golder Associates
Ottawa, Ontario

PROJECT No. 12-1125-0045			SCALE AS SHOWN	REV.0
DESIGN	MKF	Nov. 23/2013		
GIS	---	---		
CHECK	PLE	Aug. 2014		
REVIEW	PAS	Aug. 2014		

FIGURE 11.3.2-6

The results of the modelling for all key landfill leachate contaminant parameters are summarized in Table 11.3.2-1 and indicate essentially no predicted impact on the silty layer at the downgradient edge of the landfill. For all parameters, the Reasonable Use Criteria for the silty layer (indicated in Table 11.3.2-1) are satisfied, noting however that chloride naturally exceeds the ODWQS (MOE, 2003a).

The contaminating lifespan for the proposed landfill component of the CRRRC corresponds to the time at which contaminant concentrations in the landfill have decreased to the extent that the landfill would no longer require the engineered system components to protect off-Site groundwater quality, but can rely on the natural containment provided by the silty clay deposit to do so.

To ensure protection of off-Site groundwater and compliance with MOECC requirements, the design of the proposed CRRRC landfill component relies primarily on: 1) the perimeter GCL hydraulic barrier and operation of the leachate collection system for protection of groundwater quality within the on-Site surficial silty sand layer, and 2) the natural silty clay deposit augmented by the leachate collection system for protection of the groundwater within the on-Site silty layer located several metres below the base of the landfill.

In addition to the above modelling, sensitivity analyses were carried out to assess a number of scenarios related to the potential impact to the subsurface silty layer: all contaminants going to the silty layer; settlement of the underlying clay deposit; and early failure of the leachate collection system beneath the landfill. The sensitivity analyses are reported in Volume III. Under these scenarios, the Site is still predicted to remain in compliance with the Reasonable Use Criteria (MOE, 1994b). All of these analyses show that should the leachate collection system fail after 20 years beyond the mid-point of landfilling or 20 years beyond year 10 after filling commenced, the thickness and low hydraulic conductivity of the natural silty clay deposit would provide the required off-Site groundwater protection. Nevertheless, the leachate collection system while functioning still helps ensure the protection of groundwater within the surficial silty sand layer by reducing leachate mounding on the GCL hydraulic barrier. Monitoring of leachate levels within the landfill will be ongoing during operations and post-closure and determine the need for contingency measures to prevent seeps and breakouts that could potentially impact surface water.

As described in Section 10.8, the design of the leachate collection system is such that leachate movement is towards sumps in the centre portion of the landfill, away from the perimeter of the landfill. The consolidation of the clay under the weight of the landfill will enhance this flow even more over time. As such, a significant mound of leachate will have to build up within the landfill before there is a leachate head against the perimeter of the landfill and the GCL barrier, which would be the condition required for leachate to potentially diffuse through the GCL hydraulic barrier and into the surficial silty sand layer. Should leachate diffusion through the GCL barrier occur it would be detected by the monitoring program and there are a number of contingency measures available to ensure protection of off-Site groundwater in the surficial silty sand layer in such circumstances as described in Section 14.0.

Summary: The following conclusions can be derived from the groundwater modelling analyses described above:

- Groundwater levels (in the surficial silty sand and other strata) will not be affected beyond the property; and
- Off-Site groundwater quality will not be adversely affected by the CRRRC.

Table 11.3.2-1: Predicted Concentrations of Key Leachate Contaminants in the Silty Layer from the CRRRC Landfill

Contaminant	Background Median Concentration in Silty Layer (mg/L)[1]	Ontario Drinking Water Quality Standards [2] (mg/L)	Reasonable Use Criteria [3] (mg/L)	Predicted Peak Concentration* (mg/L)	Predicted Peak Plus Background Concentration* (mg/L)	Time of Peak Concentration** (years)
Boron	0.225	5 (H)	1.42	0.166	0.39	272
Chloride	890	250 (A)	N/A	16	906	272
Cadmium	0.00005	0.005 (H)	0.001	0.00004	0.00009	>1000
Lead	0.00025	0.01 (H)	0.003	0	0.00025	>1000
Benzene	0.0001	0.005 (H)	0.001	0	0.0001	162
1,4-Dichlorobenzene	0.00015	0.005 (H)	0.001	0	0.00015	272
Dichloromethane	0.0005	0.05 (H)	0.01	0	0.0005	122
Toluene	0.0003	0.024 (A)	0.01	0	0.0003	172
Vinyl Chloride	0.0002	0.002 (H)	0.0007	0	0.0002	142

Notes:
(H) Health-related objective.
(A) Aesthetic objective.
N/A – Reasonable Use Criteria concentration cannot be calculated since the background concentration exceeds the ODWQS.
mg/L – milligrams per Litre

[1] Based on the median results of groundwater samples taken from groundwater monitoring wells BH12-1-5B, BH12-2-5B, BH12-3-5B, BH12-4-5B, BH13-5-5, BH13-6-5B and BH13-7-4-2 between January and July 2013.

[2] Ref. Ontario Drinking Water Quality Standards (MOE, 2003a).

[3] Reasonable Use Criteria = Background Concentration + X (ODWQS Criteria - Background Concentration):

where X = 0.25 for health related drinking water parameters
= 0.50 for aesthetic related drinking water parameters

* Based on a 1,000 year contaminant transport modelling time frame, has been added to the background concentration.
** Relative to year 10 of the landfilling period.

11.3.3 Geotechnical Assessment

As described in Section 10.8, the results of stability analyses (under both static and seismic loading conditions) and settlement analyses were used as the basis for the design of the landfill component of the CRRRC.

Static Stability: The static stability analyses indicate that in order to have an adequate factor of safety against instability of the landfill, the following are required: a 3.5 metre high perimeter berm around the landfill with a 36 metre top width; flat sideslopes at 14 horizontal to 1 vertical to a height of 13.5 metres above existing ground and then 20 horizontal to 1 vertical up to a central ridge or peak; and specific setbacks and sideslope inclinations for various facilities adjacent to the landfill (and for excavated features such as ponds elsewhere on the Site). The minimum target factors of safety used for this design were 1.4 for overall and interim waste/landfill slopes and 1.3 for internal perimeter berm and excavation slopes.

Seismic Stability: Dynamic analyses were also carried out to assess the seismic stability of the proposed landfill configuration when subjected to strong earthquake shaking, as well as estimate the associated movements of the waste and underlying clay soils. The analysis considered the Site-specific subsurface conditions, i.e., thick clay soil deposit, and design earthquakes having a return period of 1:2,475 years, consistent with the design shaking set out in the National Building Code of Canada (NRC, 2010). This is also consistent with design guidelines established for solid waste landfills in the United States.

The corresponding seismic ground motion parameters for the Site were evaluated using the seismic hazard models and seismogenic zones developed on a regional basis by Natural Resources Canada for use in the National Building Code of Canada (NRC, 2010).

The de-aggregated hazard for the Site indicates that the earthquake characteristics correspond to “mean” earthquake magnitudes ranging between M6 and M7 with associated distances between 25 kilometres and 72 kilometres from the Site. Bedrock acceleration time-histories that correspond to those earthquake magnitudes were then selected from available synthetic earthquake records for eastern Canada.

Non-linear dynamic time-history analyses were then carried out to assess the seismic stability and deformations of the CRRRC landfill at the closure condition. The seismic ground motions were propagated from the bedrock upwards towards the ground surface using ground response analysis models.

The analyses were carried out using the computer code FLAC^{2D} *V6* (Itasca*,* 2008) and considered conditions after 30 years of operation. Over that time, the self-weight loads imposed by the landfill materials will induce consolidation settlements in the underlying clayey soils, which will increase the strength and stiffness of the clay foundation soils.

The computed seismic loading-induced lateral movements of the landfill for all six of the analyzed time histories are less than 340 millimetres. The calculated earthquake-induced deformations of the landfill are the result of deformations occurring in the upper clay layers directly below the landfill. These results are indicative of a stable landfill under the design seismic loading conditions.

Settlement: The development of the landfill (i.e., the placement of up to 25 metres of waste) will induce time-dependant consolidation of the underlying clay soil deposit. Due to the low hydraulic conductivity of the silty clay, the settlements will be time-dependant in nature and will occur over many years/decades.

A range of values/profiles for both the preconsolidation pressure and the coefficient of consolidation parameters was considered, and several combinations of the two used in the analyses. This methodology results in a range of the calculated possible settlements over time.

The results of the analyses indicate that, under the highest portions of the landfill, the settlements resulting from primary consolidation of the deposit are expected to be in the order of 6 to 8 metres, by about 100 years from the start of consolidation. In the longer term, the settlements would increase beyond this estimate due to secondary compression of the deposit. The calculated range of settlements over time, based on the combination of primary consolidation and secondary compression, are shown on Figure 11.3.3-1.

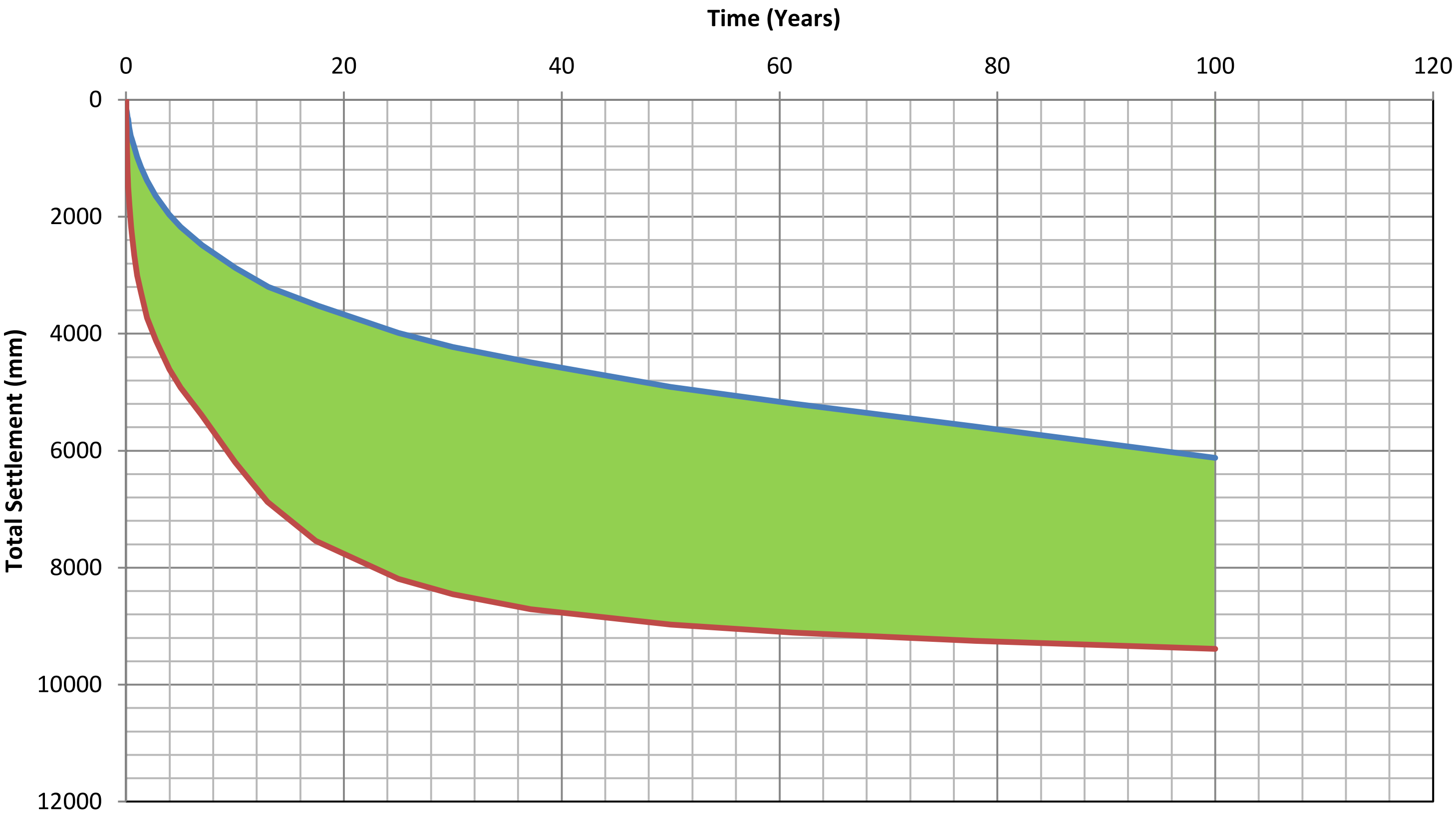
The landfill subgrade settlements will also vary across the footprint, due to the variation in the landfill waste thickness. The calculated range of settlements under waste heights varying up to the maximum proposed waste height, at a time of 100 years following the start of consolidation, are shown on Figure 11.3.3-2. These results were used to evaluate the potential differential settlements of the subgrade (and leachate collection system) beneath different points in the landfill footprint and to design the leachate collection system and assess its expected performance.

As discussed in Section 10.8, the completed landfill geometry (i.e., the elevation of the ‘finished’ landfill surface and sideslopes) will need to account for subgrade settlements. Because the subgrade surface will be settling while waste is placed, it will not, therefore, likely be technically feasible to actually fill to the theoretical slope/cover geometry. Based on monitoring and the associated gain in strength of the clay as it consolidates, the appropriate final waste thickness (not to exceed the final elevation contours assumed for purposes of this EA) will be determined in consultation with the MOECC prior to placement of the waste in the uppermost phases of the landfill.

The geological assessment described in Section 11.3.1 concluded, based on available information, that there is no evidence of surface fault ruptures from historical earthquakes at the proposed CRRRC Site or its immediate vicinity. The assessment further concluded that there is negligible hazard at the CRRRC Site of future fault movement resulting in large scale differential displacements at the surface or shallow subsurface and that there is also little potential for differential settlement associated with strong earthquake shaking (liquefaction) at the CRRRC Site.

In any event, in terms of the engineering significance or potential effects of surface or subsurface displacements from potential future fault movement on the design and performance of the proposed CRRRC landfill, both the landfill mass itself and the proposed leachate containment and collection system (and its components), are very capable of withstanding significant differential displacements. There is no constructed or manufactured liner system at the base of the landfill as designed; rather, the containment of landfill leachate relies on the natural containment properties of the 30 metres of low permeability silty clay underlying the Site. The proposed leachate containment and collection system has been designed to withstand relatively large differential movements and continue to perform its intended function. For example, this containment and collection system has been designed to function when experiencing the predicted movements associated with long term consolidation of the clay deposit beneath the landfill, i.e., total settlements of 6 to 8 metres under the central portion of the landfill. The containment and collection system has also been designed to accommodate lateral displacements of up to 350 mm under seismic loading conditions. In addition, as discussed in Section 11.3.2, the groundwater analyses show that even if there was an early failure of the leachate collection system, then the thickness and low hydraulic conductivity of the natural silty clay deposit would provide the required off-Site groundwater protection. For these reasons, the effects of surface or subsurface displacements from local fault movement, in the very unlikely event that it occurs during the contaminating lifespan of the landfill, are inconsequential for engineering design or performance of the landfill. It is also noted in this regard, as discussed in Section 11.3.2, that the contaminating lifespan of the landfill (the period of time during which the landfill leachate, if released to the natural environment, would have an adverse effect on off-Site groundwater resources) is very short in geological terms, i.e., only of the order of several decades.

In summary, the geotechnical and geologic assessments considered static stability, seismic (dynamic) stability and longer term settlement. To ensure that the landfill will be stable under normal (static) conditions, the height of the landfill has been restricted, the side slopes flattened compared to that recommended in the Landfill Standards (MOE, 1998b), the landfill was set back from adjacent facilities including ponds; and the landfill was surrounded by a perimeter berm. The stability of the landfill under earthquake shaking conditions was also analyzed. The landfill stability models, which considered the movement of the waste, movement of the underlying clay soils and used Site-specific subsurface conditions, estimated the potential lateral displacement of the landfill to be less than 340 millimetres during the design earthquake. These models indicate that the landfill is stable under the design seismic loading conditions. Finally, based on the characteristics of the silty clay at the Site and the maximum weight of the landfill, it is expected that there will be settlement of the subsurface over many years/decades. After approximately 100 years, the subsurface below the central portions of the landfill (where the landfill is thickest) is expected to settle in the order of 6 to 8 metres. Because the thickness of the waste reduces as the landfill slopes downward to meet the perimeter berm, less settlement is expected towards the outer edges of the landfill as the weight of the landfill is not as great in these areas,. The leachate containment and collection system was designed to account for these longer term settlements so that it would continue to perform as expected during and after the settlement. The effects of small-scale surface or subsurface displacements from fault displacement are, therefore, inconsequential for the engineering design and performance of the landfill component of the CRRRC.



NOTE: THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT

Golder Associates

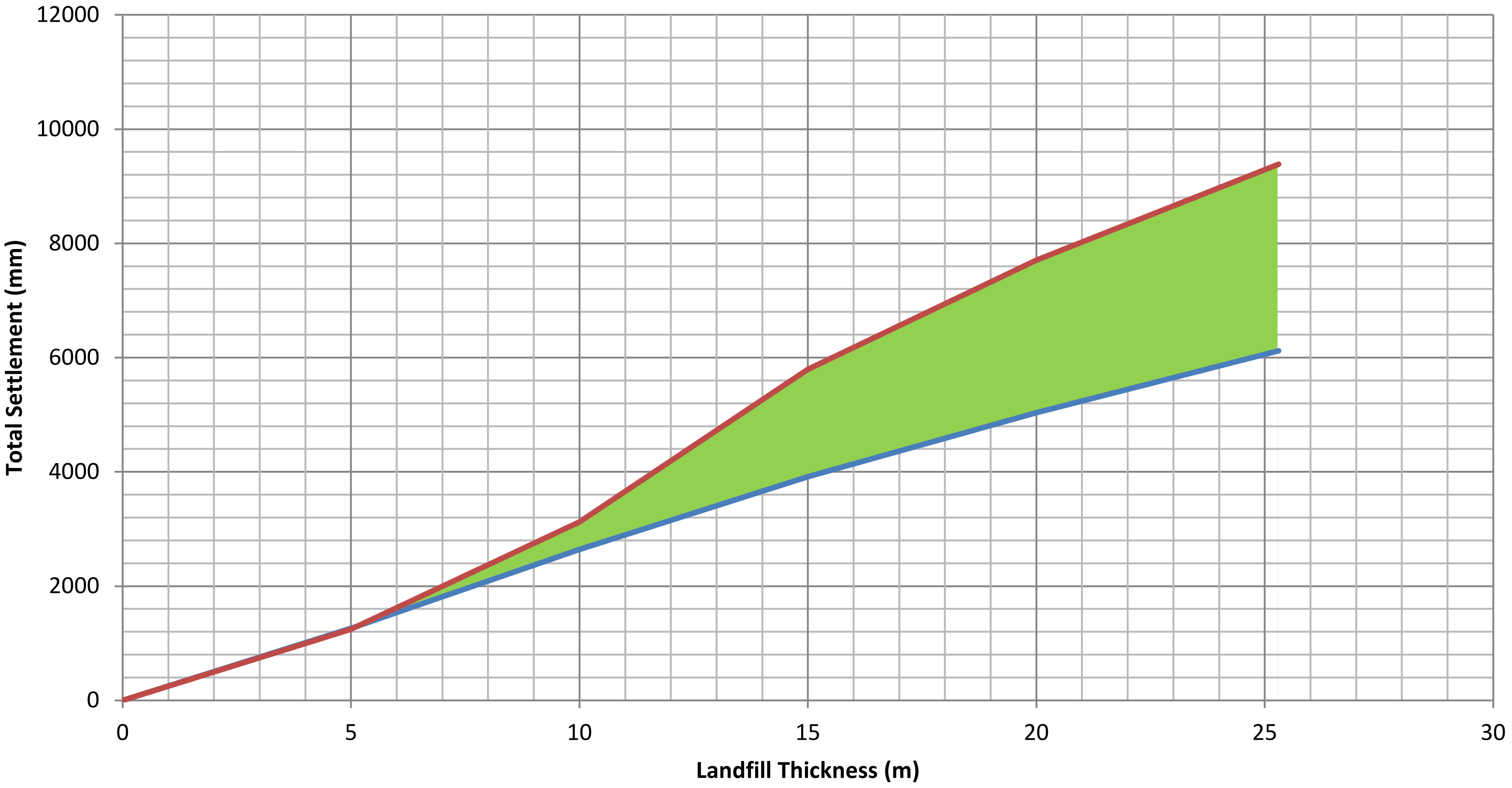
CALCULATED RANGE OF TOTAL SETTLEMENT

SETTLEMENT VERSUS TIME - 25-METRE HIGH LANDFILL

ENVIRONMENTAL ASSESSMENT OF THE CAPITAL REGION RESOURCE RECOVERY CENTRE

Project No.	12-1125-0045
Drawn:	CK
Date:	Nov. 2013
Checked:	PLE
Review:	PAS

FIGURE 11.3.3-1



NOTE: THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT

Golder Associates

CALCULATED RANGE OF TOTAL SETTLEMENT

TOTAL SETTLEMENT VERSUS LANDFILL THICKNESS - 100 YEARS
ENVIRONMENTAL ASSESSMENT OF THE CAPITAL REGION RESOURCE RECOVERY CENTRE

Project No.	12-1125-0045
Drawn:	CK
Date:	Nov. 2013
Checked:	PLE
Review:	PAS

FIGURE 11.3.3-2

11.4 Surface Water

The surface water assessment is provided in Appendix A to the Volume IV D&O Report. Surface water quantity and quality were examined in the assessment. The post-development model results were compared to the pre-development results, with consideration of proposed mitigation systems.

Table 11.4-1 below summarizes the criteria used in designing the stormwater management (SWM) system for the CRRRC Site. The general layout of the SWM system is shown on Figure 10-1.

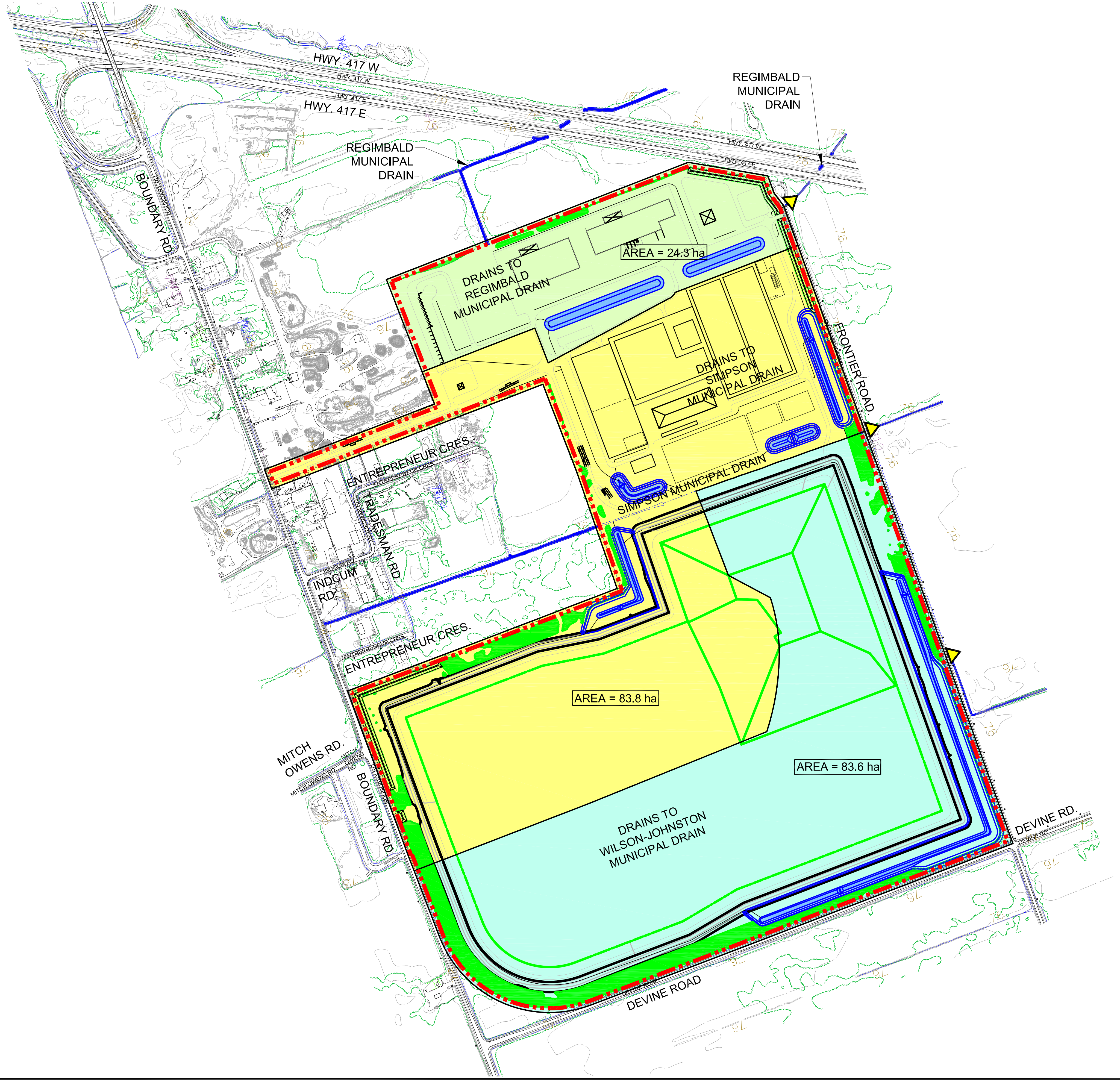
Table 11.4-1: Site SWM Design Criteria

Criterion	Description	Target
Quantity	1 in 2 year to 1 in 100 year runoff events	Post-development peak flows at/below pre-development
Peak Runoff Control		
Conveyance Capacity	Internal drainage ditches, storm sewers and conveyance structures Continuous overland flow route	Design Capacity to accommodate 1 in 25 year design storm Convey the peak flow from the 1 in 100 year design storm
Stormwater Water Quality	TSS	Enhanced Level Treatment (80% TSS removal) (MOE, 2003b)

Predicted Effects on Drainage Areas: The post-development conditions scenario considers the Site Development Plan layout for the ultimate build-out of the CRRRC facilities, the landfill final cover and the SWM controls shown on Figure 11.4-1. The three Site sub-catchment drainage areas and corresponding land uses for the proposed ultimate build-out state of the Site are presented below.

Regimbald Municipal Drain: The proposed northern Regimbald Municipal Drain, sub-catchment area will increase by 3.3 hectares, to a total sub-catchment area of 24.3 hectares. The proposed grading and servicing plans route the drainage from this part of the CRRRC facility area to the two cell SWM/Fire Ponds. This post-development Site sub-catchment area includes buildings, parking areas, roadways, stockpile areas, preserved existing and/or landscaped green space and the two SWM/Fire Pond cells (Ponds 5a and 5b) located in the central area of this sub-catchment.

Simpson Municipal Drain: The proposed Simpson Municipal Drain post-development total sub-catchment area of approximately 83.8 hectares increases from existing conditions by approximately 8.2 hectares. This post-development drainage area is proposed to control runoff via a pond northwest and northeast of the Simpson Drain (Ponds 3, 4a and 4b) and one pond southwest of the drain (Pond 1). The area north of the Drain will include pads for the composting operations and soil treatment facilities, buildings, roadways and leachate storage ponds. The area south of the Simpson Drain will include the northwest segment of the landfill component of the CRRRC.



N
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LEGEND:

- 🟥 PROPERTY BOUNDARY
- 🟦 SURFACE WATER
- △ OUTLET
- — DRAINAGE AREA BOUNDARY

NOTE

1. THIS FIGURE SHOULD BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT.

REFERENCES:

1. BASE DRAWING PROVIDED IN A DIGITAL FORMAT BY BASE MAPPING CO. LTD., CONTRACT No. 2517-12, PHOTO DATE: NOVEMBER 7, 2012, DATE RECEIVED: JANUARY 9, 2013.
2. PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 18

200 0 200 400

SCALE 1:10,000 METRES

REV	DATE	DES	REVISION DESCRIPTION	CAD	CHK	RVW

PROJECT

ENVIRONMENTAL ASSESSMENT OF THE
CAPITAL REGION RESOURCE RECOVERY CENTRE

TITLE

POST-DEVELOPMENT DRAINAGE AREAS

Golder Associates
Ottawa, Ontario, Canada

PROJECT No.		12-1125-0045
DESIGN	D.H.	22 Jan. 2013
CAD	M.L.F.	23 Jan. 2013
CHECK	D.V.K.	Aug. 2014
REVIEW	P.A.S.	Aug. 2014

FILE No.1211250045-V1-EAr-11.4-1.dwg

SCALE AS SHOWN REV. 0

FIGURE No.

11.4-1

PLOT DATE: October 9, 2014
FILENAME: N:\Active\Spatial_IM\Miller_Paving_Ltd\CRRRC\ACAD\Vol 1 (Report Figures)\Chapter 11\1211250045-V1-EAr-11.4-1.dwg

Wilson-Johnston Municipal Drain: The post-development, final build-out sub-catchment area draining to the Wilson-Johnston Drain will decrease by approximately 11.5 hectares, from 95.1 hectares to 83.6 hectares. This area will include approximately two-thirds of the landfill area and will include one long pond located along the southern and eastern sides of the Site.

A summary of existing and proposed post-development drainage areas is presented in Table 11.4-2.

Table 11.4-2: Existing and Proposed Drainage Areas

Site Municipal Drain Sub-catchment	**Area (hectares)**	
	Existing	**Proposed**
Regimbald	21.0	24.3
Simpson	75.6	83.8
Wilson-Johnston	95.1	83.6
Total Site	***191.7***	***191.7***

The total Site drainage area is not expected to change. The Regimbald Municipal Drain still has the smallest drainage area and the Simpson and Wilson-Johnston Municipal Drains will have identically sized drainage areas. Drainage leaving the Site to these three outlets will be managed by the on-Site SWM facilities.

Predicted Effects on off-Site Flows: The ditches within the Site are designed to convey stormwater to the SWM ponds, or eastern Site boundary culverts directly. Three types of channels (ditch, SWM pond inlet, or outfall channels and spillways) have been designed considering the slope along with the peak flow and corresponding velocity computed for a 1 in 25 year design storm. Based on the functionality of the channels, with consideration of peak velocity results, these conveyance features have been designed with two types of surface treatment: rip-rap lined, or vegetated ditches.

Post-closure conditions were used for the surface water quantity assessment as the entire Site will be contributing to Site runoff when the landfill component has been capped. In order to minimize potential for nuisance flooding during minor storm events and property damage during major events, the ponds have been designed for the 1:100 year storm event.

Under the post-development scenario, the increase in impervious land use and average slopes for the sub-catchment areas are expected to generate increased runoff conditions.

Considering the proposed SWM ponds (storage reservoirs), Table 11.4-3 compares the pre-development and controlled, post-development peak flows for each Site sub-catchment area. As shown, the post-development peak flows are less than the pre-development flows and the CRRRC will not lead to increased peak off-Site surface water flows.

Table 11.4-3: Pre- and Post-Development Peak Flow Rates Comparison

Municipal Drain Sub-Catchment		Drainage Areas (hectares)		Peak Discharge to Municipal Drains (Litres per second)							
				1:2 year		1:5 year		1:25 year		1:100 year	
		Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
1	Regimbald	21	24.3	86	38	298	195	471	336	538	455
2	Simpson	75.6	83.8	35	13	284	251	585	549	732	617
3	Wilson-Johnston	95.1	83.6	40	25	345	338	715	580	898	675

These peak flows are conservative for the purposes of determining the approximate SWM pond sizes to meet storage volume requirements to manage peak flows without flooding.

Predicted Effects on On-Site Runoff Flow Volumes: Environment Canada (1940-2011) climate normals were used to estimate annual average water budget comparisons for the existing and post-development Site conditions (Environment Canada, 2012). Results for the existing Site condition water budget are provided in Table 11.4-4. Results for the post-development Site condition water budget are provided in Table 11.4-5.

Table 11.4-4: Existing Conditions Water Budget

Municipal Drain Sub-catchment	Average Annual Volumes			
	Area (hectares)	Surplus (m^3/yr)	Runoff (m^3/yr)	Infiltration (m^3/yr)
Regimbald	21.0	81,340	63,000	18,340
Simpson	75.6	270,430	196,790	73,640
Wilson-Johnston	95.1	334,850	245,940	88,910
Total	***191.7***	***686,620***	***505,730***	***180,890***

Table 11.4-5: Proposed Conditions Water Budget

Municipal Drain Sub-catchment	Average Annual Volumes			
	Area (hectares)	Surplus (m^3/yr)	Runoff (m^3/yr)	Infiltration (m^3/yr)
Regimbald	24.3	100,510	94,660	5,850
Simpson	83.8	308,170	254,030	54,140
Wilson-Johnston	83.6	273,450	194,470	78,980
Total	***191.7***	***682,130***	***543,160***	***138,970***

Due to the proposed development of the CRRRC, the overall Site is expected to see a decrease in annual infiltration and a corresponding increase in annual runoff. Also, shifting of drainage area boundaries at the sub-catchment levels is expected to result in larger changes when compared to pre-development conditions. The Regimbald sub-catchment area is increased, which results in an increase in runoff and a decrease in infiltration. A similar scenario is expected for the Simpson sub-catchment area with an expected increase of approximately 30%. Since the Wilson-Johnson sub-catchment is proposed to be reduced in area, the runoff is expected to decrease by approximately 20%; the expected annual infiltration will also decrease. As described above, the off-Site flows associated with the runoff volumes will however be controlled by the on-Site SWM facilities.

The existing Site drainage is poor and discharge in the outlet ditches downstream of the Site is highly variable. The proposed SWM facilities will regulate and provide more regular flows compared to the current condition. Since all drainage originating from the CRRRC Site areas combine at Shaw's Creek, any potential impacts associated with changes in post-development drainage will be primarily limited to the sections of ditches immediately downstream of the Site. These potential impacts were considered as part of the biology assessment.

Surface Water Quality: Stormwater quality control will be provided for the Site to remove a minimum of 80% TSS loading (Enhanced Level Treatment (MOE, 2003b)) for each of the three sub-catchment systems. The extended detention drawdown time for proposed SWM Ponds 1 to 5 is approximately 24 hours, considering the 25 millimetre City of Ottawa design storm event.

To improve the settling of TSS within the permanent pool, SWM Ponds 1, 2, 3 and 4b will be constructed with a forebay equal to approximately 1/5 of the width and length of the pond bottom. Due to the long, linear nature of most of the SWM ponds, some of the runoff entering the ponds will bypass the forebays. To assist with removal of TSS, it is proposed that much of the runoff for these areas be promoted to enter the ponds as sheet flow across vegetated buffer areas adjacent to the ponds. To avoid re-suspension of accumulated sediments and flushing of the ponds during major storm events exceeding the 1 in 100 year event, a pond bypass/overflow would convey excess flow to the outlet.

During the operational/construction phase of the project, ditches and swales at the perimeter of unvegetated portions of the Site will be protected from potential runoff containing suspended solids through the use of temporary berms and silt fences. Perimeter ditches along the completed and capped areas will divert runoff through grass lined swales to the SWM ponds.

The ponds and the swales will serve to remove suspended sediment from the runoff and prevent significant outflows that could potentially impair the water quality in downstream watercourses in extreme events.

In the post-closure phase of the Site, finalized perimeter ditches along the outer berm of the landfill footprint will capture and direct runoff from the landfill surface and will continue to direct the water via grass lined swales or ditches to the SWM ponds that have been designed for Enhanced protection levels (MOE, 2003b).

During operational phases of the diversion facilities or the landfill, drainage features will be implemented to keep potentially contaminated runoff separate. Drainage around the active face of the landfill will be directed to the landfill leachate collection system. Pond 4a will be a two celled storage pond dedicated to receive runoff from the proposed compost pad area. One cell will be dedicated to receive runoff from final curing areas of the pad while the other will be for runoff from the remainder. This pond is sized to contain runoff equivalent to 110% of a 1:25 year, 24 hour event for the pad area, without discharge to off-Site surface water. The stored water within the pond cells will be managed to maintain adequate capacity by re-using the water from the appropriate cell for compost pile spraying and Site irrigation. To ensure Site irrigation is a viable option, water quality samples from both cells of Pond 4a will be collected for analysis during the demonstration phase of the organics processing facility. Should water quality be such that Site irrigation is not possible, it is contemplated that surplus water from Pond 4a would be taken to the City of Ottawa wastewater treatment plant with the pre-treated wastewater from the Site.

The proposed works are predicted to result in surface water quality conditions that are comparable to existing conditions. Post-closure, the SWM ponds will continue to operate, to ensure surface water quality downstream of the Site remains protected.

11.5 Biology

The assessment of effects on the aquatic and terrestrial biology environment is provided in TSD #4. Potential adverse effects of the project were identified considering linkages between project components or activities and natural environmental features. The assessment follows a source-pathway-receptor approach. Effects from the CRRRC project may occur either directly or indirectly.

11.5.1 Potential Direct Effects

Vegetation Communities: The construction of the project will result in the removal of all vegetation from the Site, with the exception of a 15 to 20 metre wide vegetated screen around the perimeter of the Site.

There will be permanent loss of approximately 65.7 hectares of forest vegetation on the Site. This vegetation is largely immature with more than half dominated by non-native invasive species, including European white birch and common buckthorn. Common buckthorn thrives in a variety of habitats and forms dense thickets that crowd and shade out native plants. It can alter nitrogen levels in the soil, creating better conditions for its own growth and discouraging the growth of native species. Common buckthorn also produces large numbers of seeds that germinate quickly and prevent the natural growth of native trees and shrubs (Ontario Federation of Anglers and Hunters, 2013). A white spruce plantation comprises 15% of the forested area on the Site and the remainder is immature deciduous swamps.

The remainder of the Site is vegetated in primarily thicket and thicket swamp, representing low-diversity, early successional communities. These vegetation communities have a high proportion of glossy buckthorn (*Frangula alnus*). Glossy buckthorn has the same invasive characteristics as common buckthorn, as described above, but is found in more moist conditions. Based on existing conditions and the prevalence of glossy buckthorn in the seeding layer observed during the field surveys, it is likely that glossy buckthorn would increase in dominance in the non-forest vegetation communities on the Site if left undisturbed. Thickets and thicket swamps are not uncommon in the Site-vicinity or in the City of Ottawa.

All vegetation species to be removed on the Site are common to the Site-vicinity and widespread in the area. There will be no removal outside of the Site.

The loss of the non-native dominated vegetation communities on the Site is not considered to be ecologically important from a vegetation perspective.

Wildlife Habitat: The Site provides disturbed, fragmented habitat for a number of common and widespread species. The construction of the project will result in the removal of this habitat, including barn swallow habitat (designated threatened under the ESA) in some old barns on the Site.

The habitat on the Site does not meet the criteria for significant wildlife habitat under the Significant Wildlife Habitat Technical Guide (MNR, 2000). There are similar available habitats in the Site-vicinity that can be used by the species currently using the Site. It is likely that during the construction of the project, the species on the Site will relocate nearby.

It is not anticipated that there will any direct effects on the wildlife habitat outside the Site.

Barn swallow, listed as Threatened under the Ontario ESA, was observed nesting on the Site. In order to remove the on-Site habitat, authorization will be sought from the MNRF through a notice of activity under O. Reg.323/13 (MNR, 2013b). A mitigation and restoration record will be prepared and new barn swallow habitat will be created within approximately 1 kilometre of the Site and monitored for three years. Following the creation of the new habitat, it is expected that there will be no net residual impact on barn swallow or barn swallow habitat as a result of CRRRC.

Little brown myotis and small-footed myotis, listed as Endangered under the ESA, were detected flying over the Site. The field surveys indicated that the bats were only flying over the Site. There is no maternity roosting habitat on the Site. The MNRF has concurred that there was no habitat on the Site that required protection. It is expected that there will be no impact on little brown myotis, small-footed myotis, or their habitat, as a result of CRRRC.

Although milksnake, listed as Special Concern under the ESA, was not observed on the Site, there is suitable habitat and low to moderate potential for this species to be found on the Site or in the Site-vicinity. Because milksnake is listed as a species of concern, its habitat is not protected. During construction and operation, it is likely that any milksnake in the Site-vicinity will avoid the Site and will use the available adjacent habitats. A worker awareness program to avoid harm to individuals, if they are in the Site-vicinity, is recommended.

Three bird species were identified during breeding bird surveys on the Site that are area sensitive and require a certain amount of mature or immature forest habitat on the landscape - ovenbird (*Seiurus aurocapilla*), yellow-bellied sapsucker (*Sphyrapicus varius*) and veery (*Catharus fuscenscens*). There is sufficient contiguous forest habitat for all of these species within the Site-vicinity, particularly to the west and the south of the Site. There is also suitable habitat to the north of the Site, north of Highway 417. The construction and operation of the project is not expected to adversely affect local populations of any bird species.

Because the wildlife habitat on the Site is considered disturbed and fragmented, and there will be no material effects to local populations of species, the loss of wildlife habitat on the Site is not considered to be ecologically important.

Migratory Bird Nests: The *Migratory Birds Convention Act* prohibits the destruction of migratory bird nests (passerine, waterfowl and raptor) during the breeding season. In Ontario, the migratory bird breeding season extends from approximately May 1 to July 31. Where possible, vegetation removal will be scheduled outside the migratory bird breeding season. If it is not possible to complete the clearing outside this window, a biologist will conduct nest searches no more than 24 hours prior to the construction activities to avoid destruction of migratory bird nests. These mitigation measures will ensure minimal impact to the nest success of migratory birds relative to baseline conditions.

Fish Habitat: The Simpson Drain on the Site will be improved from its existing condition (with removal of the existing beaver dam to avoid obstruction of flow through the Drain) throughout the construction and operation of the project. There will be no direct loss of fish habitat in this surface water feature.

Construction of the diversion facilities in the northern part of the CRRRC will require complete removal of DD1. During the 2012 survey, DD1 was dry along its entire length; during the 2013 survey, there was an approximately five metre section with pooled water in which three fish were caught. The fish habitat in DD1 is marginal and poor quality and typical of other drainage ditches in the area. Removal of this feature is not considered to have a negative impact on fish and fish habitat as it does not support critical life functions (i.e., reproduction) and there is similar suitable habitat in the immediate area, including downstream of the Site.

Construction of the CRRRC will require the complete removal of DD2 across the Site. DD2 originates in a roadside ditch along Boundary Road and collects surface runoff from the south part of the Site. There was no flow and no fish were observed in DD2 during any of the field surveys. Furthermore, dissolved oxygen levels in the pooled water were low enough to exclude most aquatic species, including fish, from using this habitat. On this basis, DD2 is not considered direct fish habitat and removal of this feature will not result in a direct loss of fish habitat on the Site.

DD3 is a constructed feature that is isolated from all other surface water features in the Site-vicinity, although it appears that there may be a tenuous overland connection with DD2 during periods of high flow such as following storm events or spring freshet. DD3 is also subject to stress associated with winter low temperatures, summer extremes and is characterized by poor quality aquatic habitat. DD3 contains a small fish community and is considered direct fish habitat. Because DD3 will be removed during the construction of the project, the CRRRC project will have an adverse effect on the fish habitat in this feature.

Prior to any work associated with DD3 a fish collection permit will be obtained from the MNRF. The fish will be salvaged and relocated to a nearby surface water feature. Any non-native species encountered during the fish salvage will be euthanized and disposed of using appropriate methods.

The loss of habitat from the isolated DD3 surface water feature is not ecologically important given its poor quality. By removing and relocating the fish to a nearby feature with a similar fish community and habitat structure, it is expected that there will be no adverse impacts to the fish community.

Wildlife Vehicle Collisions: The construction and operation of the CRRRC will result in an increase in the volume of vehicle traffic in the Site-vicinity, with the majority of Site-related traffic along the 800 metre long section of Boundary Road (an arterial road) between Highway 417 and the Site entrance location. The potential for vehicle collisions with wildlife may marginally increase, however Boundary Road is already heavily travelled. Traffic speed and volume are generally the primary factors that contribute to road-related wildlife mortality. The incremental increase in the number of wildlife-vehicle collisions associated with the CRRRC is expected to be minor or negligible relative to baseline conditions. The Site is isolated from other wildlife habitats by active roads, including Boundary Road, Frontier Road, Devine Road and Highway 417.

Mitigation measures will be implemented to reduce the number of on-Site wildlife-vehicle collisions, in particular establishing and enforcing speed limits on the Site. Material increase in wildlife mortalities on the Site from vehicle strikes associated with the CRRRC is not anticipated.

11.5.2 Potential Indirect Effects

Habitat Fragmentation/Changes to Wildlife Movement Corridors: The lands to the east are in open agricultural use (crops) and the Site is bounded by a 400 series divided highway (Highway 417) to the north and an industrial park and Boundary Road to the west. The NCC has hypothesized the existence of a wildlife movement corridor from the Cumberland Forest through the Vars Forest, across Highway 417 and through an area including the Site and then to the west of Boundary Road based on their high level assessment (NCC, 2013b). This hypothesized corridor is fragmented by Highway 417 in its northeast portion and Boundary Road to the west/northwest, which would significantly limit wildlife movement between the Vars and Cumberland Forests and anything to the south of that four lane divided highway. To the extent there may be wildlife movement across Highway 417, the vegetation to the south of Devine Road would provide a continued movement corridor to the area west of Boundary Road. Based on the data collected during the field surveys on the Site, there were no signs of an existing wildlife movement corridor on the Site such as heavily used game trails or high numbers of wildlife. Further, the NCC also identifies a wildlife corridor north of both the Site and Highway 417 from the Vars Forest, directly across Boundary Road to a natural area connected to the Mer Bleue further to the west/northwest; this corridor, which provides direct linkage from the Forests to natural areas further northwest without having to cross Highway 417, remains available to allow wildlife movement in the area.

The wildlife habitat in the Site-vicinity is patchy, disturbed and fragmented. Although fragmentation can accompany habitat loss, it is a different phenomenon (McGarigal and Cushman, 2002; Fahrig, 2003). Habitat fragmentation effects are generally lesser in magnitude than direct habitat loss (Andrén, 1999; Fahrig, 2003) and species with very specific habitat requirements and low dispersal abilities are more likely to be affected by habitat fragmentation or associated changes to wildlife movement corridors.

All of the wildlife species identified on the Site are habitat generalists, habituated to the disturbed, fragmented landscape and are mobile species. It is expected that because of the current fragmented landscape, the construction and operation of the project will not affect the overall movement of wildlife between habitats to any material degree.

The fragmentation of habitats or any changes to wildlife movement corridors in the Site-vicinity are not considered to be ecologically important adverse effects.

Air Emissions: Wildlife in the Site-vicinity may potentially be exposed to airborne contaminants from the CRRRC. Direct exposure includes inhalation of air emissions, or ingestion of water, soil or vegetation impacted by air emissions. Mitigation measures to limit the amount of airborne constituents from the Site in compliance with MOECC requirements will be implemented, such as air emission controls in buildings and processing operations, minimizing idling in on-Site vehicles, use of equipment with industry-standard emission control systems and developing operating procedures that reduce air emissions (e.g., regular maintenance of equipment to meet emission standards).

All air constituents generated by the CRRRC will meet MOECC guidelines/standards, which generally consider both human and ecological risk (TSD #2). Air standards in Ontario are based on the best scientific information available and are set at levels intended to safeguard the natural environment and protect sensitive populations (MOE, 2009a). In addition, volatile and semi-volatile constituents generally degrade in air and will not likely deposit onto surface water or soil and will not persist in the environment. Contaminants that are gaseous at room temperature are also not expected to deposit onto surface water or soil. Although metals and ions such as chloride, sulfate, sulphides and nitrate may be deposited on surface water or soil via wet (adhered to precipitation) and dry deposition (adhered to particulate matter), the levels will be in such low amounts that there will be no adverse effects on the off-Site natural environment, including wildlife.

Dust Deposition: Accumulation of total suspended particulate deposition (i.e., dust) can result in a local indirect change on the quality of habitat on the Site and in the Site-vicinity. Dust deposition in surface water has the potential to alter surface water chemistry and increase the sediment load in receiving surface water features. Dust can also affect vegetation by smothering the leaf surface of plants, blocking the stomata and by changing the soil pH and ionic composition. The physical smothering of the leaf surface reduces light transmission causing reduced photosynthesis, growth (vegetative and reproductive) and plant vigour. It may also inhibit pollen germination. Physical blocking on the stomata has been shown to reduce stomatal resistance, causing higher uptake of toxic metals and phytotoxic pollutant gases. Dust deposition may also increase pH in acidic soils, alter soil nutrient availability and cause greater bulk density. Dust can also exacerbate secondary stresses such as drought, insects and pathogens (Farmer, 1993).

Mitigation measures will be implemented to minimize the amount of airborne dust such as enforcing on-Site speed limits and paving almost all of the roads in the north part of the Site, and applying Site fugitive dust best management practices, as necessary and appropriate, such as the use of a truck tire washing station and watering or applying dust suppressant to on-Site road surfaces to minimize track in and track out of dust.

The major sources of dust on the Site will be the internal road system (mainly the unpaved roads in the south part of the Site) and disturbed exposed soil areas during construction and during operation of the landfill portion of the CRRRC. The results of the air quality modelling predicted that the total suspended particulate air concentrations within the Site-vicinity, as a result of the project, will be below provincial guidelines (120 µg/m^3) (TSD #2). It is anticipated that any effects of dust on off-Site vegetation or wildlife will be at worst occasional and of low magnitude considering the low concentrations.

In summary, it is not expected that vegetation or wildlife habitat will be adversely affected as a result of dust emissions from the CRRRC project.

Noise: Increased noise as a result of CRRRC could cause avoidance of the Site-vicinity by wildlife and possibly, reduced reproductive success.

Sound is comprised of energy at various frequencies, which give each sound we hear its unique character. The frequencies are measured in Hertz (Hz) and are typically grouped into octave or 1/3 octave bands. It is common practice to sum sound levels over the entire audible spectrum to give an overall sound level. However, the human ear does not respond to each frequency equally. To approximate the hearing response of humans, “A-weighted” sound levels apply an adjustment to each octave band. In general, a larger adjustment is applied to low frequencies, as human hearing is less sensitive to low frequency sound. Although it is possible to develop adjustments to represent how human perceive sounds of different frequencies, it is not possible to develop comparable adjustments for the perception of non-humans to noise. Literature suggests that livestock have a fairly similar hearing range to that of humans, with the lower end of their range of hearing starting at the same, or slightly higher, frequencies than humans (Strain, 2013). This literature also suggests that livestock can hear sounds at frequencies that extend beyond the range of human hearing. Noise effects from the project on wildlife were assessed using dB(Lin), which best describes the full range of frequencies at which wildlife species hear and vocalize.

The noise model predictions were based on the assumption that the processing facilities and landfill component are operating at maximum capacity, with the landfill activity elevated at the closest point to the Site boundary. Based on the models, within the Site-vicinity, noise from CRRRC to the north, south and west is not expected to exceed baseline conditions. The existing noise levels from the traffic along Boundary Road, Devine Road and Highway 417, which contribute to the baseline conditions, are at least 8 dB(Lin) higher than those predicted due to the operation of CRRRC. To the east of the Site, the predicted elevated noise levels are lower than baseline by the boundary of the agricultural fields at Highway 417, but elevated above baseline further away from the influence of Highway 417. The lands to the east of the Site are in active agricultural (crop) use.

Although little is known about the effects of noise on individual species, no particularly sensitive wildlife species have been identified in the Site-vicinity. Because the lands to the east are not being used by livestock, and the existing natural wildlife habitats are limited to hedgerows and small patches of isolated woodland, with common mobile species, wildlife habitat utilization patterns outside of the Site are not predicted to be altered as a result of project noise.

In summary, predicted noise levels from the CRRRC are not considered to be ecologically important.

Increased Erosion: Increased erosion on the Site can cause a disturbance and change in aquatic communities through sediment loading, or a decrease in available aquatic habitat.

A minimum setback of 20 metres will be maintained, during both construction and operation of the project, from the Simpson Drain on the Site. It is proposed to use standard mitigation measures such as implementing a sediment and erosion control plan prior to construction, where appropriate (to mitigate erosion potential and promote Site stabilization), controlling access and movement of equipment, and scheduling construction activities to minimize areas and duration of soil exposure to the extent practical. All areas of disturbed/exposed soil during construction and the SWM structures during operation, will be stabilized and re-vegetated as soon as possible. Through the implementation of these mitigation measures, it is anticipated that there will not be any material increase in erosion and associated transported sediment effects on the Site or in the Site-vicinity.

Alteration of Surface Water Regime: Alteration of the surface water regime has the potential to affect streamflow in downstream sections of aquatic systems associated with watercourses and ditches within the Site. Changes in flow downstream could affect fish habitat by reducing the amount of habitat, increasing the deposition of fines in habitats and decreasing the amount of in-stream vegetation for cover.

The area of the municipal drain sub-catchments is anticipated to change as a result of CRRRC, with an increase of approximately 17% of the Regimbald sub-catchment (DD1), an increase of approximately 11% of the Simpson sub-catchment and a decrease of approximately 12% of the Wilson-Johnston sub-catchment (DD2). Due to the increase in imperviousness and the change in contributing drainage areas, the annual runoff from the Site to each sub-catchment will also change. There will be an increase of approximately 50% and 29% in the amount of annual runoff to the Regimbald and Simpson sub-catchments, respectively, and a decrease of approximately 20% annual runoff to the Wilson-Johnston sub-catchment.

While the annual runoff amounts are anticipated to change, the post-construction peak flows will be controlled through the SWM ponds to equal or less than pre-development conditions. The SWM ponds will be designed such that the surface water leaving the Site will be controlled and the hydrologic regime post-construction will meet the pre-construction conditions, through the design of the hydraulic outlet controls for post development flow to meet peak flow conditions for the 1 in 2, 5, 25 and 100 year design storms. As set out in the surface water assessment (Appendix A to the Volume IV D&O Report), it is anticipated that because under existing conditions the Site is prone to flooding and the groundwater levels are close to the surface, by meeting the pre- and post-construction peak flows at the outlets of DD1 and DD2, the post-development base flow will be similar to pre-development conditions. As described in Section 8.6.2 and shown on Figure 8.6.2-1, there are three surface water discharge points from the Site. The three on-Site surface water discharge points meet and become Shaw's Creek, north of Highway 417. The runoff from the Site discharged to the Regimbald and Simpson sub-catchments will have an overall annual increase, but will be controlled to meet the pre-construction peak flow conditions. The alteration in the flow regime of these sub-catchments is not expected to adversely affect downstream aquatic habitat or biology. The runoff from the Site discharged to the Wilson-Johnston sub-catchment will have an overall annual decrease, but again will be controlled to meet the pre-construction peak flow conditions. DD2 (the discharge point that drains to the Wilson-Johnston Municipal Drain), from the Site to Highway 417, is an intermittent channelized farm drain characterized by terrestrial grasses. There is no direct fish habitat in the reach of DD2 from Frontier Road to Highway 417. Because there is no fish habitat in DD2 downstream from the Site and all surface water runoff from the Site will contribute to Shaw's Creek, a small potential change in the streamflow in DD2 is not expected to affect downstream fish habitat.

A surface water monitoring program will be implemented to confirm predictions re the surface water regime post-development and to make adjustments to the operation of the stormwater control system, as necessary (see Stormwater Management Design report in Appendix A to the D&O Report for details).Overall, it is not predicted that changes in the surface water flow regime will be ecologically important.

Alteration of Groundwater Quantity Regime: Alteration of the groundwater regime (i.e., a change in the direction of flow of groundwater, or a groundwater drawdown zone of influence) can result in a reduction of baseflow in predominantly groundwater-fed surface water features or wetlands, or affect shallow-rooted vegetation. The direction of groundwater flow is not expected to change as a result of the CRRRC.

Seasonal variation in groundwater elevation is indicated to be currently on the order of 0.5 metres in the Site-vicinity. It is predicted that the groundwater zone of influence from the CRRRC will not extend beyond the Site boundary. As such, off-Site groundwater levels should not be affected by the CRRRC.

On-Site, there is currently limited infiltration of surface runoff into the groundwater system. What infiltration occurs would be into the surficial silty sand layer and generally not deeper into the subsurface because of the underlying low permeability silty clay deposit. As such, surface water features on the Site, including the Simpson Drain, are fed primarily by surface flows.

The surface water features and the vegetation communities on-Site and in the Site-vicinity should not be affected by any changes in the groundwater regime.

Surface Water Quality: Surface water runoff from CRRRC could potentially affect vegetation and wildlife habitat. Contamination of surface water could include nutrient loading and/or input of sediments or other contaminants from the Site.

Surface water on-Site will be managed through stormwater ponds. The stormwater ponds will incorporate erosion and flow control measures and the stormwater ponds will be regularly monitored and maintained. Stormwater discharge will also be monitored. The Site will have sufficient storage capacity to store both operating flows and design storm events.

The facility incorporates several environmental design features to prevent release of untreated Site water into the receiving environment, including separation of leachate and potentially contaminated runoff from processing areas from clean runoff and design of the stormwater ponds to achieve an Enhanced Level of TSS removal (MOE, 2003b).Off-Site surface water quality should therefore not be adversely impacted as a result of the CRRRC project.

Groundwater Quality: The engineered containment and leachate collection and management system for the CRRRC has been designed to safeguard off-Site groundwater resources. The performance of the containment systems will be monitored and the leachate collection system will be monitored and regularly maintained. Based on the results of the groundwater modelling (as described in Volume III Geology, Hydrogeology and Geotechnical Report), groundwater quality is predicted to meet the Reasonable Use Criteria (MOE, 1994b) at the downgradient edge of landfill footprint and there will be no adverse off-Site groundwater impacts as a result of the CRRRC.

Pests: Increased use of the active landfill area by pests including nuisance birds, insects and rodents could result in avoidance of the area by some wildlife and reduced reproductive success. Mitigation measures, such as managing waste effectively to avoid attracting nuisance wildlife and pests, controlling the nuisance wildlife populations as permitted and required, and conducting periodic inspections to monitor effectiveness of the pest control, will be implemented to reduce the potential for adverse effects to the current local wildlife populations.

With the implementation of the above mentioned mitigation measures, use of the Site by nuisance wildlife and pests is not anticipated to be a concern.

11.5.3 Mer Bleue

As described in Section 8.7.1, the Mer Bleue (an Earth Science Provincially significant ANSI and considered a Core Natural Area by the NCC) is located to the northwest of the Site; at its closest point, the southernmost limit of the Mer Bleue is approximately 3.5 kilometres from the northwest-most boundary of the CRRRC Site. This 3,500 hectare conservation area contains the second largest bog in southern Ontario, providing habitat to many species of regionally rare and significant plants, birds and other wildlife (NCC, 2013a). Considering its separation distance from the CRRRC Site, the direction of groundwater flow and the results of assessments of potential direct and indirect effects of the CRRRC on the natural environment as described above in Sections 11.5.1and 11.5.2, there are no anticipated adverse effects from the CRRRC on the Mer Bleue. This is further discussed in Section 11.6.1 below in relation to the NCC.

11.6 Land Use & Socio-economic

The assessment of effects on the land use and socio-economic environment is provided in TSD #5. The assessment is broken down into three sub-components: land use, socio-economic and visual. Potential adverse effects of the project were identified considering linkages between potential impacts from project components or activities and other land uses in the Site-vicinity.

11.6.1 Land Use

The potential effects on existing and proposed future land use in the area as a result of the preferred Site Development Plan were assessed taking into account current relevant planning policy to determine the potential for future development in the area, as well as the impact assessment work of other disciplines as summarized in the Biology section immediately above.

The land use planning policy for this area is determined by the City of Ottawa's Official Plan (City of Ottawa, 2013g) and Zoning By-law (City of Ottawa, 2008), which has been approved in accordance with the Province's Land Use Planning Policy Statement and the *Planning Act*. The land is within the National Capital Region; therefore a review of the NCC's relevant planning policy has also been undertaken.

MOECC Guideline D-4: The MOECC D-4 Guideline (MOE, 1994c) is used by Ministry staff during review of land use approvals in the vicinity of landfills. This guideline indicates that the greatest likelihood of effects from landfill sites will occur within 500 metres of the site and recommends that in the absence of site-specific studies municipalities should establish within their Official Plan a 500 metre holding or buffer zone (called the influence area of the site in the City Official Plan (City of Ottawa, 2013g) Section 3.8.5) around landfills as related to potential development. In order to develop within this 500 metre zone an applicant must carry out site-specific studies. It should be noted that through this process the 500 metre buffer can be reduced to as little as zero.

In the case of the CRRRC, the EA and EPA/OWRA studies that Taggart Miller have undertaken as part of this EA demonstrate that the CRRRC can be designed and operated to not have adverse effects on adjacent land uses. These evaluations include a review of the sensitive land uses within the 500 metre area around the Site and an assessment of the potential impacts on these uses and any need for mitigation measures.

Should the EA be approved, the CRRRC will have to be identified in the Official Plan as it is a new proposed land use. Based upon the conclusions of the Taggart Miller studies, there would appear to be no need for a buffer zone around the Site from an impact perspective. The City of Ottawa may consider this matter as a part of any Official Plan Amendment process that arises from this project, or in a general review of its policies.

MMAH PPS, 2014: Planning policies for rural lands within municipalities are addressed in Section 1.1.5 of the PPS (MMAH, 2014). In rural lands located in municipalities, permitted uses and activities should relate to the management or use of resources, resource-based recreational activities, limited residential development, home occupations and home industries, cemeteries, and other rural land uses. Recreational, tourism and other economic opportunities should also be promoted.

The City has identified its Settlement Areas. There are no Settlement Areas identified immediately around the Site. The City has also included a policy in the Official Plan where rural subdivisions are not permitted (Section 3.7.2.8); therefore no new residential development is anticipated in the area.

Development of rural lands under the PPS is to be appropriate to the infrastructure that is planned or available, and avoid the need for the unjustified and/or uneconomical expansion of this infrastructure. Development that is compatible with the rural landscape and can be sustained by rural service levels should also be promoted. The results of the various studies have confirmed that the existing infrastructure, with minor modification along Boundary Road at the Site access location (as described in TSD #9 Traffic), is easily able to support this development.

Agricultural uses, agriculture-related uses, on-farm diversified uses and normal farm practices should be promoted and protected in accordance with provincial standards [Section 1.1.5.8]. Policy 2.3 speaks to the protection of Prime Agricultural Areas. The implementation of this Policy is reflected in the City's Official Plan, wherein the City did not identify the lands proposed for the CRRRC as an agricultural area. There has been a detailed review of agricultural impacts as a part of the EA (refer to TSD #8), which confirms that there are no negative impacts predicted on agricultural lands or operations.

Waste Management Systems are defined by the PPS as sites and facilities to accommodate solid waste from one or more municipalities and includes landfill sites, recycling facilities, transfer stations, processing sites and hazardous waste depots. Section 1.6.8 of the PPS lays out policies for Waste Management Systems. It states that "*Waste management systems* need to be provided that are of an appropriate size and type to accommodate present and future requirements, and facilitate, encourage and promote reduction, reuse and recycling objectives. Planning authorities should consider the implications of development and land use patterns on waste generation, management and diversion. Waste management systems shall be located and designed in accordance with provincial legislation and standards." In particular the recycling emphasis of the PPS aligns well with the objectives of the CRRRC.

MMAH Shape the Future: Eastern Ontario Smart Growth Panel, 2003: In 2002, the government appointed a Smart Growth panel for eastern Ontario to develop recommendations for bringing growth and prosperity to Eastern Ontario (MMAH, 2003). When the eastern panel was established, the Minister of Municipal Affairs and Housing challenged panel members to think creatively and to come up with a bold new strategy to guide eastern Ontario's growth over the next 30 years.

In Section 2 of the Panel's final report, recommendations were made for enhancing environmental stewardship (MMAH, 2003). Section 2.3 dealt with waste management: "The panel has recognized that waste management is a significant issue now and will continue to be in the future. Disposing of waste has become a costly exercise, financially and environmentally. Co-operation among provincial and municipal governments and stakeholders must exist in order to develop a more comprehensive, integrated waste management plan for the zone. Eastern Ontario must strive to embrace alternative technologies, and the re-use and reduction of waste when considering waste disposal."

The CRRRC reflects the intent to provide a more comprehensive and integrated approach to the re-use and reduction of IC&I waste.

City of Ottawa Official Plan, By-law 2003-203: The City completed a five-year review in 2013 of its Official Plan (City of Ottawa, 2013g). As a result of this review, Official Plan Amendment #150 was adopted by Council in December 2013 and is currently under appeal to the Ontario Municipal Board. The subject lands are designated as General Rural Area on Schedule A of the City of Ottawa's Official Plan. The lands immediately to the west and south of the Site are also designated General Rural Area, while the lands to the north, separated from the Site by Highway 417, are designated Natural Features Area. The lands to the southeast of the Site are designated Agricultural Resource Area.

The five-year review of the Official Plan in 2013 included a Land Evaluation and Area Review for Agriculture areas. A draft report of the Lands Evaluation and Area Review was issued in 2012, which identified various calculation options for mapping agriculture parcels and areas throughout rural Ottawa, and did not include the Site as an Agricultural area. The Land Evaluation and Area Review report currently has no status.

Section 3.7.2 of the City's Official Plan (City of Ottawa, 2013g) outlines the development policies for lands designated General Rural Area. The intent of this designation is to accommodate a variety of land uses that are appropriate for a rural location and a limited amount of residential development where such development will not preclude continued agricultural and non-residential uses.

General Rural Areas are designated on Schedule A with the intent to provide a location for agriculture uses and for those non-agricultural uses that, due to their land requirements or the nature of their operation would not be more appropriately located within urban or Village locations.

Policy 5 of Section 3.7.2 states that: A zoning by-law amendment will be required where any of the following uses are proposed in General Rural Areas:

a) New industrial and commercial uses, such as farm equipment and supply centres, machine and truck repair shops, building products yards, landscape contractors and nurseries; and

b) Uses that are noxious by virtue of their noise, odour, dust or other emissions or that have potential for impact on air quality or surface water or groundwater, such as salvage or recycling yards, composting or transfer facilities; concrete plants; the treatment of aggregate products; and abattoirs.

The evaluation criteria for rezoning identified in Policy 5 are as follows:

a) The use would not be better located in a village or the urban area;

b) If the use is to be located on a local road, it must be demonstrated that the volume and pattern of traffic flow anticipated from the development will not interfere with the proper functioning of the local road network;

c) The privacy of adjacent landowners or the amelioration of potential adverse impacts from lighting, noise, odour, dust or traffic can be achieved by separating the land uses, buffering or other measures as part of the development;

d) The potential for reducing possible impacts on neighbouring agricultural uses or nearby rural residential uses or village communities, where relevant;

e) The development is in keeping with the surrounding rural character and landscape;

f) All those requirements of Sections 2 and 4 related to transportation, servicing, design and compatibility and environmental protection;

g) Noxious uses will only be considered where suitable screening and buffering can be provided and generally these uses will not be considered in locations within groundwater recharge areas or immediately adjacent to residential areas, Scenic-Entry Routes, or waterfront areas; and

h) The impact that the development will have on the protection of tree cover and local wildlife movement, as result of proposed site clearing and grading, fencing, security lighting and other similar site plan matters.

The various studies done in support of this EA generally support the rezoning of the site taking into account the above considerations.

The City also has policies that deal with *Mineral-Aggregate Resources* throughout the City. There are no Aggregate Resources identified for these lands. The City undertook a comprehensive review of the Aggregate Resources as a part of the review of the Official Plan (City of Ottawa, 2013g). The draft was released during the summer of 2013. This report has not identified the Site as having any such resource. The recommendations from the study were included within the amendment that was adopted by Council in December 2013 and there was no recommendation for any designation of the subject lands.

Operating and non-operating *Solid Waste Disposal Sites* are landfills, dumps, incinerators and any other facilities providing for the long-term storage or destruction of municipal solid waste. Composting, recycling and transfer facilities are considered processing operations.

The City of Ottawa will require an Official Plan Amendment for the establishment of any new Solid Waste Disposal Site to show the location of the Site. The City will evaluate applications based on the following:

a) The proponent has completed an EA or an Environmental Screening Report under the EAA;

b) Compliance with a TOR for the EA, as approved by the Minister of the Environment under the EAA; or in the case of a project using the Environmental Screening Process, the submission of a Notice of Completion to the MOECC; and

c) Does not duplicate the requirements of the EAA.

In terms of *Transportation*, Schedule G of the Official Plan (City of Ottawa, 2013g) identifies Boundary Road, Devine Road and the 8th Line as Arterial Roads. Section 2.3.1 (48) outlines policy related to the movement of goods throughout the City. It notes that “The City will minimize the impact of truck traffic on residential neighbourhoods caused by the presence of these vehicles and their noise, vibration and emissions by ensuring the availability of a comprehensive truck route network based on the arterial road system”. The City of Ottawa has also identified both Boundary Road and Devine Road as full load Truck Routes.

The City’s Transportation Master Plan (City of Ottawa, 2013d) further details the City’s objectives for Transportation. Section 6.10 Goods Movements notes that: “While efficient goods movement by truck, rail and air supports Ottawa’s economic livelihood and competitiveness, trucks remain the primary mode of local freight transportation. Ottawa’s truck route system is generally represented by arterial roads that can withstand use by heavy trucks, the sizes of which are legislated by the Province of Ontario. The City will encourage industry to explore goods movement technologies and practices that can reduce community impacts, improve efficiency and enhance regional competitiveness, such as the development of intermodal terminals that enable a transfer of tonnage from road to rail."

The main Site access along Boundary Road follows the intent of the Official Plan (City of Ottawa, 2013g) policies related to arterial roads as reflected in Schedule G and the Transportation Master Plan (City of Ottawa, 2013d).

Section 2.4.4 of the City's Official Plan (City of Ottawa, 2013g) outlines policy for *Groundwater Management*. The City has responsibility for the regulation of land use and development that impacts groundwater resources; and for the operation of public drinking water systems including public communal wells and the delivery of public health programs and educational materials.

The following policies shall apply:

1) Where monitoring and characterization of the groundwater resource has indicated degradation of the resource function, the Zoning By-law will restrict uses to prevent further impacts on that function; and

2) Where monitoring and characterization of the groundwater resource has indicated that a significant resource function exists, the Zoning By-law will restrict uses to protect that function.

Volume III of the EA supporting documents presents the results of the hydrogeology impact assessment. The Site is in an area that is constrained in its ability to yield meaningful groundwater resources. The predicted results indicate that the required groundwater quality will be easily maintained at the CRRRC property boundary.

In terms of *Additional Aspects of the Official Plan Policies:* no archaeological potential has been identified by the City of Ottawa E-Maps system, and the Site is located more than one kilometre from the Village Boundary of Carlsbad Springs and the City's Boundary. Edwards is no longer identified as a Village in the Official Plan (City of Ottawa, 2013g). Also, the City does not identify any Environmental Constraints or Natural Features on the Site lands as shown on Schedule K and Schedule L1 of the Official Plan.

The City has identified Scenic Entry Routes throughout the City. Highway 417 starting at the Boundary Road interchange (i.e. to the west of the Site of the proposed CRRRC) is identified as a Scenic Entry Route. (City of Ottawa, 2013g).

Section 3.7.2 (6) (g) of the Official Plan (City of Ottawa, 2013g) states that: "Noxious uses will only be considered where suitable screening and buffering can be provided and generally these uses will not be considered in locations within groundwater recharge areas or immediately adjacent to residential areas, Scenic-Entry Routes, or waterfront areas."

The CRRRC would be east of this interchange but in any event can be readily screened from view from Highway 417. The proposed CRRRC has been designed to include constructed screening features (earth berms 2 to 3 metres high with trees transplanted on them). They are to be constructed where the screening could not be otherwise provided by leaving an adequate width (15 to 20 metres) of existing tree cover around the perimeter of the property. The constructed screening will be required at the northeast and southeast corner areas and along a portion of the west central Site boundary. It is noted that a portion of the constructed screening proposed at the northeast corner to specifically screen the view of the Site from Highway 417 could be replaced by transplanting trees in the gap in the existing tree line at the north end of the Frontier Road cul-de-sac.

The proposed CRRRC will provide for rural employment, which requires the proximity to the interchange for transportation needs, but as a result of its industrial nature should not be located within a rural village. The CRRRC proposal reinforces the current zoning for the lands, where the lands along Boundary Road, including a part of the Site, are zoned for Heavy Rural Industrial development.

As part of the City's 5-year review of the Official Plan (City of Ottawa, 2013g), updates were made to the Infrastructure Master Plan (City of Ottawa, 2013c) and to the Transportation Master Plan (City of Ottawa, 2013d). The Master Plan updates are being conducted in accordance with Master Planning process including Phases 1 and 2 of the Municipal Class Environmental Assessment process, an approved process under the Ontario Environmental Assessment Act. All of the Plans were approved by City Council in December 2013. The Notice of Commencement for the updates was issued on January 18, 2013 and the City will be issuing the Notice of Completion in the Spring of 2014.

No significant changes that affect this Site have been identified in the updated reports. The Infrastructure Master Plan and Transportation Master Plan have both been reviewed by City Committee and have yet to be adopted by City Council.

Zoning: The majority of the subject lands are currently zoned Rural (RU) in the City of Ottawa's Zoning By-law (City of Ottawa, 2008); however a not insignificant portion is zoned Rural Heavy Industrial (RH). Permitted uses in the Rural Heavy Industrial Zone include waste processing and transfer, and leaf and yard waste composting. While the proposed development of these lands for the CRRRC will require an amendment to this By-law, the Rural Heavy Industrial zoning already attached to a portion of the Site indicates that the CRRRC is generally not inconsistent with existing zoning for the Site.

Aggregate Resources: Previous subsurface investigation on and in the area of the Site, as well as current on-Site investigations show that the Site is underlain by a surficial sand layer followed by an extensive and thick deposit of silty clay. The surficial sand layer generally consists of silty sand having a thickness generally ranging from about 0.6 to 1.2 metres.

As a result of its fine grained nature, this surficial sand layer is not of high quality as a potential aggregate material. Also, the layer is relatively thin compared to what would typically be considered for an aggregate resource operation, i.e., Aggregate Resource Industry Reports consider 6 metres as a minimum thickness for identification as an aggregate resource and there are already sand resources within the City that are known and reasonably plentiful, even within the existing licensed pits.

From review of the 1995 study regarding aggregate supply in the Region of Ottawa-Carleton, which includes sand, gravel, crushed stone, shale and clay, there are no aggregate resources at or within 500 metres of the Site (MHBC, 1995). Additionally the MNDM prepared an Aggregate Resource Inventory Paper for the Ottawa Region in 2013 and it does not show any aggregate resource at or within 500 metres of the Site (MNDM, 2013).

City of Ottawa Published data of Public Recreational Facilities and Activities: No public or recreational facilities as mapped by the City of Ottawa exist within 500 metres of the Site.

NCC's Plan for Canada's Capital, 1999: This report was written as the federal government's lead policy statement on the physical planning and development of the National Capital Region (or the Capital) over the next fifty years. This report identified scenic entries as complementary routes, found mostly in the built-up areas that offer a scenic and alternative access to the core of the Capital. These scenic routes are generally under the jurisdiction of regional governments and can also connect to the Capital Parkway network.

The City of Ottawa Official Plan (City of Ottawa, 2013g) identifies Highway 417 starting at the Boundary Road interchange and proceeding westward a Scenic Entry Route. The proposed CRRRC is east of that interchange but in any event has been designed to include screening at the northeast corner, intended to screen the CRRRC from view of the Highway 417, as shown in Figure 11.6.3-2.

In August 2011, the NCC released a draft discussion paper for a 50 year planning framework for matters under its jurisdiction - *Horizon 2067*. Eight challenges and suggestions to respond were identified by the NCC. The challenges and suggestions are not directly relevant to the CRRRC. At this time *Horizons 2067* has not progressed beyond a discussion paper.

NCC's Greenbelt Master Plan, 2013: A new Greenbelt Master Plan (GMP) was released by the National Capital Commission in November 2013 (NCC, 2013b). This replaced the 1996 predecessor.

The Greenbelt is an area of 206 square kilometres largely owned by the federal government. The NCC envisions the Greenbelt as an integrated and recognizable feature that among other things:

- Provides a gateway to the Capital;
- Preserves and connects natural ecosystems; and
- Buffers and connects human activities.

The updated GMP provides for augmented protection for natural environment features through stricter policies for permitted activities in certain areas. Seven "sectors" are defined in the new GMP (fewer than its 1996 predecessor). One of these sectors is the Mer Bleue Bog.

The Core Natural Area on which the Mer Bleue Bog sector centers is of course the bog itself. The Mer Bleue Bog sector is removed from the Site by over 3 kilometres and a 400 series highway and is hydrogeologically upgradient from the Site. A "natural link" has been identified as part of the Mer Bleue sector extending to the northwest corner of the Boundary Road/Highway 417 interchange. The Site is separated from this area by the four lane 400 series highway as well as approximately 1 kilometre of industrial/commercial land.

The new GMP notes that the quality of arrivals by road in the Capital is dependent on the visual quality of the landscape. The GMP also notes that while the vistas of the Greenbelt along the western arrival route on Highway 417 are very attractive, views from Highway 417 along the eastern approach to Ottawa "are not as impressive as those from the west because of the area's more level topography." The Mer Bleue sector plan proposes a "Highway 417 Capital Arrival" sign near the northwest corner of the Boundary Road/Highway 417 interchange, enhancing the landscape west of Anderson Road, as well as working with the City to improve the visual aesthetic of industrial uses further west of the Greenbelt edge along Highway 417. As noted elsewhere, the Site is east of this interchange but in any event can be readily screened from Highway 417. The majority of the Site is already well screened from the highway by existing trees.

During public consultation on the proposed new GMP, the CRRRC was raised by some opponents of the project as a concern in terms of "contamination and potential impact on the Mer Bleue Bog". The NCC responded that it "has no jurisdiction over this site or decision since the Site is outside of the federal government's jurisdiction." In any event, as noted above, the Mer Bleue is over 3 kilometres away from the Site at its closest point is on the other side of a 400 series highway and is hydrogeologically up gradient. Further none of the multidisciplinary impact assessment work carried out with respect to the proposed CRRRC has identified the potential for any adverse impacts on the Mer Bleue.

It was concluded that the proposed CRRRC is a compatible land use with existing and future land uses in the vicinity of the Site from a planning perspective.

11.6.2 Socio-economic

The following data were developed/collected as indicators to assess the potential socio-economic effects of the proposed CRRRC in accordance with the approved TOR:

- Estimated person hours of employment for the construction and operation of the CRRRC;
- An estimate of the tax revenue generated by the CRRRC for the municipality;
- Estimated value of goods and services required for construction and operation of the CRRRC; and
- Estimated business impacts (positive or negative) from the CRRRC on nearby commercial activities.

During the construction phase, the CRRRC is expected to generate approximately 400,000 person-hours of employment, which represents approximately 160 to 200 full-time equivalent positions over one year. Gross income paid to the construction phase workers will total approximately $16.3 million that translates to approximately $80,000 - $100,000 per year gross income, which is much higher than the median individual or household income in the Site-vicinity. During the operation phase, the CRRRC is expected to generate approximately 198,000 person-hours of employment per year, which represents approximately 80 to 100 full-time equivalent positions over the thirty year life of the CRRRC at a gross income totalling approximately $7.2 million per year. This translates to approximately $70,000 per year gross income, which is expected to exceed the median individual annual income in the Site-vicinity. It can also be assumed that there will be spin-off benefits to the local economy as a result of increased direct CRRRC-related income. Direct effects of the CRRRC on employment are expected to be beneficial in the Site-vicinity.

The proposed CRRRC will provide for rural employment in accordance with the Employment Lands Study (City of Ottawa, 2013e) completed by the City. The proposed CRRRC reinforces the current Heavy Rural Industrial zoning for a portion of the lands where the Site is located. Employment opportunities will be available for skilled and non-skilled workers. There will be opportunities for local employees to fill both skilled and non-skilled positions. Direct effects of the CRRRC on employment are expected to be beneficial in the Site-vicinity.

In addition to one-time building permit revenue for the City estimated at approximately $300,000, the CRRRC is expected to directly increase annual municipal property revenue for the City of Ottawa by $1.6 to 3.7 million annually over the thirty year planning period. There will also be spin-off effects of this increased revenue to the City that, although not calculated, could create opportunities for further economic development and growth within the Site-vicinity. Direct effects of the CRRRC on municipal tax revenue are expected to be beneficial in the Site-vicinity.

Construction costs for goods and services (excluding labour) are estimated at $58 million for initial construction works and activities, followed by an average of approximately $700,000 per year over the 30 year planning period. Operational costs for goods and services (excluding labour) over the 30 year planning period are estimated at $3.2 million per year in capital expenditures and $16.2 million per year in operating expenditures. Much of this spending on goods and services will occur within the Site-vicinity (City of Ottawa), representing opportunities for local businesses to capitalize on this spending. Direct effects of the CRRRC on spending and businesses are expected to be beneficial in the Site-vicinity.

Based on the impact analysis as described in Section 11.0, as well as the traffic and visual assessments, no indirect adverse effects on local businesses due to air quality and odour, noise, visual or traffic associated with the CRRRC project are expected.

11.6.3 Visual

The potential for the proposed CRRRC to affect the visual appeal of a landscape was assessed. The proposed impact of the CRRRC impact from the five selected viewpoints is shown in Figures 11.6.3-1 to 11.6.3-5 and each viewpoint is described below.

VIEWPOINT 1: From Devine Road, Figure 11.6.3-1

This is a long view of the Site from the east along Devine Road across existing farm fields that are bisected by existing hedgerows of deciduous trees and shrubs. This view is oblique from the road and partially seasonally obscured by row crops in the fields and by trees along the Site perimeter. A screening berm with trees on top is proposed along the south part of the east Site boundary, however because of the flat terrain the CRRRC will be partly visible from this vantage point. With the proposed flat landfill sideslopes, the landfill component will be visible from this vantage point and appear as a gradual rise.

VIEWPOINT 2: From Highway 417, Figure 11.6.3-2

This view is taken through a break in a hedgerow of coniferous trees along Highway 417 at the northeast corner of the Site and is looking across the existing cleared fields where the proposed diversion buildings and ancillary facilities will be located, with the future landfill further to the south. Looking through an opening in the coniferous hedgerow, in the absence of mitigation, some of the proposed diversion buildings and ancillary facilities would be visible with the north end of landfill mound visible in the distance to the left to the secondary digester. The proposed screening berm with trees planted on top will provide effective visual mitigation. There will be a small gap in the berm at the secondary Site access location that will allow the secondary digester to be visible. If mature coniferous trees are planted to infill the existing opening in the hedgerow, this view into the Site will be effectively obscured.

VIEWPOINT 3: From Boundary Road, Figure 11.6.3-3

This view looks over what will be the demolished former auto parts building and yard and into the Site from southbound Boundary Road. An existing berm on-Site will likely remain in place and will provide some visual mitigation. The proposed screening berm with trees on top will be constructed along the property boundary and will provide effective visual mitigation.

VIEWPOINT 4: From Mitch Owens Road, Figure 11.6.3-4

This view looks directly east from Mitch Owens Road towards the Site. With the existing auto parts building removed, the landfill component of the CRRRC would become visible. As shown, the proposed perimeter screening berm with trees on top will effectively provide visual mitigation from this viewpoint, similar to what is described above for Viewpoint 1.

VIEWPOINT 5: From Boundary Road, opposite future entrance to CRRRC, Figure 11.6.3-5

This view is east from Boundary Road, looking at the Site from the proposed entrance to the CRRRC. Existing piles of granular material and vehicles in the foreground will no longer be there and the new paved access road will be constructed. It should be noted that this view has been presented conservatively by removing more of the neighbouring activity to the north of the Site entrance than may actually occur. Some future buildings such as the scale house, office building and C&D processing facility could be visible in the distance from this viewpoint, consistent with other existing Industrial Park development in this area.

Due to the presence of vegetation in the area surrounding the Site and the design of the Site, including the perimeter berms and tree planting, there will be little visual impact from off-Site nearby viewpoints.

EXISTING CONDITIONS

SITE DEVELOPMENT PLAN

MITIGATED VIEW

TECHNICAL DATA:

PHOTOGRAPH: VIEWPOINT 1
COORDINATES (UTM NAD 83): 467646.49 E 5020117.96 N
GROUND ELEVATION ABOVE SEA LEVEL: 76.345 m
ALTITUDE OF PHOTOGRAPH RELATIVE TO GROUND ELEVATION: 1.41 m
CAMERA: NIKON D80 DIGITAL SLR
DATE PHOTOGRAPH TAKEN: NOVEMBER 16, 2012
FOCAL LENGTH: 34 MM
HORIZONTAL FIELD OF VIEW: 38.12°
DIRECTION: 287.72° TN

REFERENCES:

BASE DATA SUPPLIED BY THE BASE MAPPING Co. LTD.

NOTES:

1. THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT.
2. ALL LOCATIONS ON THIS FIGURE ARE FOR ILLUSTRATION PURPOSES ONLY.
3. SEE FIGURE 8.8.3-1 FOR VIEWPOINT LOCATION.

Golder Associates
Ottawa, Ontario, Canada

SCALE NA
DATE DEC. 2013
DESIGN PJM
CAD PJM/BR
CHECK PLE
REVIEW PAS

FILE No. 1211250045-4000-Vol1-11.6.3-1.dwg
PROJECT No. 12-1125-0045 REV.

TITLE
VIEWPOINT 1
PROJECTION FROM DEVINE ROAD

ENVIRONMENTAL ASSESSMENT OF THE CAPITAL
REGION RESOURCE RECOVERY CENTRE

FIGURE
11.6.3-1

PLOT DATE: June 26, 2014
FILENAME: N:\Active\Spatial_IM\Miller_Paving_Ltd\CRRRC\GIS\Visual\ACAD\1211250045-4000-Vol1-11.6.3-1.dwg

PLOT DATE: June 26, 2014
FILENAME: N:\Active\Spatial_IM\Miller_Paving_Ltd\CRRRC\GIS\Visual\ACAD\1211250045-4000-Vol1-11.6.3-2.dwg

EXISTING CONDITIONS

SITE DEVELOPMENT PLAN

MITIGATED VIEW

TECHNICAL DATA:

PHOTOGRAPH: VIEWPOINT 2
COORDINATES (UTM NAD 83): 466716.42 E 5021599.16 N
GROUND ELEVATION ABOVE SEA LEVEL: 77.265 m
ALTITUDE OF PHOTOGRAPH RELATIVE TO GROUND ELEVATION: 1.43 m
CAMERA: NIKON D80 DIGITAL SLR
DATE PHOTOGRAPH TAKEN: NOVEMBER 16, 2012
FOCAL LENGTH: 18 MM
HORIZONTAL FIELD OF VIEW: 66.0°
DIRECTION: 195.0° TN

REFERENCES:

BASE DATA SUPPLIED BY THE BASE MAPPING Co. LTD.

NOTES:

1. THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT.
2. ALL LOCATIONS ON THIS FIGURE ARE FOR ILLUSTRATION PURPOSES ONLY.
3. SEE FIGURE 8.8.3-1 FOR VIEWPOINT LOCATION.

Golder Associates
Ottawa, Ontario, Canada

SCALE	NA	TITLE	
DATE	DEC. 2013		
DESIGN	PJM		
CAD	PJM/BR		
CHECK	PLE		
REVIEW	PAS		

FILE No. 1211250045-4000-Vol1-11.6.3-2.dwg
PROJECT No. 12-1125-0045 REV.

VIEWPOINT 2
PROJECTION FROM HWY 417

ENVIRONMENTAL ASSESSMENT OF THE CAPITAL REGION RESOURCE RECOVERY CENTRE

FIGURE 11.6.3-2

EXISTING CONDITIONS

SITE DEVELOPMENT PLAN

MITIGATED VIEW

PLOT DATE: June 26, 2014
FILENAME: N:\Active\Spatial_IM\Miller_Paving_Ltd\CRRRC\GIS\Visual\ACAD\1211250045-4000-Vol1-11.6.3-3.dwg

TECHNICAL DATA:

PHOTOGRAPH: VIEWPOINT 3
COORDINATES (UTM NAD 83): 465666.31 E 5020309.25 N
GROUND ELEVATION ABOVE SEA LEVEL: 77.612 m
ALTITUDE OF PHOTOGRAPH RELATIVE TO GROUND ELEVATION: 1.435 m
CAMERA: NIKON D80 DIGITAL SLR

DATE PHOTOGRAPH TAKEN: NOVEMBER 16, 2012
FOCAL LENGTH: 18 mm
HORIZONTAL FIELD OF VIEW: 66.0°
DIRECTION: 104.4° TN

REFERENCES:

BASE DATA SUPPLIED BY THE BASE MAPPING Co. LTD.

NOTES:

1. THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT.
2. ALL LOCATIONS ON THIS FIGURE ARE FOR ILLUSTRATION PURPOSES ONLY.
3. SEE FIGURE 8.8.3-1 FOR VIEWPOINT LOCATION.

Golder Associates
Ottawa, Ontario, Canada

FILE No. 1211250045-4000-Vol1-11.6.3-3.dwg
PROJECT No. 12-1125-0045 REV.

SCALE NA
DATE DEC. 2013
DESIGN PJM
CAD PJM/BR
CHECK PLE
REVIEW PAS

TITLE

VIEWPOINT 3
PROJECTION FROM BOUNDARY ROAD

ENVIRONMENTAL ASSESSMENT OF THE CAPITAL REGION RESOURCE RECOVERY CENTRE

FIGURE
11.6.3-3

EXISTING CONDITIONS

SITE DEVELOPMENT PLAN

MITIGATED VIEW

TECHNICAL DATA:

PHOTOGRAPH: VIEWPOINT 4
COORDINATES (MTM NAD 83): 465175.87 E 5019893.62 N
GROUND ELEVATION ABOVE SEA LEVEL: 77.743 m
ALTITUDE OF PHOTOGRAPH RELATIVE TO GROUND ELEVATION: 1.425 m
CAMERA: NIKON D80 DIGITAL SLR

DATE PHOTOGRAPH TAKEN: NOVEMBER 16, 2012
FOCAL LENGTH: 18 mm
HORIZONTAL FIELD OF VIEW: 66.0°
DIRECTION: 70.0° TN

REFERENCES:

BASE DATA SUPPLIED BY THE BASE MAPPING Co. LTD.

NOTES:

1. THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT.
2. ALL LOCATIONS ON THIS FIGURE ARE FOR ILLUSTRATION PURPOSES ONLY.
3. SEE FIGURE 8.8.3-1 FOR VIEWPOINT LOCATION.

Golder Associates
Ottawa, Ontario, Canada

SCALE	NA
DATE	DEC. 2013
DESIGN	PJM
CAD	PJM/BR
CHECK	PLE
REVIEW	PAS
FILE No.	1211250045-4000-Vol1-11.6.3-4.dwg
PROJECT No.	12-1125-0045
REV.	

TITLE

VIEWPOINT 4
PROJECTION FROM MITCH OWENS ROAD

ENVIRONMENTAL ASSESSMENT OF THE CAPITAL REGION RESOURCE RECOVERY CENTRE

FIGURE
11.6.3-4

PLOT DATE: June 26, 2014
FILENAME: N:\Active\Spatial_IM\Miller_Paving_Ltd\CRRRC\GIS\Visual\ACAD\1211250045-4000-Vol1-11.6.3-4.dwg

EXISTING CONDITIONS

SITE DEVELOPMENT PLAN

PLOT DATE: June 26, 2014
FILENAME: N:\Active\Spatial_IM\Miller_Paving_Ltd\CRRRC\GIS\Visual\ACAD\1211250045-4000-Vol1-11.6.3-5.dwg

TECHNICAL DATA:

PHOTOGRAPH: VIEWPOINT 5
COORDINATES (UTM NAD 83): 467298.71 E 5019927.05 N
GROUND ELEVATION ABOVE SEA LEVEL: 76.405 m
ALTITUDE OF PHOTOGRAPH RELATIVE TO GROUND ELEVATION: 1.425 m
CAMERA: NIKON D80 DIGITAL SLR

DATE PHOTOGRAPH TAKEN: NOVEMBER 16, 2012
FOCAL LENGTH: 22 mm
HORIZONTAL FIELD OF VIEW: 56.35°
DIRECTION: 70.0° TN

REFERENCES:

BASE DATA SUPPLIED BY THE BASE MAPPING Co. LTD.

NOTES:

1. THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT.
2. ALL LOCATIONS ON THIS FIGURE ARE FOR ILLUSTRATION PURPOSES ONLY.
3. SEE FIGURE 8.8.3-1 FOR VIEWPOINT LOCATION.

Golder Associates
Ottawa, Ontario, Canada

FILE No. 1211250045-4000-Vol1-11.6.3-5.dwg
PROJECT No. 12-1125-0045
REV.

SCALE NA
DATE DEC. 2013
DESIGN PJM
CAD PJM/BR
CHECK PLE
REVIEW PAS

TITLE

VIEWPOINT 5
PROJECTION FROM BOUNDARY ROAD, PROPOSED MAIN ENTRANCE

ENVIRONMENTAL ASSESSMENT OF THE CAPITAL REGION RESOURCE RECOVERY CENTRE

FIGURE
11.6.3-5

11.7 Cultural Heritage & Archaeology

The assessment is divided into the two components of archaeology and cultural (built) heritage, the results of which are provided in TSD #6 and #7, respectively.

The results of an Archaeological study concluded that: there are no registered archaeological sites in proximity to the study area; the Site and study area have very limited potential for aboriginal resources as it is poorly drained, low lying and a significant distance from any permanent or ancient source of water; the potential for historic archaeological resources within the study area is very low; and the City of Ottawa Archaeological Master Plan (Archaeological Services Inc. and Geomatics International Inc., 1999) does not indicate any archaeological potential within the study area. As such, in summary, no registered archaeological sites and no areas of archaeological potential were identified by the Archaeological Assessment, and no further archeological investigations of the Site are required.

Five properties in the study area were identified as requiring cultural heritage assessment to determine if any of the properties had cultural heritage value or interest (in accordance with *Ontario Heritage Act* Regulation 9/06). They were identified for study because they are structures older than 40 years, i.e., pre-1973. Each of the five properties was evaluated for cultural heritage value or interest. Using the *Ontario Heritage Act Regulation* 9/06 (MTCS, 2006) "Criteria for Determining Cultural Heritage Value or Interest," and using the City of Ottawa's Heritage Survey and Evaluation Form*,* it was found that none of the five potential cultural heritage resources demonstrate cultural heritage value or interest and are therefore not eligible for designation under the *Ontario Heritage Act*.

In conclusion, the assessment showed that the development of the Site will not have an adverse effect on archaeological or cultural heritage resources. The archaeological report provides standard recommendations relevant to the development of the proposed CRRRC that:

1) Should previously undocumented archaeological resources be discovered, they may be a new archaeological site and therefore subject to Section 48 (1) of the *Ontario Heritage Act*. The proponent or person discovering the archaeological resources must cease alteration of the site immediately and engage a licensed consultant archaeologist to carry out archaeological fieldwork, in compliance with Section 48 (1) of the *Ontario Heritage Act*;

2) The *Cemeteries Act*, R.S.O. 1990 c. C.4 and the *Funeral, Burial and Cremation Services Act*, 2002, S.O. 2002, c.33 (when proclaimed in force) require that any person discovering human remains must notify the police or coroner and the Registrar of Cemeteries at the Ministry of Consumer Services; and

3) If during the process of development any archaeological resources or human remains of potential Aboriginal interest are encountered, the Algonquins of Ontario Consultation Office will be contacted.

11.8 Agriculture

The agricultural assessment, which is provided in TSD #8, considered potential effects of the CRRRC on on-Site and off-Site agricultural land and land uses.

11.8.1 On-Site Agricultural Use

Type and Intensity of Existing Agricultural Production: The Site Development Plan will remove a small area of land on which agricultural production (grain) is being or has in the past been attempted. This area of land has significant constraints to productive agricultural use. In particular, the land is poorly drained and would only be capable of production in relatively dry years. It is Class 4 land or lower. Removal of these lands from agricultural use will not have a significant impact on farm management for any other lands. These lands do not have significant investment in agricultural production. Despite the presence of the Simpson Municipal Drain, no agricultural tile drainage has been installed and no farm assessment parcel has been identified on the Site. The removal of the limited extent of lands currently under production will not impact the viability of other farming operations and the existing production is quite marginal. It was therefore concluded that the impact of the CRRRC on on-Site agricultural production would not be significant.

11.8.2 Off Site Agricultural Use

Livestock Compatibility: The OMAFRA provides MDS Formulae and Guidelines to evaluate the compatibility of non-farm uses with livestock operations (OMAFRA, 2006). The MDS calculation provides a measurement of the minimum distance recommended to limit the impact of the non-farm use on the livestock operation. The measurement includes consideration of the type of livestock, the housing capacity of the livestock facility, the type of manure handling employed and the tillable area available for both feed production and manure disposal. MDS calculations were prepared for all livestock facilities within 1 kilometre of the Site, as per the Guidelines, and the results are shown on Figure 11.8.2-1. The calculations illustrated that there is sufficient distance between existing livestock operations and the Site to ensure compatibility of the proposed CRRRC with these facilities. The actual setback distance between the existing barns and the CRRRC exceeds that required by the MDS calculations, generally by a factor of two to five times. During the land use survey conducted for this EA, farmers were contacted to confirm the information to be used in the MDS calculation. This discussion also included a review of farming operations in the area. Livestock facilities between 1 and 2 kilometres of the Site were also reviewed visually to ensure that there were no large livestock facilities in the area.

It was concluded that the proposed CRRRC would be compatible with the existing livestock facilities in the Site-vicinity.

Impact on Agricultural Production: Agricultural production in the Site-vicinity is predominantly field crops. The potential impacts of the proposed CRRRC on field crop production include the following:

1) Loss of productive lands: The proposed CRRRC does not involve any loss of off-Site agricultural lands due to infrastructure improvements, increased runoff or other direct action resulting in the removal of productive lands; and

2) Changes to productive characteristics of the adjacent lands: The design and operational objectives for the CRRRC includes the control of air, surface water and groundwater impacts resulting from the operation to MOECC standards at the Site boundary. The potential emissions from the CRRRC have been predicted by the impact assessments of other technical disciplines as described elsewhere in the EASR and TSDs. On this basis, it can be concluded that there will be no material changes to the agricultural productive potential of the lands in the Site-vicinity.

Impact on Farming Practices: The normal farming practices on the lands in the Site-vicinity relate to crop production. As outlined above, no impacts on these uses are anticipated. Farming practices also include the movement of farm equipment for cultivation, seeding and harvesting. There are no farm access points off Boundary Road between the location of the Site access and Highway 417. This should limit conflicts between road traffic and the movement of farm equipment on these roads to existing levels.

In summary, the proposed CRRRC development is compatible with and should not adversely impact off-Site agricultural land uses and farming practices.

NOTE

THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT

REFERENCE

FIGURE PROVIDED BY CLARK CONSULTING SERVICES

PROJECT

ENVIRONMENTAL ASSESSMENT OF THE
CAPITAL REGION RESOURCE RECOVERY CENTRE

TITLE

MDS AND LAND USE

Golder Associates

PROJECT No. 12-1125-0045			PHASE No. 4500	
DESIGN	LB	NOV. 2013	NOT TO SCALE	REV.0
GIS	--	--	FIGURE 11.8.2-1	
CHECK	PLE	AUG 2014		
REVIEW	PAS	AUG 2014		

11.9 Traffic

As a result of the comparative evaluation of the two Sites as described in Section 7.0, the Boundary Road Site has been identified as the preferred Site and the North Russell Road Site is no longer under consideration. As such, and in accordance with the approved TOR, the Traffic discipline conducted an assessment of the only haul route to the Boundary Road Site. The complete assessment of the impacts of CRRRC Site-related traffic is provided in TSD #9. This corresponds to Task 4 of the methodology described in Section 2.3.

The number of expected Site generated trips was determined by considering the amount and types of recyclable material/waste expected to be received at the Site, the anticipated diversion and other Site activities. The Site generated trips would consist of loaded trucks entering the Site hauling waste material and surplus and contaminated soils, and loaded trucks exiting the Site hauling pre-processed and composted organics and other diverted materials. The analysis examined the impact of the Site trips during the peak AM and PM hours of traffic along the adjacent roads. The calculations have assumed that the facility is operating at a maximum annual capacity of 450,000 tonnes per year of incoming material/waste. Assuming the Site operates about 300 days per year, on a typical day the Site would receive an average of 1,500 tonnes per day of various materials/waste.

It was however recognized that on some days there could be receipt of surplus or contaminated soil from excavation and/or remediation projects in addition to typical IC&I and C&D materials/waste received, as such projects are by definition episodic and event-driven. In order to account for this event-related soil traffic, for purposes of traffic analysis it was assumed that the Site might on a peak day receive 1,300 tonnes of IC&I and C&D wastes, and in addition 1,700 tonnes of soil. Therefore, to ensure traffic impacts were fully considered, the traffic analysis assumed a maximum 3,000 tonnes per day of materials at the CRRRC (but within the overall assumed maximum of 450,000 tonnes per year of incoming material).

The estimated maximum daily truck trips corresponding to the 3,000 tonnes per day scenario described above is 271 trucks entering and exiting the Site. Assuming a 10 hour day, and applying a 1.45 peaking factor to all trips entering and exiting the Site to account for random arrivals, the total assumed number of peak hour trips are 40 trips per hour entering and exiting. In addition the Site will generate landfill leachate that will require treatment, with the preferred option being off-site treatment at the City of Ottawa ROPEC facility. The estimated maximum quantity of leachate and digested organics processing liquor is 265,000 cubic metres per year. Assuming it is transported about 250 days per year and would enter and leave the Site at regular intervals, this corresponds to an additional maximum when the Site is fully developed of 26 trucks per day, or 3 trucks per hour. The maximum peak AM and PM hour number of trucks used in the assessment was 43 truck trips per hour entering and exiting the Site.

It is anticipated that the queuing capacity of the primary Site entrance road and in-bound separate queuing lane will allow all vehicles waiting to be processed over the in-bound scale to be accommodated on-Site. The primary Site entrance road is approximately 450 metres in length between Boundary Road and the scales, with an additional 400 metre long separate in-bound queuing lane, giving a total of approximately 850 metres of on-Site queuing capacity. It is expected that Site-related trucks may range in length between about 6 metres and 25 metres, though the majority of the vehicles expected to transport waste to the Site are waste disposal trucks that are approximately 10 metres in length. Assuming that the majority of these 43 vehicles entering the Site during the peak hour are approximately 10 metres in length, there is enough queuing capacity on the primary

Site entrance road alone to accommodate all vehicles entering during the peak hour, and the separate queuing lane is also available. It is also noted that as the trucks are arriving during the peak hour, they will be entering the Site through the in-bound scale, thereby decreasing the queue length.

The distribution of Site generated trips was assigned to the adjacent roads by examination of the most convenient and efficient route(s) to and from major developed and populated areas. The vast majority of the trips will utilize the Highway 417 interchange and Boundary Road, which is the direct route to/from Highway 417.

The study allocated the trips as per the following distribution:

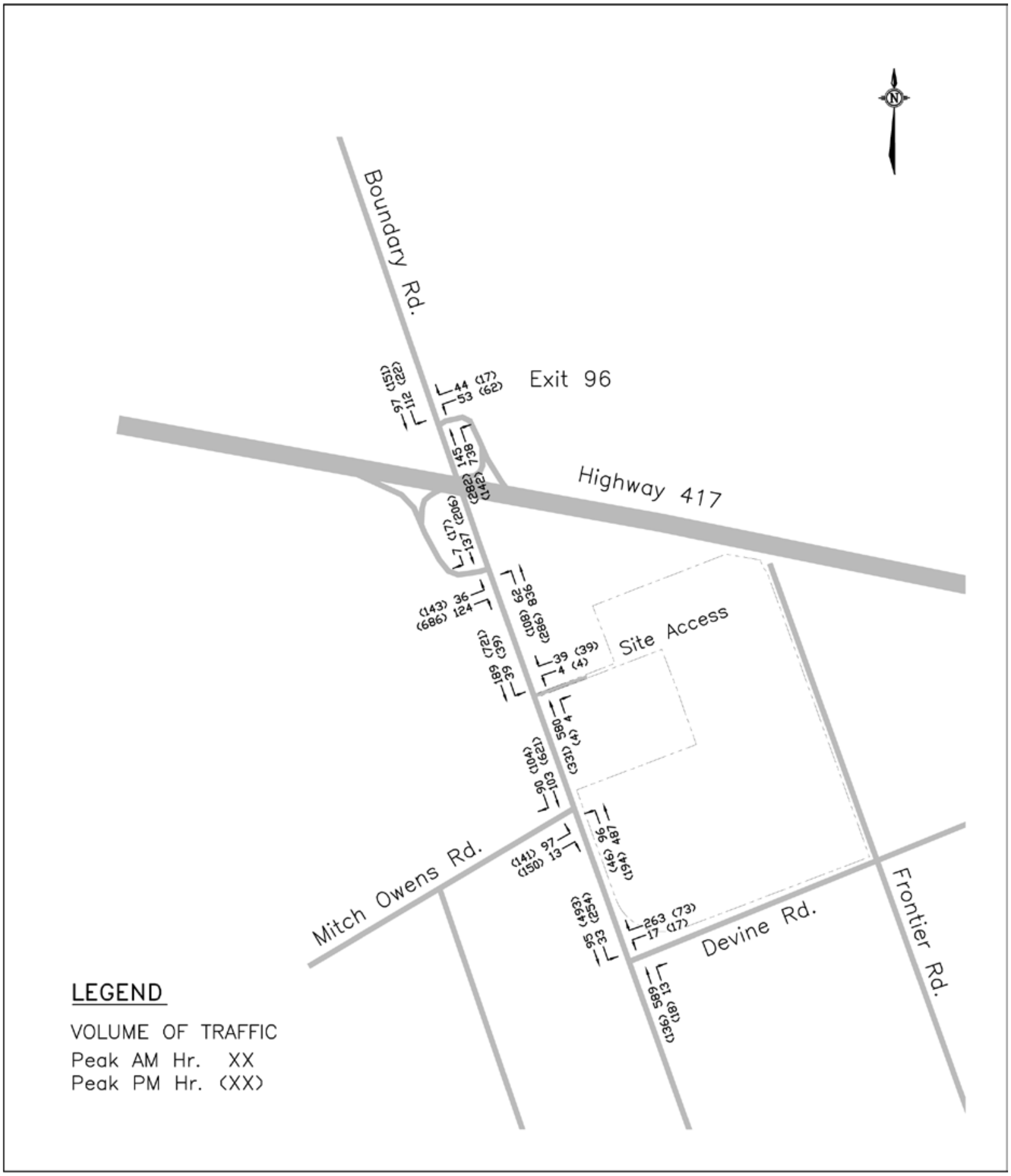
1)	To/From the North (along Boundary Road)	2%
2)	To/From the West (along Highway 417)	83%
3)	To/From the East (along Highway 417)	5%
4)	To/From the West (along Mitch Owens Road)	7%
5)	To/From the South (along Boundary Road)	3%

Highway 417 is a major provincial highway and Boundary Road is an arterial road, both of which have pavement structures designed to carry large volumes of traffic and heavy vehicles. Because of their function, their pavement structures are expected to be appropriate to carry CRRRC Site-related traffic. As described previously, Frontier Road will only provide a secondary access to the Site, and Devine Road will also only receive limited Site-related traffic (and not heavy vehicles on a routine basis). As such, a determination and evaluation of the expected performance of the pavement structure on Frontier and Devine Roads was not deemed necessary as part of this traffic assessment.

The background traffic volumes consist of the expected increase in traffic that does not include traffic associated with the development of the CRRRC. The increase in background traffic would be the result of new traffic generated by future development within and outside the study area. To determine the expected increase in traffic volumes, historical and current traffic counts at the intersection of Boundary Road and Mitch Owens Road were examined. Counts taken showed that the traffic volumes remained essentially constant with slight increases and decreases in traffic when comparing the approaches at various years. Typically in rural areas the annual growth rate in traffic is approximately 1 to 2%. The study therefore conservatively assumed an annual compounded growth rate of 2%, which was applied to all lane movements shown in the traffic counts presented in Figure 8.11-1 for the weekday peak AM and PM hour. This growth rate was applied to the 2011 and 2012 traffic counts to derive the expected year 2022 background traffic volumes for the weekday peak AM and PM hours. Assuming that the CRRRC would be operational in 2017 and that it would ramp up to its maximum annual waste receipt in five years, 2022 was selected as the year for traffic analysis.

The expected total traffic volumes at the year 2022 were determined by the addition of the expected background traffic and the expected Site generated trips. Figure 11.9-1 shows the expected 2022 weekday total peak AM and PM hour traffic volumes. Given the total volume of traffic along Boundary Road adjacent to the CRRRC, the truck traffic from the CRRRC at maximum daily receipts would represent approximately 8% of the peak hour traffic along Boundary Road.

The assessment examined the operation of the Site access point onto Boundary Road and the intersections of Devine/Boundary, Boundary/Mitch Owens, the eastbound Highway 417 on/off ramps and the westbound Highway 417 on/off ramps. The analysis used the Highway Capacity Software (University of Florida, N.D.), which utilizes the intersection capacity analysis procedure as documented in the Highway Capacity Manual (Transportation Research Board, 2010).



NOT TO SCALE

NOTE

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REFERENCE

FIGURE PROVIDED BY D.J. HALPENNY & ASSOCIATES LTD.

PROJECT

ENVIRONMENTAL ASSESSMENT OF THE
CAPITAL REGION RESOURCE RECOVERY CENTRE

TITLE

2022 WEEKDAY PEAK AM AND PM HOUR TOTAL TRAFFIC

Golder Associates

PROJECT No. 12-1125-0045			PHASE No. 4500
DESIGN	LB	NOV. 2013	NOT TO SCALE REV.0
GIS	--	--	FIGURE 11.9-1
CHECK	PLE	AUG 2014	
REVIEW	PAS	AUG 2014	

For unsignalized intersections, the level of service of each lane movement is determined as a function of the delay of vehicles at the approach. The following relates the level of service of each lane movement with the expected delay at the approach, which was utilized in the analysis of the operation of the Site access point and intersections within the study area:

LEVEL OF SERVICE	DELAY (seconds per vehicle)	
Level of Service A	0 – 10	Little or No Delay
Level of Service B	>10 – 15	Short Traffic Delays
Level of Service C	>15 – 25	Average Traffic Delays
Level of Service D	>25 – 35	Long Traffic Delays
Level of Service E	>35 – 50	Very Long Traffic Delays
Level of Service F	>50	Extreme Delays – Demand exceeds Capacity

The expected length of queue at the critical lane movements for an unsignalized intersection was determined by the calculation of the 95th percentile queue at the lane approach. The 95th percentile queue length is the calculated 95th greatest queue length out of 100 occurrences at a movement during a 15-minute peak period. The 95th percentile queue length is a function of the capacity of a movement and the total expected traffic, with the calculated value determining the magnitude of the queue by representing the queue length as fractions of vehicle lengths (where a vehicle length is taken as 7 metres).

The traffic analysis evaluated the operation of the intersections in the area of the CRRRC Site under the peak AM and peak PM traffic scenarios in terms of level of service and expected length of queue. The analysis showed that there would be no requirement for modifications to any of the four existing intersections analysed due to the truck traffic associated with the proposed CRRRC.

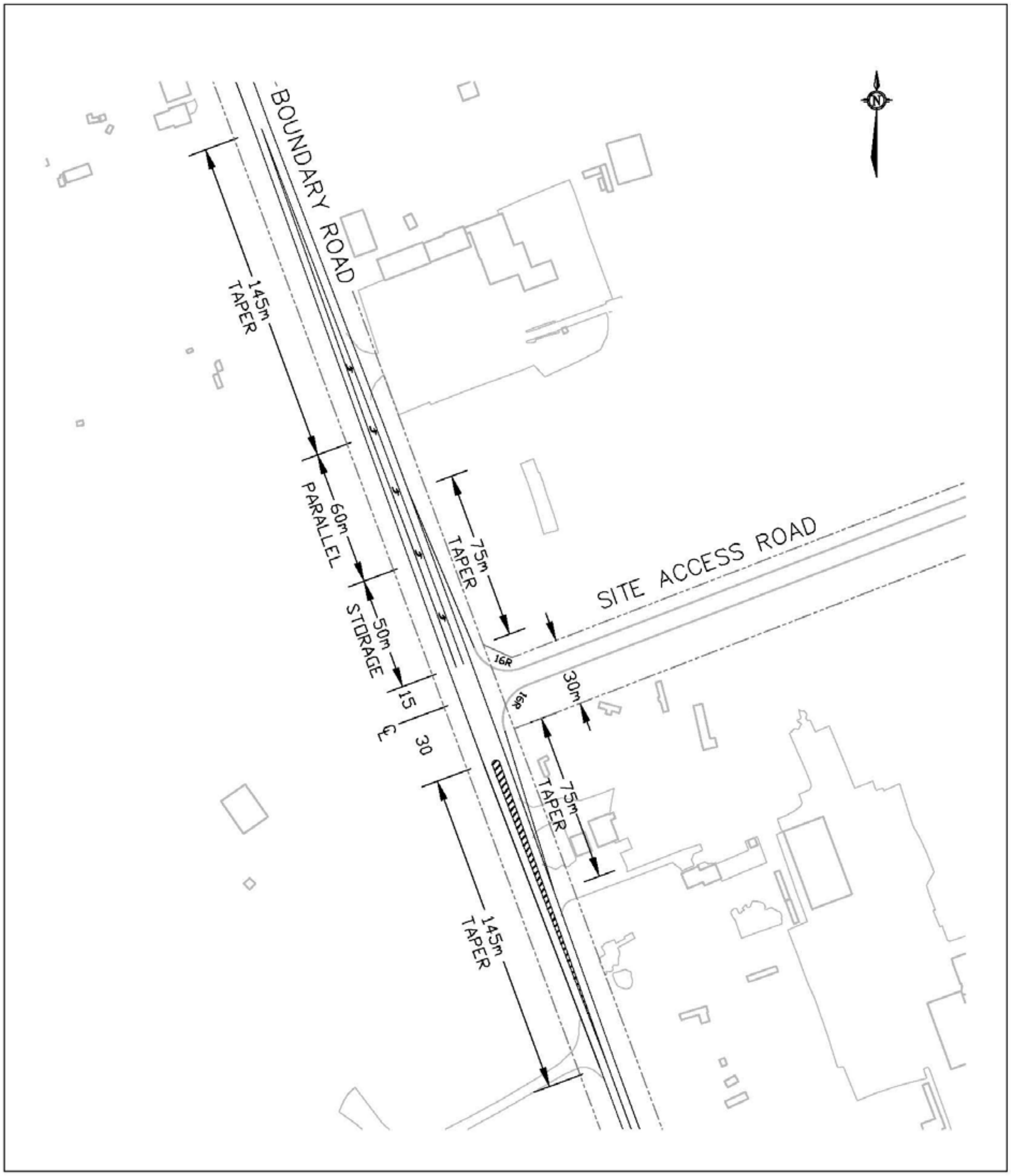
Analysis of the proposed Site access location along Boundary Road determined that a dedicated southbound left turn lane was warranted, together with the associated lengths of tapers, vehicular storage and parallel lanes. The proposed Site access/Boundary Road intersection geometry is shown on Figure 11.9-2.

The access road itself would provide a driveway length of approximately 450 metres between Boundary Road and the gate to the CRRRC Site. In addition to the proposed separate truck queuing lane area, the clear throat length of the access road would provide adequate space for trucks to park prior to the opening of the Site so that traffic would not back up onto Boundary Road.

There are no agricultural land uses along Boundary Road between Highway 417 and the Site access location. As such, the CRRRC Site-related traffic along this section of Boundary Road will not affect the use of agricultural Site entrances or farm vehicle movements. The low usage of Frontier Road associated with the proposed secondary Site access onto the north end of Frontier Road is unlikely to adversely affect the usage of this road or Devine Road by agricultural traffic.

11.10 Net Effects and Effects Monitoring

Table 11.10-1 summarizes the in-design mitigation measures and best practices proposed for the CRRRC, together with the predicted net effects for each environmental component assessed as well as the monitoring proposed to confirm the effects predictions.



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NOTE

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PROJECT

ENVIRONMENTAL ASSESSMENT OF THE
CAPITAL REGION RESOURCE RECOVERY CENTRE

TITLE

PROPOSED BOUNDARY ROAD/SITE ACCESS GEOMETRY

Golder Associates

PROJECT No. 12-1125-0045			PHASE No. 4500	
DESIGN	LB	NOV. 2013	NOT TO SCALE	REV.0
GIS	--	--	FIGURE 11.9-2	
CHECK	PLE	AUG 2014		
REVIEW	PAS	AUG 2014		

Table 11.10-1: Mitigation Measures, Net Effects and Monitoring

Environmental Component	In-Design Mitigation Measures	Best Management Practices	Net Effects	Effects Monitoring
Atmosphere	▪ Minimize need for use of back-up alarms ▪ Paved roads in the northern part of the Site ▪ Berms to attenuate noise as required and verification of vacant land use annually ▪ Use of equipment that complies with appropriate emission standards ▪ Truck waiting area inside the Site ▪ Maintain existing vegetation in buffer around Site perimeter or, where required construct perimeter screening berms with plantings on top ▪ Receipt of organics and materials at the MRF and C&D facilities within buildings ▪ Biofilters on the exhaust of air from within the organics processing and PHC contaminated soil treatment facilities ▪ Dust collection system from the MRF and C&D processing buildings ▪ Low permeability cover of organics primary reactor cells and PHC contaminated soil treatment cells ▪ Flare ▪ LFG collection system ▪ Truck tire wash	Air Quality ▪ Place compacted granular materials, and, if required, surface sealing on regularly used Site construction roads ▪ Use of typical best management practices for dust suppression ▪ Minimize idling of vehicles on-Site Noise ▪ Restrict the use of heavy equipment to daytime hours as best possible ▪ Maintain vehicles and equipment and ensure they have noise suppression equipment ▪ Control speed limit for traffic on-Site Odour ▪ Time the frequency of turning of compost piles ▪ Introduction of oxygen into the anaerobically digested organics reactors prior to uncovering them ▪ Manage the working face of the landfill effectively ▪ Apply appropriate daily cover on landfill ▪ Minimize the area of uncovered waste ▪ Placement of final cover progressively on completed landfill areas ▪ Implement odour control measures for leachate holding and treated effluent ponds, if required, i.e., aeration system, cover, misting system, chemical addition	Air Quality and Odour Predicted air quality at property boundary and off-Site sensitive receptors meets MOECC criteria. Noise Noise from the landfill and diversion facilities meets MOECC criteria. While predicted noise increases from Site-related traffic along the approximate 800 metres of Boundary Road from Highway 417 to the Site would be noticeable, the assessment of noise effects has not identified the need for additional mitigation measures.	Noise and dust monitoring is proposed as described in Section 14.1.1. The proposed noise monitoring program includes initially monitoring noise levels once per year during operations. The noise monitors, placed at or near POR02 and POR03, as defined in Section 8.4.1, will log acoustic data every hour for the duration of the monitoring period. The proposed dust monitoring program is annual property line dust monitoring after operational start up during the summer season for two summer seasons.

Environmental Component	In-Design Mitigation Measures	Best Management Practices	Net Effects	Effects Monitoring
Geology and Hydrogeology (Groundwater and Geotechnical)	▪ Engineered leachate/liquid containment for the landfill, leachate ponds and organics processing and PHC treatment ▪ Perimeter liner system cut-off for the landfill, together with leachate collection system ▪ Buffer between landfill component and property boundary	▪ Provide construction quality control on all liner and collection system installations ▪ Provide monitoring and maintenance of leachate collection system components ▪ Inspect construction and operating equipment regularly and repair promptly if found to be leaking ▪ Geotechnical monitoring of landfill settlement	The natural clay deposit and the proposed engineered leachate collection system and management systems will contain and control landfill leachate at the Site. The landfill will not adversely affect off-Site groundwater quality. Other sources such as leachate management ponds or organics primary reactor and soil treatment cells are lined and always accessible for repair. The Site is predicted to remain in compliance with groundwater protection requirements in both the short term and long term. In addition, the CRRRC is not predicted to adversely affect the quantity of groundwater available to any shallow dug wells in the vicinity of the Site.	Groundwater and geotechnical monitoring are proposed as described in Section 14.1.2. The existing and proposed groundwater monitoring locations for the processing and treatment facilities north of the Simpson Drain and for the landfill south of the Simpson drain are shown on Figure 14.1.2-1. Leachate samples are proposed to be collected from the connection to the leachate pre-treatment facility and at three locations within the landfill, while leachate levels will be measured in each leachate sump in the landfill (as they are constructed). The groundwater and leachate monitoring will occur three times per year with groundwater analysis for parameters outlined in O.Reg. 232/98 (MOE, 1998a) with some additions. In addition, water wells within 500 metres of the Site will be sampled, with consent from the owner, one time prior to operations starting at the facility. The proposed geotechnical monitoring includes subgrade settlement

Environmental Component	In-Design Mitigation Measures	Best Management Practices	Net Effects	Effects Monitoring
				monitoring, unit weight of the as-placed waste, inclinometers and surface survey points/monuments to monitor lateral displacements of the silty clay beneath the perimeter berm of the landfill, and vibrating wire piezometers to monitor the porewater pressure dissipation below the landfill
Surface Water	▪ Design surface water management systems to separate leachate and liquids from processing from clean surface water runoff ▪ Divert clean runoff to swales, ditches and ponds ▪ Design ditch systems to convey design storm flows ▪ Control post-development discharge flows to match pre-development conditions as close as possible ▪ Enhanced sediment removal in SWM system design ▪ Sedimentation and erosion control measures ▪ Design and construct the component liners and leachate/liquid collection systems to safeguard surface water resources	Surface Water Quality ▪ Implementation of a sediment and erosion control plan during construction and operations ▪ Re-vegetate final landfill cover ▪ Provide monitoring and maintenance of stormwater ponds; provide valve(s) on ponds, where necessary depending on ongoing water quality monitoring ▪ Provide monitoring and maintenance of leachate /liquid collection systems ▪ Use standard best management practices for erosion control until vegetation cover is established Surface Water Quantity ▪ Manage surface water on-Site; control off-Site stormwater discharge	The CRRRC has been designed to not adversely affect surface water quality on-Site or surface water quantity off-Site. .	Surface water monitoring is proposed as described in Section 14.1.3. The proposed surface water sampling locations, as shown on Figure 14.1.2-1, are the three discharge points from the Site at the eastern property boundary as well as Simpson Drain as it enters the Site at the western property boundary. Surface water samples and estimates of flow will be collected four times per year. Samples will be analyzed for the list of parameters as outlined in O. Reg. 232/98 (MOE, 1998a).

Environmental Component	In-Design Mitigation Measures	Best Management Practices	Net Effects	Effects Monitoring
		<u>Accidental Spills</u> ▪ Operate, store and maintain all equipment and associated materials in an area away from surface water features in a manner that minimizes the potential for the entry of any deleterious substance into water bodies ▪ Inspect construction and operating equipment regularly and repair promptly if found to be leaking ▪ Develop a spill response plan		
Biology	▪ Maintain existing perimeter vegetative buffers where possible	▪ Remove vegetative cover progressively in sequence with Site development ▪ Stabilize and re-vegetate areas of soil disturbed/exposed during construction ▪ Apply best management practices in applying chemical dust suppressants, fertilizers, pesticides and herbicides and minimize their use to the extent possible ▪ Conduct all vegetation clearing activities outside the breeding bird season where possible ▪ To the extent practical, limit the extent of disturbed areas and soil stockpiles, control their orientation , and for piles to be left in place for a prolonged period of time seed to establish vegetation ▪ Schedule construction activities to minimize area and duration of soil exposure, to the extent practical	No ecologically significant effects predicted as a result of construction and operation of the CRRRC.	<u>Benthic monitoring is proposed as described in Section 14.1.4.</u> Benthic and sediment monitoring will occur on a bi-annual basis at sampling stations B5, B6, B8, B9 and downstream of B5 and B7 as shown on Figure 8.7-1. Monitoring for barn swallow will be conducted for a period of three years. Ongoing review of conditions of revegetation and maintenance is proposed. Surface water monitoring is also proposed as set out in this table .

Environmental Component	In-Design Mitigation Measures	Best Management Practices	Net Effects	Effects Monitoring
		▪ Worker awareness program to avoid harm to milksnake (a species of concern), if they are in the Site-vicinity ▪ Manage waste effectively to avoid attracting nuisance wildlife and pests, control the nuisance wildlife populations as permitted and required, and conduct periodic inspections to monitor effectiveness of the pest control		
Land Use & Socio-economic **and** **Agriculture**	▪ Maintain appropriate buffer between proposed on-Site activities and off-Site land uses ▪ Maintain perimeter vegetative buffers where possible; construct screening features where there is not already a significant stand of trees ▪ Provide Property Value Protection Plan	▪ Control off-Site nuisance emissions ▪ Purchase goods and services locally as best possible ▪ Prevent the on-Site generation and accumulation of litter ▪ Use litter fencing to control windborne trash from leaving Site ▪ Regularly clean up litter both on-Site and in the Site-vicinity ▪ Establish procedure to register and address complaints ▪ Use best efforts to establish a community liaison committee	<u>Land use & Socio-economic</u> No material adverse effects identified. Several positive economic effects. <u>Agriculture</u> Limited on-Site agricultural use will be eliminated. No impacts on off-Site agricultural use or production identified.	To help mitigate and monitor potential nuisance or perception-related effects, a communication plan, including a telephone number and email address, will be prepared to allow and encourage farmers in the Site-vicinity to report any concerns, and to pose questions related to Site operations. In addition, a Community Liaison Committee will be established assuming there are interested volunteers in the community, to assist in the community monitoring CRRRC operations. Environmental monitoring for other components set out in this table.

Environmental Component	In-Design Mitigation Measures	Best Management Practices	Net Effects	Effects Monitoring
Culture and Heritage Resources	▪ N/A since low potential for on-Site archaeological resources	▪ Should any archaeological resources be discovered, cease all alteration of the Site immediately and engage a licensed consultant archaeologist to carry out archaeological fieldwork ▪ Should any human remains be discovered, the police or coroner and the Registrar of Cemeteries at the Ministry of Consumer Services must be notified ▪ If during the process of development any archaeological resources or human remains of potential Aboriginal interest are encountered, the Algonquins of Ontario Consultation Office will be contacted	No registered archaeological sites within the Site and Site-vicinity. The on-Site lands contain no or low archaeological potential; no Stage 2 assessment required. Five pre-1973 properties within 250 metres of the Site identified as potential cultural resources did not demonstrate cultural heritage value or interest, and are therefore not eligible for designation under the *Ontario Heritage Act*.	No monitoring proposed.
Traffic	▪ Provide required intersection improvements at the Site access location off Boundary Road ▪ Provide on-Site queuing area of sufficient capacity to avoid truck queuing on Boundary Road		All of the intersections evaluated would operate at an acceptable Level of Service during the weekday peak AM and PM hours of Site operations, with no intersections requiring modifications due to the CRRRC truck trips. The proposed lane configuration at the Site access includes an exclusive left turn lane on southbound Boundary Road.	No monitoring proposed.

12.0 ASSESSMENT OF LEACHATE MANAGEMENT OPTIONS

12.1 Overview

Leachate treatment is required for the organics processing and disposal components of the proposed CRRRC. Leachate generated from the landfill component will be collected within the landfill and removed from the leachate collection system by pumping. Surplus liquid wastewater from organics processing will be collected. Both of these wastewaters will require management and treatment. Runoff from the compost pad may also be removed for treatment.

The methodology of assessing the leachate management options was as follows in accordance with the approved TOR:

- Screen potential on-Site leachate treatment technologies;
- Select preferred on-Site treatment option based on criteria including performance and cost-effectiveness;
- Identify potential off-Site leachate receiver/treatment alternatives that may include on-Site pre-treatment;
- Determine off-Site leachate receiver/treatment alternatives potentially available to Taggart Miller;
- Describe potential alternatives to convey leachate to available off-Site leachate treatment alternatives;
- Develop leachate management system options; and
- Compare on-Site and off-Site alternative leachate management options using the evaluation criteria provided in Appendix B of the TOR (Appendix A).

The complete assessment is provided in TSD #10. This corresponds to Task 5 of the methodology described in Section 2.3.

12.2 Estimated Wastewater Volumes and Quality

12.2.1 Wastewater Volumes

The leachate quantity from the landfill component was estimated using local climactic data and a predictive model as explained further in Volume III. The leachate generated will be approximately 20,000 cubic metres per year during the initial years and will increase to about 88,000 cubic metres per year by year 10. The leachate generated will continue to increase to a predicted maximum in the range of 230,000 cubic metres per year at the time of filling the last stage of the landfill component and post-closure.

The liquor produced from processing 50,000 tonnes per year of organics has been estimated to be 30,000 to 35,000 cubic metres per year. During the initial period of Site operations it is proposed to pre-process the organics and send the material to off-Site anaerobic digesters for final processing. The BioPower demonstration project will likely produce a limited amount of liquor which would be re-used in the process, if possible. Hence, during this time no liquor has been accounted for requiring treatment.

12.2.2 Wastewater Quality

The quality of leachate from landfills changes with time. Typically parameter concentrations increase as a landfill is filled and then decrease following closure as the parameters are washed out via precipitation or undergo decay or reaction. Peak parameter concentrations were estimated in TSD #10 using data from municipal waste landfills and from the Otter Lake Waste Processing and Disposal Facility in Nova Scotia. The municipal waste landfill data represents data from comparably sized municipal solid waste disposal sites, literature and the MOECC Landfill Standards (MOE, 1998b). The Otter Lake Facility data was used as this facility removes organics prior to disposal and would better represent the type of waste the CRRRC is anticipated to receive for disposal. The maximum parameter concentration from any of the sources was used for this analysis.

The organic processing liquor quality was estimated based on information from the literature. Generally speaking, the peak ammonia concentrations are higher, total phosphorus is comparable and biochemical oxygen demand (BOD) and metals are lower than what is predicted as maximum concentrations in the leachate.

Parameters in the liquor or leachate that will likely require treatment include: BOD, nitrates, nitrites, ammonia, unionized ammonia, phenols, total phosphorus, aluminum, arsenic, boron, chromium, cobalt, copper, lead, nickel, vanadium, zinc, iron and pH.

12.3 Screen and Select Preferred On-Site Treatment Technology

12.3.1 Available Treatment Technologies

Available on-Site treatment technologies that include a variety of approaches were reviewed. Approaches considered ranged from chemical and mechanical treatment systems to passive treatment systems. From the review it was clear that there are more options available for the removal of the primary parameters of concern that include oxygen demand, nutrients and solids, while there are fewer technologies that can treat metals and minerals to the PWQO criteria.

For treatment of oxygen demand, nutrients and solids (BOD, total suspended solids, ammonia and total phosphorus) the following processes were evaluated:

- Suspended Growth Biological Nitrification Processes:
    - Activated sludge
    - Oxidation ditch
    - Sequencing Batch Reactor (SBR)
    - Membrane bioreactor
    - Aerated lagoon
- Trickling Filter
- Rotating Biological Contactor (RBC)
- Aerobic Submerged Fixed Beds

- Aerobic Submerged Mobile Beds
- Recirculating Sand Filters
- Intermittent Sand Filters
- Constructed Wetlands
- Siemens PACT® System (Powder Activated Carbon Treatment combined with aerobic biological treatment step)

12.3.2 Comparative Evaluation of On-Site Treatment Technologies

The technologies were compared in a preliminary way considering their performance to treat BOD, TSS, ammonia and total phosphorus, as well as any other benefits or drawbacks as outlined in TSD #10. Biological treatment systems were found to be the most effective at removing high BOD and ammonia concentrations through nitrification processes; however to maintain healthy biological processes certain other compounds are required to be reduced (if found to be elevated to a point of creating toxic conditions) through chemical precipitation.

Biological systems have minimal effect on reducing phosphorus; therefore, chemical coagulants and filtration will be required. Filtration can be achieved by a diverse range of methods and approaches with varying degrees of performance and operational requirements.

The best available technology to reduce the concentrations of the remaining parameters of concern with regard to the PWQO criteria (where possible) was identified as reverse osmosis (RO), with a possible contingency of an ion exchange (IE) stage. Treated effluent would be stored in an on-Site holding pond prior to discharge to the municipal drain. Sludge management and waste liquid management are required to complete the treatment system.

The evaluation of the available treatment technologies to treat the primary parameters is summarized in TSD #10 where it was concluded that the following options would be most suitable for use as the main treatment stage:

- Activated Sludge – which would include:

Raw Wastewater → Equalization Pond → Activated Sludge Process (aerobic) → Clarifier → Chemical Precipitation/Filtration → RO → IE → Phosphorus Removal→ Effluent Holding Pond

- Sequencing Batch Reactor (SBR) – which would include:

Raw Wastewater → Equalization Pond → SBR Process → Chemical Precipitation/Filtration → RO → IE → Phosphorus Removal→ Effluent Holding Pond

- RBC – which would include:

Raw Wastewater → Equalization Pond → RBC → Denitrification Unit(s) → Clarifier → Chemical Precipitation/Filtration → RO → IE → Phosphorus Removal → Effluent Holding Pond

- Siemens PACT® (Powder Activated Carbon Treatment combined with aerobic biological treatment step) – which would include:

Raw Wastewater → Equalization Pond → PACT® → Chemical Precipitation/Filtration → RO → IE → Phosphorus Removal→ Effluent Holding Pond

These options were compared considering flexibility, reliability, ease of use, capital costs, operational costs and operation and maintenance as described in TSD #10 and shown in Table 12.3.2-1. The activated sludge and SBR are comparable in estimated capital cost; however, the Siemens PACT® system has higher annual electricity and chemical costs, which over the lifetime of the CRRRC increases the total investment. The SBR and activated sludge processes offer similar performance; however, the activated sludge process will produce larger volumes of sludge that require additional digestion and dewatering. The anaerobic stage in the SBR limits sludge production and reduces the anticipated volume of sludge that will require dewatering and disposal. The nature of the SBR sludge also requires less treatment. Additionally, the SBR is less sensitive to operational changes (quality and quantity) and more flexible in operating scenarios to optimize treatment compared to the activated sludge process.

12.3.3 Identify Preferred On-Site Treatment Approach

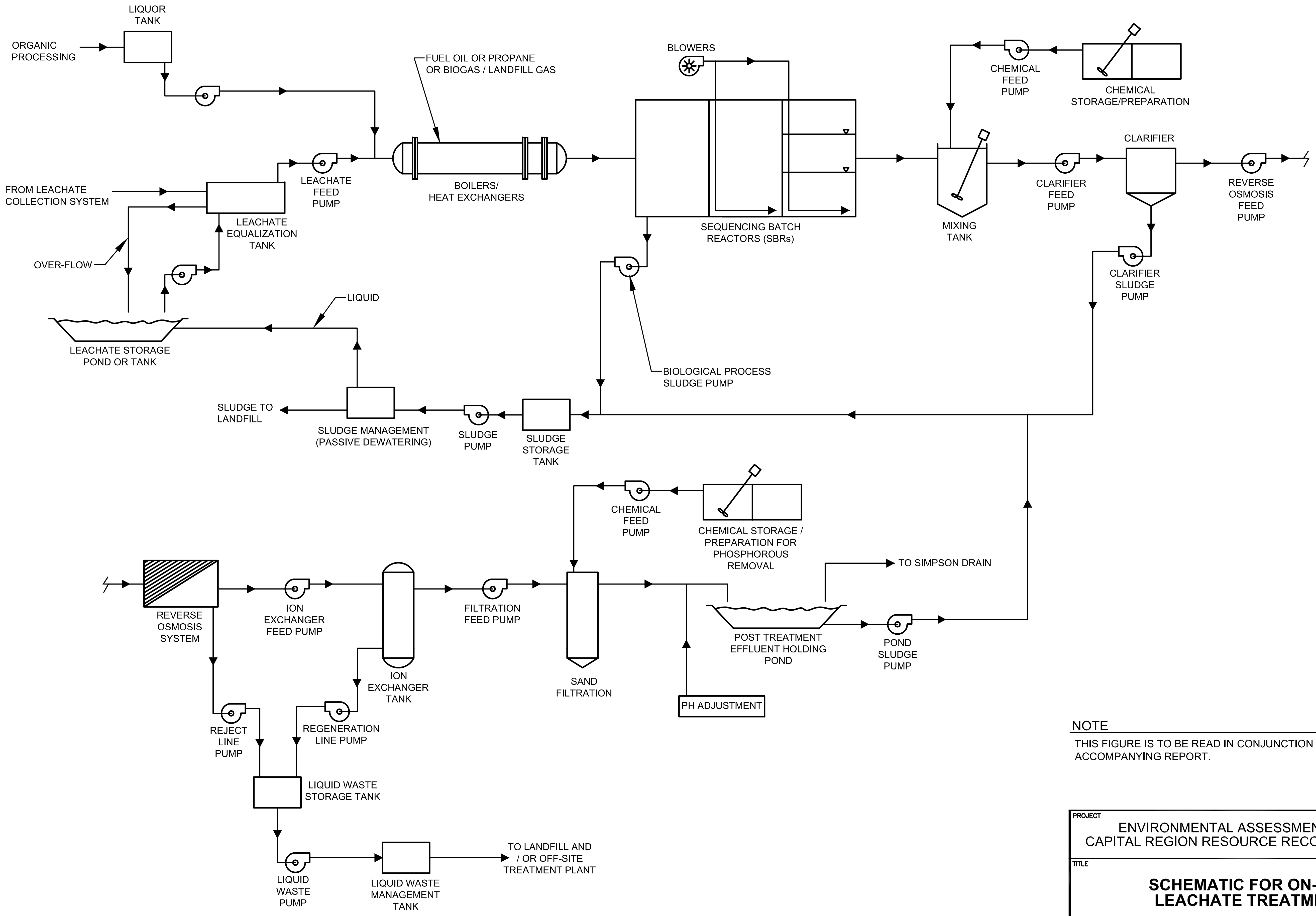
Based on this assessment, the SBR was identified as the preferred on-Site primary treatment approach. A flow diagram of the full on-Site treatment process is shown in Figure 12.3.3-1.

Table 12.3.2-1: Evaluation of Selected Leachate Treatment Systems

Criteria	Activated Sludge (AS)	Sequencing Batch Reactor (SBR)	Rotation Biological Contactor (RBC)	Siemens PACT® (Powder Activated Carbon Treatment combined with aerobic biological treatment step)
Flexibility	**Ranked 3rd because:** ■ May require adjustment to optimize treatment at different flow rates ■ May overcome increases in peak loadings ■ System can be expended by adding new AS units and clarifier	**Ranked 1st because:** ■ May require adjustment to optimize treatment at different flow rates ■ Susceptible to increases in peak loadings ■ Easier and less costly than the AS system to add additional treatment units to handle additional flow	**Ranked 4th because:** ■ Can handle flow changes ■ May be susceptible to increases in peak loadings ■ System can be expanded by adding RBC units	**Ranked 2nd because:** ■ May require adjustment to optimize treatment at different flow rates ■ Susceptible to increases in peak loadings ■ System can be expanded by adding new PACT® units and clarifier
Reliability	**Ranked 1st (tied) because:** ■ Aeration system and pump failure are only reliability concerns	**Ranked 2nd because:** ■ Restart of SBR would require a skilled operator (complex process control system) ■ Aeration system is equipped with jet aerators that allow mixing, self-cleaning and accessibility for maintenance. Pumps and automated switch failure are concerns	**Ranked 3rd because:** ■ Has a reputation for variable performance, sensitivity to variable inflow quality and weight imbalances causing rotating shaft damage ■ System upset would require cleaning discs and lengthy restart	**Ranked 1st (tied) because:** ■ Aeration system and pump failure are only reliability concerns
Ease of Use	**Ranked 3rd because:** ■ Requires regular maintenance of aeration system and the chemical addition system	**Ranked 4th because:** ■ Higher level of operation and maintenance required due to controls, aeration system, pumps, valves and automated switches	**Ranked 1st because:** ■ Minimal operation requirements	**Ranked 2nd because:** ■ Can be operated in continuous mode or SBR mode ■ In the case of SBR, higher level of operation and maintenance required due to controls, aeration devices, pumps, valves and automated switches

Criteria	Activated Sludge (AS)	Sequencing Batch Reactor (SBR)	Rotation Biological Contactor (RBC)	Siemens PACT® (Powder Activated Carbon Treatment combined with aerobic biological treatment step)
Capital Costs	**Ranked 1st (tied) because:** ■ Requires high efficiency aeration system ■ Continuous flow mode of AS requires external clarification stage following the AS unit ■ May require pre-treatment (chemical precipitation) ■ Requires equalization pond ■ Lower capital cost compared to Siemens PACT system but similar to SBR and RBC	**Ranked 1st (tied) because:** ■ Requires high efficiency aeration system ■ SBR does not require external clarification stage ■ May require pre-treatment (chemical precipitation) ■ Requires equalization pond ■ Lower capital cost compared to Siemens PACT system but similar to AS and RBC	**Ranked 1st (tied) because:** ■ Does not require aeration system but requires large motors for shaft rotation. ■ Requires external clarification stage ■ May require chemical precipitation treatment unit ■ Requires equalization pond ■ Lower capital cost compared to Siemens PACT system but similar to AS and SBR	**Ranked 2nd because:** ■ Requires high efficiency aeration system ■ SBR mode does not require external clarification stage ■ Continuous mode requires external clarification stage following the PACT unit ■ Requires equalization pond ■ Highest capital cost compared to the other options considered
Operational Costs	**Ranked 2nd because:** ■ Electricity is required for aeration system and pumps operating in continuous mode ■ Chemical cost to remove metals, non-biodegradable and toxic compounds prior to AS treatment unit ■ Requires heating of the AS tank to maintain optimal temperature (10-15ºC)	**Ranked 1st (tied) because:** ■ Electricity is required for pumps and blowers operating in intermittent mode (less electricity than continuous aeration systems) ■ Chemical cost to remove metals, non-biodegradable and toxic compounds prior to SBR treatment unit(s) ■ Requires heating of the SBR tank to maintain optimal temperature (10-15ºC)	**Ranked 1st (tied) because:** ■ Energy requirement for pumps and the shaft ■ Regular bearing maintenance ■ Requires heating of the RBC tank to maintain optimal temperature (10-15ºC)	**Ranked 3rd because:** ■ Electricity is required for pumps and blowers operating in continuous mode ■ Requires continuous addition of activated carbon (~ 220 kg/day) ■ Requires heating of the biological treatment unit to maintain optimal temperature (10-15ºC)

Criteria	**Activated Sludge (AS)**	**Sequencing Batch Reactor (SBR)**	**Rotation Biological Contactor (RBC)**	**Siemens PACT® (Powder Activated Carbon Treatment combined with aerobic biological treatment step)**
Operations and Maintenance	**Ranked 2nd (tied) because:** ■ Regular pump, blower and boiler maintenance ■ Sludge removal from AS treatment unit, chemical precipitation unit and clarifier on a regular basis ■ Plate air diffusers require shutdown and removal for cleaning and replacement	**Ranked 1st because:** ■ Regular pump, blower and boiler maintenance ■ Sludge removal from SBR treatment unit(s) and chemical precipitation unit on a regular basis ■ Less sludge volume from SBR treatment unit(s) compared to other selected options ■ Jet aerators are located above water for maintenance without shutdown and are self-cleaning	**Ranked 2nd (tied) because:** ■ Regular pump and boiler maintenance ■ Chemical cost to remove metals, non-biodegradable and toxic compounds prior to RBC ■ Sludge removal from RBC and chemical precipitation unit on a regular basis	**Ranked 2nd (tied) because:** ■ Regular pump, blower and boiler maintenance ■ Sludge removal from biological treatment unit, clarifier or SBR reactor and chemical precipitation unit on a regular basis ■ Plate air diffusers require shutdown and removal for cleaning and replacement
OVERALL RANKING	**2nd (TIED)**	**1st**	**3rd**	**2nd (TIED)**



NOTE

THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT.

PROJECT

ENVIRONMENTAL ASSESSMENT OF THE
CAPITAL REGION RESOURCE RECOVERY CENTRE

TITLE

SCHEMATIC FOR ON-SITE LEACHATE TREATMENT

Golder Associates
Ottawa, Ontario

PROJECT No. 12–1125–0045		
DESIGN	I.T.M.	Nov. 2013
CADD	M.L.F.	Nov. 2013
CHECK	P.L.E.	Aug. 2014
REVIEW	P.A.S.	Aug. 2014

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Fig. 12.3.3-1

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12.4 Identify and Determine Availability of Off-Site Treatment Alternatives, Describe Alternatives to Convey Leachate and Develop Leachate Management System Options

12.4.1 Available Off-Site Treatment Alternatives

Based on available information, the following wastewater treatment facilities were identified for potential acceptance and treatment of wastewater from the proposed CRRRC. Information on these local municipal sewage treatment facilities is provided in TSD #10. The treatment facilities identified are as follows:

- Robert O. Pickard Environmental Centre (ROPEC);
- Embrun Sewage Treatment Facility;
- Russell Sewage Treatment Facility; and
- Village of Limoges Sewage Treatment Facility.

The ROPEC currently accepts leachate for treatment by agreement from three landfills (Waste Management's Ottawa landfill, BFI's Navan landfill, City-owned Trail Road landfill). The Trail Road landfill transports leachate by truck while the two private sites do so by forcemain into the City sewer system. ROPEC provides wastewater treatment for the City from residences, businesses and institutions as well as some industrial wastewaters under specific conditions. ROPEC is a large wastewater treatment facility that is operating well below its design hydraulic capacity. The landfills that send leachate to ROPEC do so under individual agreements with the City of Ottawa that generally have specific maximum concentrations for parameters of concern. Pre-treatment of the leachate is in some cases required to meet these limits, prior to discharging the leachate to the sanitary sewer or the plant headworks, but is dependent on the specific leachate characteristics and agreement requirements.

The Embrun, Russell and Village of Limoges wastewater treatment facilities all consist of lagoons and it is understood that future expansion is planned to accommodate anticipated population growth. The Embrun and Russell facilities are located within the Township of Russell and the Village of Limoges facility is located in the Township of Nation. The estimated CRRRC wastewater generation would represent a significant increase in loading in terms of the existing capacity and treatment ability of these facilities and would likely require modifications/expansion of some sort.

Based on the available information, and given that the proposed CRRRC is within City boundaries and will be servicing primarily City waste generators, ROPEC was therefore identified as the realistic and most appropriate off-Site wastewater receiver/treatment option for the proposed CRRRC. The City of Ottawa was accordingly consulted regarding this option. From those discussions the following conclusions were drawn:

- ROPEC is currently operating at well below its hydraulic capacity. The estimated wastewater quantity from CRRRC was discussed with City staff and it is very small compared to the available treatment capacity at ROPEC; and
- For ROPEC to accept wastewater from the CRRRC Site, the objective is to meet the Sewer Use By-law quality requirements. Certain parameters may be allowed to exceed and be subject to a surcharge cost. Methane, hydrogen sulphide and ammonia were highlighted as the parameters of greatest concern.

Based on the leachate and liquor quality estimates, in addition to the expected presence of methane and hydrogen sulphide, the following parameters are most likely to require pre-treatment:

Table 12.4.1-1: CRRRC Wastewater Parameters Likely to Require Pre-treatment

Parameters	City of Ottawa Sewer Use By-law Limits (mg/L)
BOD	300
TKN	100
Ammonia	--
Total Phosphorus	10
TSS	350
Aluminum	50
Cadmium	0.02
Copper	3

12.4.2 On-Site Pre-Treatment Technologies

Similar to the treatment options for full on-Site treatment described previously, high BOD and ammonia concentrations in the raw wastewater are the two main parameters of concern to comply with the City of Ottawa Sewer Use By-law (City of Ottawa, 2003b). The assessment used to evaluate on-Site treatment is also applicable for on-Site pre-treatment. The preferred pre-treatment technology is also identified as an equalization pond or tank(s), followed by the SBR system. Chemical precipitation may be required before the SBR system to reduce toxic conditions for biological removal, if they occur. The concentrations of the metals in the wastewater are expected to be below the By-law limits after discharge from the SBR system, eliminating the need for the RO → IE final treatment stages required for on-Site treatment. However, chemical precipitation is included as a contingency if the metal concentrations are found to be higher than the Sewer Use By-law limits. The effluent storage ponds or tanks will still be necessary and will be used to balance flows and provide storage for treated wastewater. The general process flow chart for on-Site wastewater pre-treatment is as follows:

Raw Wastewater → Equalization Pond or Tank(s) → SBR system → Chemical Precipitation of Metals (pH adjustment as required) → Effluent Holding Ponds or Tanks

The pre-treatment system will require sludge management similar to the on-Site treatment option.

Figure 12.4.2-1 shows the preferred on-Site pre-treatment system for subsequent off-Site treatment and disposal.

12.4.3 Leachate Conveyance Options

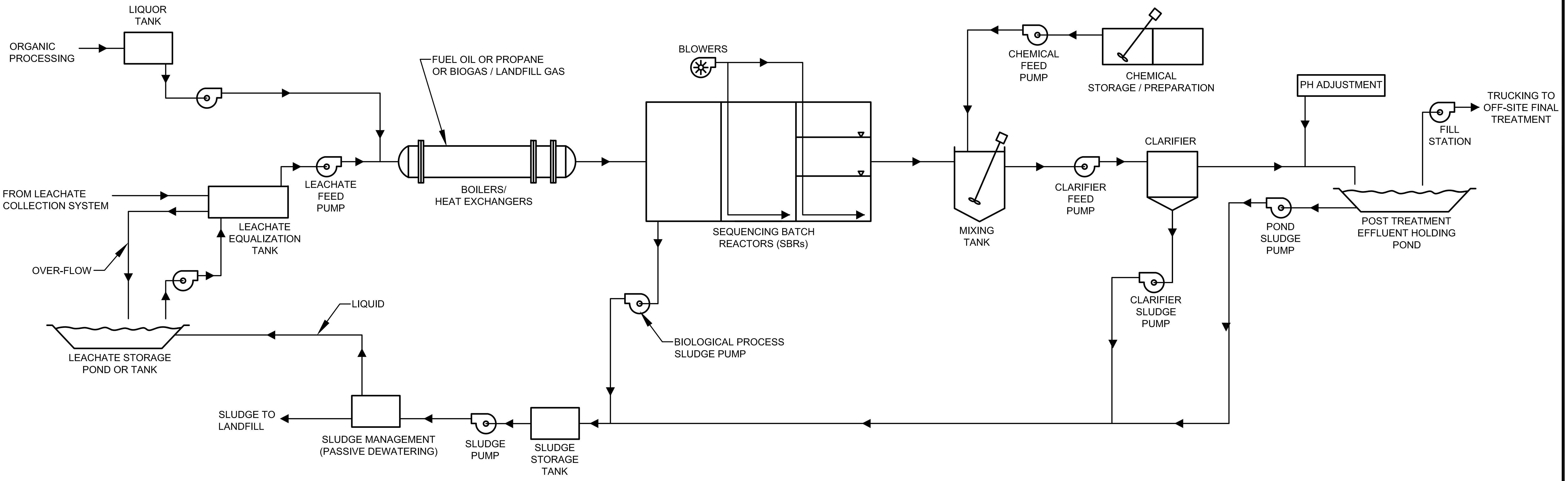
The two options available to convey pre-treated leachate from the CRRRC to ROPEC are: 1) tanker truck; and 2) a dedicated forcemain pipe to the City sanitary sewer system. As described in Section 12.4.1, both of these options are currently used to convey leachate from waste disposal facilities in Ottawa to ROPEC.

Based on consultation with the City of Ottawa, it is understood that the City would prefer the wastewater from CRRRC to ROPEC to be trucked, at least initially, so that information and assurance on leachate quantity and especially quality over time could be obtained. In view of the City's understood preference, the preferred method of conveyance is by tanker truck at this time.

The possibility of forcemain conveyance will be reconsidered in consultation with the City in the future, after leachate quality from the CRRRC over time is established and the requirements for and success of pre-treatment to meet City Sewer Use By-law requirements are established and confirmed.

12.4.4 Off-Site Leachate Management System Option

Based on the assessment of off-Site leachate receivers, the need for pre-treatment and the approach to convey leachate, the off-Site management system option proposed includes on-Site wastewater pre-treatment and off-Site delivery via truck for wastewater management at the City of Ottawa's wastewater treatment facility. A force main connection to the City system may be considered in the future.



NOTE

THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT.

PROJECT

ENVIRONMENTAL ASSESSMENT OF THE
CAPITAL REGION RESOURCE RECOVERY CENTRE

TITLE

SCHEMATIC FOR LEACHATE PRE-TREATMENT FOR CONVEYANCE TO OFF-SITE WASTEWATER TREATMENT PLANT

Golder Associates
Ottawa, Ontario

PROJECT No. 12–1125–0045			FILE No. 1211250045-V1-EAr-12.4.2-.dwg	
DESIGN	I.T.M.	Nov. 2013	SCALE N.T.S.	REV. 0
CADD	M.L.F.	Nov. 2013	Fig. 12.4.2-1	
CHECK	P.L.E.	Aug. 2014		
REVIEW	P.A.S.	Aug. 2014		

FILENAME: N:\Active\Spatial_IM\Miller_Paving_Ltd\CRRRC\ACAD\Vol 1 (Report Figures)\EA report\1211250045–V1–EAr–12.4.2–1.dwg

12.5 Comparative Evaluation and Identify Preferred Option

The comparison of the two identified wastewater management options, i.e., 1) on-Site treatment with discharge to the Simpson Drain, and 2) on-Site pre-treatment for off-Site treatment and disposal, considered the following environmental components as set out in Appendix B of the approved TOR:

- Atmosphere
- Geology and hydrogeology
- Surface water
- Biology
- Land use
- Traffic
- Technical effectiveness
- Regulatory approvability
- Capital and operating costs

Table 12.5-1 summarizes the comparison.

Table 12.5-1: Comparison of Wastewater Management Options

Environmental Component	On-Site Wastewater Treatment and Discharge to Simpson Drain	On-Site Wastewater Pre-Treatment and Off-Site Wastewater Management at City of Ottawa Wastewater Treatment Facility
Atmosphere – Odour	**Ranked 2nd because:** Treatment operations would have a greater number of more complex processes; hence potential odour generation is greater; disadvantage.	**Ranked 1st because:** Pre-treatment operations would have less complex processes; hence potential odour generation is less; advantage.
Atmosphere – Air Quality	**Ranked 2nd because:** Treatment operations would have greater number of more complex processes; hence potential air quality impacts are greater; disadvantage.	**Ranked 1st because:** Pre-treatment operations would have less complex processes, hence potential air quality impacts are less; advantage.
Atmosphere – Noise	**Ranked 1st because:** This option has more equipment, however does not require use of leachate transport vehicles; advantage.	**Ranked 2nd because:** This option has less equipment, however would require use of leachate transport vehicles; disadvantage.

Environmental Component	On-Site Wastewater Treatment and Discharge to Simpson Drain	On-Site Wastewater Pre-Treatment and Off-Site Wastewater Management at City of Ottawa Wastewater Treatment Facility
Geology and Hydrogeology – Groundwater Quality	**Ranked 1st (tied) because:** No predicted effect on off-Site groundwater quality; advantage.	**Ranked 1st (tied) because:** No predicted effect on off-Site groundwater quality; advantage.
Surface Water – Surface Water Quality	**Ranked 2nd because:** Although this option is designed to meet the PWQO within the receiving surface water course, there will still be a discharge to manage and monitor and some parameter concentrations will increase from the baseline conditions. Limited flow in the receiving surface water course to provide a mixing zone; disadvantage.	**Ranked 1st because:** No predicted effect on off-Site surface water quality. The surface water receiver for ROPEC provides a significant mixing zone and PWQO readily achievable in that receiver; advantage.
Surface Water – Surface Water Quantity	**Ranked 1st (tied) because:** This option would discharge to the Simpson Drain. The discharge quantity will be controlled and pre-development flows largely matched; advantage.	**Ranked 1st (tied) because:** This option would discharge to the Ottawa River and will have negligible effect on water quantity in the river; advantage.
Biology – Aquatic Biological Resources	**Ranked 2nd because:** Although this option is designed to meet the PWQO within the receiving surface water course, there will still be a discharge to manage and monitor and some parameter concentrations will go up from the baseline conditions; disadvantage.	**Ranked 1st because:** This option does not influence aquatic biological resources on or in the area of the Site and treatment of CRRRC wastewater by the City plant would not have any measureable effect on aquatic resources at that location; advantage.
Biology – Terrestrial Biological Resources	**Ranked 1st (tied) because:** No basis to distinguish the two options for this criterion as area in which facility will be located will be disturbed in any event: advantage.	**Ranked 1st (tied) because:** No basis to distinguish the two options for this criterion as area in which facility will be located will be disturbed in any event: advantage.
Land Use	**Ranked 1st (tied) because:** No predicted impact on off-Site existing or probable planned future land use; advantage.	**Ranked 1st (tied) because:** No predicted impact on off-Site existing or probable planned future land use; advantage.

Environmental Component	On-Site Wastewater Treatment and Discharge to Simpson Drain	On-Site Wastewater Pre-Treatment and Off-Site Wastewater Management at City of Ottawa Wastewater Treatment Facility
Traffic	**Ranked 1st because:** This option does not have trucks hauling wastewater; advantage.	**Ranked 2nd because:** This option has trucks hauling wastewater, which will generate additional Site-related traffic; disadvantage.
Technical Effectiveness	**Ranked 2nd because:** Full treatment required to meet the PWQO. Less flexible to variations in wastewater quality; disadvantage.	**Ranked 1st because:** Wastewater can be readily treated to meet Sewer Use By-law limits (City of Ottawa, 2003b). Not expected to adversely affect operation or performance of ROPEC; advantage.
Regulatory Approvability	**Ranked 2nd because:** This type of treatment system has been approved for the treatment of wastewater in the province of Ontario and has generally performed acceptably. However it will require greater regulatory scrutiny; disadvantage.	**Ranked 1st because:** Wastewater pre-treatment system readily approved. City treatment system already approved and in operation; advantage.
Capital and Operating Costs	**Ranked 2nd because:** Higher capital cost compared to the other option. Higher operational requirements and costs; disadvantage. Monitoring of discharge quality is required.	**Ranked 1st because:** Lower capital cost compared to the other option. Lower operational requirements and costs; advantage. Monitoring of discharge quality is required.
OVERALL RANKING	**2nd**	**1st**

The main advantages of on-Site pre-treatment and off-Site management at the City of Ottawa ROPEC facility, which also represent disadvantages for on-Site treatment and local discharge to the Simpson Drain are:

- The on-Site pre-treatment (only) process is less complex than full on-Site treatment;
- The Ottawa River is a preferable receiver for fully treated leachate compared to the Simpson Drain, which has a comparatively much lower flow regime and would be more susceptible to process upsets or unexpected variations;
- Expected more straightforward regulatory approvability due to simpler on-Site pre-treatment process, and an already approved City treatment plant at ROPEC that is already receiving landfill leachate from three disposal sites in Ottawa and performing acceptably; and
- Lower capital and operating costs.

The only disadvantage to the option of on-Site pre-treatment and off-Site management at the City of Ottawa ROPEC facility is the additional traffic associated with tanker trucks hauling the pre-treated CRRRC wastewater to ROPEC. The impact of this truck traffic was considered in the traffic assessment. A future forcemain to the City sewer system, if developed, would remove this disadvantage.

The preferred wastewater management option is therefore on-Site pre-treatment and trucking off-Site to ROPEC. Considering that implementation of this preferred option requires Taggart Miller to enter into an agreement with the City of Ottawa to accept the wastewater from the CRRRC at ROPEC, if the City of Ottawa option proves not to be available, it will be necessary to treat the wastewater using another approach. In that case, the following amending procedure for this EA would be followed:

1) MOECC would be notified that it was not possible to conclude an agreement with the City to accept the CRRRC pre-treated wastewater at ROPEC;

2) The other alternatives assessed in the evaluation would be re-visited, including the on-Site wastewater treatment and discharge option, and any possible additional alternatives available at that time would be identified and included in an updated comparative evaluation, to decide on the wastewater treatment option to be pursued;

3) Appendix J to the Volume IV D&O Report (Leachate Pre-Treatment Design Report) would be revised to describe the proposed option for which provincial approval is to be sought. The Site Development Plan would also be modified as required to accommodate the proposed option;

4) The potential sources of potential effects would be identified and compared to those for the preferred option; if necessary the predictive effects modelling would be re-run; and the ESDM and Acoustics Reports would be modified; and

5) An ECA application would be filed for the updated approach, as required.

13.0 CUMULATIVE IMPACT ASSESSMENT

In the TOR, Taggart Miller proposed to undertake a cumulative impact assessment (CIA), or cumulative effects analysis, of the potential effects of the CRRRC project. Such an assessment is not currently a requirement of the provincial EA process. To carry out this assessment, a framework often used in federal EA processes was considered (Canadian Environmental Assessment (CEA) Agency, 1999; CEA Agency, 2013), as well as guidance from other jurisdictions, in particular California. Cumulative effects are defined by the CEA Agency (1999) as "changes to the environment that are caused by an action in combination with other past, present and reasonably foreseeable future human actions".

An assessment of cumulative effects provides a more complete understanding of what might happen to environmental components of value or concern beyond the influence of the project alone. This is useful for regulatory decision-makers and authorities as they review and plan future developments.

This corresponds to Task 6 of the methodology described in Section 2.3.

13.1 Approach

13.1.1 General

This analysis considers the residual (non-zero) effects of the CRRRC and the potential for these residual effects to interact with other projects or activities, which when combined may result in a greater and in particular adverse effect to an environmental component.

13.1.2 Assessment Methodology

This cumulative effects analysis involved the following steps:

- Scoping:
    - Select appropriate environmental components for analysis;
    - Identify spatial and temporal boundaries; and
    - Identify other projects or activities that may affect the same components in time and space.
- Analysis of Effects:
    - Consider effects of the CRRRC on selected components in time, space and type of effect, accounting for mitigation measures; and
    - Assess the potential for the effects of the other identified projects and actions to overlap with those of CRRRC in time, space and type of effect on selected components.
- Evaluation of significance of residual cumulative effects.

13.2 Scope

13.2.1 Identified Components

In a typical cumulative effects analysis, Valued Ecosystem Components (VEC) are identified, which represent specific features or attributes of the environment that are considered to be important either for regulatory reasons or because of their social, cultural, economic or ecological value. VEC's for this analysis were taken from the list of components used in the assessment of environmental effects of the CRRRC as further described below.

Only those components on which the CRRRC may have a "non-zero" residual effect were carried forward into this cumulative impact analysis. Based on the studies completed for the proposed CRRRC, this includes: atmosphere; hydrogeology; surface water; biology; land use & socio-economic, agriculture and traffic. Excluded is archeology & built heritage, as there were no residual effects identified for this component.

Table 13.2.1-1 summarizes the predicted residual effects of the CRRRC on the selected components where mitigation measures may not be sufficient to completely eliminate the potential effects, even if regulatory standards are being met.

Table 13.2.1-1: Summary of CRRRC Residual Effects

Environmental Component	Potential Effects of CRRRC	Location of Residual Effect from CRRRC
Atmosphere	Odour	Site, Site-vicinity
	Dust emissions	Site, Site-vicinity
	Air quality	Site, Site-vicinity
	Noise emissions	Site, Site-vicinity and Haul route
Hydrogeology	Groundwater quality impacts	Site, Site-vicinity
	Groundwater quantity impacts	Site
Surface Water	Surface water quality impacts	Site, Site-vicinity
	Surface water quantity impacts	Site, Site-vicinity
Biology	Change in habitat as a result of moving/removing ditches and alteration of flows (aquatic biological resources)	Site, Site-vicinity
	Removal of vegetation and disruption to wildlife (terrestrial biological resources)	Site
Land Use & Socio-economic	Atmosphere, groundwater and surface water impacts	Site-vicinity, Haul route
	Spending and employment	Capital Region
	Visual	Site-vicinity
Agriculture	Loss of productive land on-Site	Site
	Atmosphere, groundwater and surface water impacts	Site-vicinity
Traffic	Increased traffic	Haul route from Highway 417

13.2.2 Spatial Boundaries

All predicted residual effects of the CRRRC are located on the Site, in the Site-vicinity or along the haul route from Highway 417 to the Site entrance, except for the positive economic effects of the project.

The existing zoning and land use in the vicinity of the Site was considered in determining the area for this assessment:

- To the north: industrial lands and Highway 417 corridor;
- Immediately to the west: zoned rural heavy industrial, with limited existing residential;
- Further west and to the south, southwest and northeast: zoned rural and largely undeveloped;
- Further southwest and south, and to the southeast and east: zoned agricultural;
- Northwest of the Boundary Road/Highway 417 interchange: natural environment designation; and
- North of Highway 417: golf course.

13.2.3 Temporal Boundaries

The residual effects of the CRRRC considered in this CIA will arise primarily during the construction and operating phase of the facility.

13.2.4 Other Projects and Activities

The TOR indicated that Taggart Miller would consider certain and probable physical activities in the Site-vicinity, where the effects of those activities and of the CRRRC may overlap.

Past actions contribute to baseline conditions. For the purpose of this CIA, effects from historical projects or activities have been included in the baseline conditions. While effects from current (present) actions may also be influencing baseline conditions, they are considered in the cumulative analysis on a component-specific basis, since these effects may continue into the future.

Obtaining sufficient data for meaningful analysis is a challenge in evaluating the interactions of probable future physical activities, since such activities are sometimes only conceptual without formalized development plans. Obtaining sufficient data from existing activities can also be a challenge in cumulative effects assessments. Some degree of uncertainty is therefore typical of cumulative impact assessments.

The existing land uses in the area of the Site south of Highway 417 can be described as follows:

1) Boundary Road Industrial Park (land zoned Heavy Rural Industrial west of CRRRC):
    - Mainly properties/facilities/yard areas such as construction companies, vehicle restoration, storage, roofing and line painting companies with usages such as storage of materials and equipment, vehicle parking, sometimes with relatively small single storey buildings used for the offices associated with these businesses, indoor storage, some stockpiling of soils and other surplus materials;
    - A gas bar which consists of one building approximately10 metres by 12 metres and three gas pumps;

- Two joined lots within which wood splitting is carried out consisting of at least four buildings (approximately 19 metres by 24 metres, 15 metres by 30 metres, 13 metres by 12 metres and 12 metres by 22 metres), with exterior log storage yard and associated moving equipment;
- A licensed used shingle storage and transfer building with one building approximately 13 metres by 19 metres;
- Pomerleau Ltd. – a trucking business; soil screening, blending and stockpiling; asphalt stockpiling for subsequent re-use; multiple aggregate stockpiles; and four buildings approximately 28 metres by 18 metres, 7 metres by 16 metres, 22 metres by 10 metres and 14 metres by 18 metres;
- Vacant undeveloped land/lots within the eastern and northern portions of the industrial park; and
- Some existing residences fronting on Boundary Road to the north/west of the proposed CRRRC, intermixed with commercial and industrial properties.

In general, the businesses within the industrial park are providing local services and are relatively small in scale with the exception of Pomerleau.

2) Rural Land (northeast and south of the Site, and west of the Industrial Park):

- Generally undeveloped and forested or fallow land, with no known uses planned.

3) Agricultural Land (east and southeast):

- Lands with some degree of agricultural improvements currently used for farming (mainly crops or pasture).

The only known new future planned land use in the Site-vicinity is a proposed new terminal to de-couple double tractor trailers to single trailers for travel to sites within the City between (north of) Pomerleau Ltd. and the CRRRC properties and Highway 417 with frontage along Boundary Road. The proponent has submitted an application to the City of Ottawa (Jeff McEwen, personal communication, December 9, 2013).

13.2.5 Potential Impacts Due to Other Projects and Activities

It has been assumed in the absence of information to the contrary that the off-Site activities and projects, existing or proposed, described above operate and perform in compliance with relevant regulatory standards, such as those established by the MOECC. There is no indication to the contrary from the work undertaken for this EA.

A residual effects interaction matrix shown in Table 13.2.5-1 was completed to identify overlaps in terms of types of effect between the residual (non-zero) effects of the CRRRC and the potential residual (non-zero) effects of other projects and activities on each environmental component.

Table 13.2.5-1: Interactions Matrix – Type of Effect

Environmental Component	CRRRC Residual Effect	Wood Splitting Facility	Shingle Storage and Transfer Building	Pomerleau Ltd.	Gas Bar	Additional Small Commercial / Industrial Operations	Farming Operations	Tractor / Trailer De-coupling Proposal
Atmosphere	Odour	no	no	yes	no	no	yes	no
	Dust emissions	yes	no	yes	no	yes	yes	yes
	Air quality	no	no	no	no	no	yes	yes
	Noise emissions	yes	yes	yes	no	yes	yes	yes
Hydrogeology	Groundwater quality impacts	no	no	no	no	no	no	no
	Groundwater quantity impacts	no	no	no	no	no	no	no
Surface Water	Surface water quality impacts	no	no	yes	no	yes	yes	no
	Surface water quantity impacts	no	no	no	no	no	no	no
Biology	Aquatic biological resources	no	no	yes	no	yes	yes	no
	Terrestrial biological resources	no	no	yes	no	yes	yes	yes
Land Use & Socio-economic	Atmosphere, groundwater and surface water impacts	yes	yes	yes	no	yes	yes	yes
	Spending and employment	yes	yes	yes	yes	yes	yes	yes
	Visual	no	no	yes	no	no	no	yes
Agriculture	Loss of productive land on Site	no	no	no	no	no	no	no
	Atmosphere, surface water and groundwater impacts off-Site	yes	no	yes	no	yes	yes	yes
Traffic	Increased traffic	yes	yes	yes	yes	yes	no	yes

13.3 Analysis of Effects

Overlaps in terms of type of effect between the residual effects of the CRRRC and the potential residual effects of the other existing and future activities in the vicinity of the Site were identified in Table 13.2.5-1.

Residual effects of the CRRRC that may also interact in space and time with other activities are summarized in Table 13.3-1. Comments on the overlap are also included.

Table 13.3-1: Interactions Matrix – Effects that May Overlap in Time and Space

CRRRC Residual Effect	Activity that may Interact with CRRRC Residual Effect in Time and Space	Comments
Odour	▪ Farming operations ▪ Pomerleau Ltd.	CRRRC will have best management practice odour control designed to ensure that off-Site receptors do not experience adverse impacts. The potential for residual odours from the CRRRC to interact with those from farming operations in the Site-vicinity to create cumulative adverse odour impacts at these receptors is judged to be negligible.
Dust emissions	▪ Wood splitting facility ▪ Pomerleau Ltd. ▪ Additional small commercial/industrial operations ▪ Farming operations ▪ Tractor/Trailer de-coupling proposal	Best management practices including paving of the northern Site roads will be implemented to minimize off-Site dust from the CRRRC. While dust from some of the activities in the Site vicinity is likely to interact cumulatively with dust from the CRRRC, no basis has been identified to conclude that such cumulative impacts are likely to result in exceedances of applicable regulatory standards.
Air quality	▪ Farming operations ▪ Tractor/Trailer de-coupling proposal	Air quality from the CRRRC will be controlled and mitigated to meet MOECC standards at the property boundary. Any overlapping air quality impacts from farming operations or the tractor/trailer proposal is unlikely to give rise to any exceedances of applicable regulatory standards.
Noise emissions	▪ Wood splitting facility ▪ Pomerleau Ltd. ▪ Shingles storage and transfer building ▪ Additional small commercial/industrial operations ▪ Farming operations ▪ Tractor/Trailer de-coupling proposal	Noise from the CRRRC is generally below existing background levels due to the presence of Highway 417. The cumulative noise impacts are likely to still be dominated by background noise from the highway.
Groundwater quality impacts	No projects/activities overlap in this type of effect with the CRRRC, therefore no cumulative effect.	

CRRRC Residual Effect	Activity that may Interact with CRRRC Residual Effect in Time and Space	Comments
Groundwater quantity impacts	No projects/activities overlap in this type of effect with the CRRRC, therefore no cumulative effect.	
Surface water quality impacts	▪ Pomerleau Ltd. ▪ Additional small commercial/industrial operations ▪ Farming operations	Special attention required given elevated concentrations of certain parameters in surface water in the Site-vicinity.
Surface water quantity impacts	No projects/activities to overlap this type of effect with the CRRRC, therefore no cumulative effect	
Aquatic biological resources	▪ Pomerleau Ltd. ▪ Additional small commercial/industrial operations ▪ Farming operations	See surface water quality residual effect above.
Terrestrial biological resources	▪ Pomerleau Ltd. ▪ Additional small commercial/industrial operations ▪ Farming operations ▪ Tractor/Trailer de-coupling proposal	Little potential for the effects of the CRRRC on on-Site terrestrial resources to interact cumulatively with the noted off-Site activities and projects in any biologically meaningful way.
Land Use (atmosphere, groundwater and surface water impacts)	▪ Wood splitting facility ▪ Pomerleau Ltd. ▪ Additional small commercial/industrial operations ▪ Shingle storage and transfer facility ▪ Farming operations ▪ Tractor/Trailer de-coupling proposal	See odour, dust, air quality, noise, groundwater and surface water residual effects above.
Spending and employment	▪ Wood splitting facility ▪ Shingle storage and transfer building ▪ Pomerleau Ltd. ▪ Gas bar ▪ Additional small commercial/industrial operations ▪ Farming operations ▪ Tractor/Trailer de-coupling proposal	The services provided by the CRRRC are not the same as the off-Site activities. Spending may increase at some of the off-Site businesses due to increased exposure to potential customers.
Visual	▪ Pomerleau Ltd ▪ Tractor/Trailer de-coupling proposal	CRRRC will be generally well-screened. Whatever is visible of the CRRRC from off-Site vantage points will generally not be in the same field of vision as Pomerleau or the tractor/trailer de-coupling facility other than on an intermittent basis.

CRRRC Residual Effect	Activity that may Interact with CRRRC Residual Effect in Time and Space	Comments
Loss of productive agricultural land on Site	No projects/activities overlap in this type of effect with CRRRC, therefore no cumulative effect.	
Impacts on off-Site agriculture usage (atmosphere, surface water and groundwater impacts)	▪ Wood splitting facility ▪ Pomerleau Ltd. ▪ Additional small commercial/industrial operations ▪ Farming operations ▪ Tractor/Trailer de-coupling proposal	See odour, dust, air quality, noise, groundwater and surface water residual effects above.
Increased traffic	▪ Wood splitting facility ▪ Shingle storage and transfer building ▪ Pomerleau Ltd. ▪ Additional small commercial/industrial operations ▪ Gas bar ▪ Tractor/Trailer de-coupling proposal	Traffic impacts from these existing uses were considered in the traffic analysis for the CRRRC. Traffic from the proposed tractor/trailer de-coupling proposal will exit Highway 417 at Boundary Road and therefore the potential for such traffic to interact cumulatively and adversely with traffic from the CRRRC and the other existing uses at this location will be somewhat minimized. It is possible nonetheless that, should the de-coupling proposal proceed, there will be cumulative adverse traffic impacts that will require additional traffic management measures, such as lights, turn lanes or other road modifications.

13.4 Evaluation of Significance

To assess the significance of cumulative effects requires, among other things, consideration of whether further effects can be sustained by a component without irreversible effects (CEA Agency, 1999). The significance of any residual cumulative effects was determined taking into account the probable magnitude, frequency and reversibility of the residual (non-zero) effects of the CRRRC in combination with the residual (non-zero) effects of the identified existing and future activities in the Site-vicinity.

Using the information presented in the preceding sections regarding the proposed CRRRC Site and the potential interaction with other existing and known planned projects in the area, the significance assessment for the CRRRC cumulative effects analysis is provided below.

In general, there is little indication of baseline environmental quality concerns or existing cumulative environmental impacts on the Site or in the Site-vicinity arising from past/present activities and projects. Air quality appears to be typical of the Ottawa urban environment and there is no evidence of measurable adverse cumulative air quality impacts associated with current activities in the Site-vicinity. Noise levels are typical of a Class 1 area and are dominated by road noise from Highway 417 and Boundary Road. Aquatic and terrestrial biological resources do not exhibit indicators of adverse cumulative impacts in the Site-vicinity, other than benthic organisms associated with surface water quality as discussed below. There are no obvious existing social, agricultural or traffic issues that could be attributed to the cumulative impact of past and present activities and projects on and in the vicinity of the Site.

However, background surface water quality in municipal drains and watercourses on Site and in the Site-vicinity regularly exceeds PWQO for iron and phosphorus, and dissolved oxygen levels are regularly lower than the PWQO. The exact source or sources of these elevated parameters is unclear, although the elevated phosphorus levels are likely due to agricultural land use in the general area; agricultural land use and other activities may also be the cause of the lower dissolved oxygen levels. Elevated concentrations of such parameters in local surface water features are common in the Ottawa urban/rural environment.

Except as discussed below, the probable residual effects of the CRRRC that have the potential to overlap in time and space with the residual effects of the other identified activities and projects described above are expected to be generally negligible and in any event less than significant. The effects are not expected to result in any substantial alteration of existing baseline conditions, nor are they expected to result in an exceedance of applicable regulatory standards to the extent that they interact cumulatively. Any effects that do interact cumulatively will be of low significance from an environmental perspective as they are likely to be of low magnitude, intermittent in frequency at most and reversible after the activity(ies) ceases.

The only areas of potential cumulative impact significance are surface water quality, given the elevated existing concentrations of some parameters in surface water, and traffic, given the tractor/trailer de-coupling proposal.

To the extent the elevated parameters in existing surface water on-Site and in the Site-vicinity are not the result of naturally occurring conditions, they are the result of past or present activities in the Site-vicinity and possibly beyond. Special care will therefore be taken to monitor surface water quality leaving the CRRRC with respect to these parameters to ensure that surface water quality downgradient of the Site is not further degraded for these parameters. The proposed CRRRC surface water management plan incorporates a number of features to ensure surface water leaving the Site meets regulatory requirements and that iron and phosphorus concentrations and dissolved oxygen impacts are minimized, such as separation of leachate from stormwater, carrying out recycling operations involving metal inside buildings and ensuring that the composting operations have a dedicated collection pond not connected to an outlet to surface water. The SWM plan also includes contingency measures based on ongoing monitoring results, as described in the Volume IV D&O Report. No need for additional surface water mitigation measures has been identified as a result of this CIA.

With respect to traffic, there is some uncertainty about the number of tractor-trailers that may utilize the proposed de-coupling facility and the long-term traffic impacts they may present at the Boundary Road/ Highway 417 interchange. This will presumably be considered by the City when assessing this proposal and any required near or longer term road improvements. No need for additional traffic mitigation measures beyond the left turn lane and road improvements already proposed for the CRRRC access off Boundary Road have been identified as a result of this CIA.

14.0 MONITORING AND CONTINGENCY

14.1 Effects Monitoring

An effective monitoring program provides results to: indicate whether the facility is working as expected and that the assumptions used in the assessment were correct; assess on an ongoing basis whether mitigation measures as designed and operated are effective; and identify unforeseen problems so they can be addressed in a timely manner. The proposed effects monitoring program for the CRRRC is summarized here and details are provided in the D&O Report, Volume IV. The monitoring program will be a separate appendix of the EPA application submission.

Effects monitoring programs are presented in relation to the environmental components used in the assessment. For the CRRRC, the conceptual effects monitoring programs are described below. The final details (i.e., frequency of monitoring, monitoring parameters, possible changes over time depending on the results of the specific monitoring program, etc.) of effects monitoring for the Atmosphere, Hydrogeology/Geotechnical, Surface Water and Biology components will be determined in consultation with the MOECC and incorporated in the ECA for the CRRRC.

14.1.1 Atmosphere

14.1.1.1 Noise

Taggart Miller proposes to initially monitor noise levels once per year during operations. The noise monitors will log acoustic data every hour for the duration of the monitoring period. If possible, monitoring will be carried out at or near POR02 and POR03, as defined in Section 8.4.1 and shown on Figure 8.4.1-1. The noise monitoring program may not be required on an on-going basis if the results are as predicted over the first few years of operation. Modifications to the noise monitoring program would be determined in consultation with the MOECC.

14.1.1.2 Air Quality & Odour

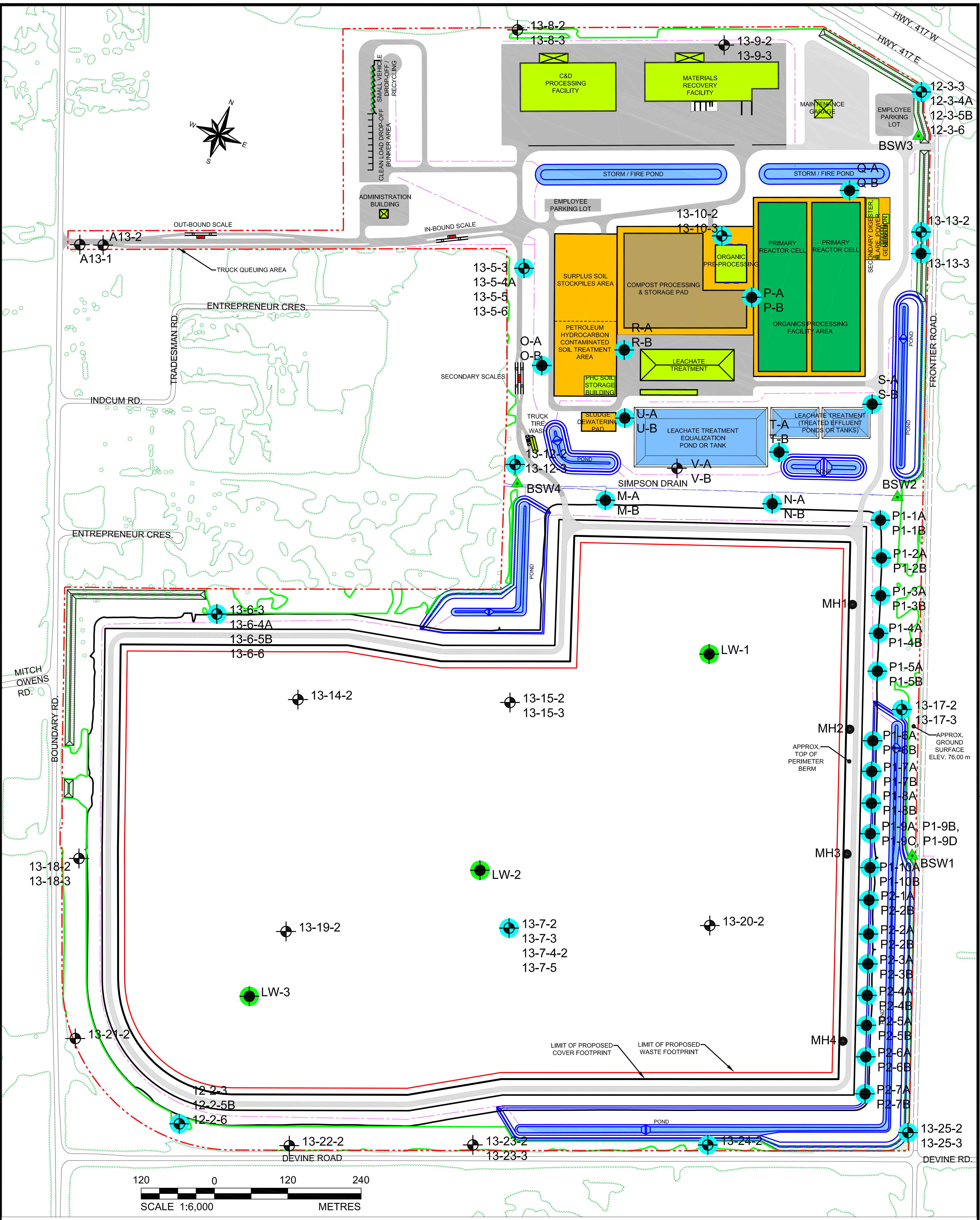
Taggart Miller proposes to complete annual property line dust monitoring after operational start up during the summer season for two summer seasons.

14.1.2 Geology, Hydrogeology & Geotechnical

14.1.2.1 Groundwater and Leachate

The proposed groundwater monitoring program for the Site has been split into the monitoring program for the processing and treatment facilities north of the Simpson Drain and a monitoring program for the landfill south of the Simpson Drain. The proposed groundwater monitoring program includes maintaining some of the existing groundwater monitoring wells that were used to assess the existing conditions and adding some additional monitoring well locations to fill in any gaps in the groundwater monitoring program, including sentinel groundwater monitoring wells located at the exterior perimeter berm toe of slope on the east side of the landfill. The existing and proposed groundwater monitoring locations are shown on Figure 14.1.2-1. In addition to on-Site groundwater monitoring wells, water wells within 500 metres of the Site will be sampled, with consent from the owner, one time prior to operations starting at the facility.

PLOT DATE: November 4, 2014
FILENAME: N:\Active\Spatial_IM\Miller_Paving_Ltd\CRRRC\ACAD\Vol 1 (Report Figures)\EA report\1211250045-V1-EAr-14.1.2-1.dwg



LEGEND

🟩 PROPOSED FACILITY BUILDING

🟧 OUTDOOR DIVERSION AREA

▬ PAVED ROAD (ASPHALT)

▬ GRAVEL ROAD

- · - PROPERTY BOUNDARY

▭ EXISTING VEGETATION SCREENING

▨ CONSTRUCTED SCREENING FEATURE

— PERIMETER BERM CONTOURS (interval 1 m)

▭ STORMWATER MANAGEMENT PONDS

⊕ EXISTING GROUNDWATER MONITORING WELL (SAMPLING PROGRAM)

⊕ EXISTING GROUNDWATER MONITORING WELL (WATER LEVELS ONLY)

⊕ PROPOSED GROUNDWATER MONITORING WELL

▲ SURFACE WATER SAMPLING STATION

⊕ PROPOSED LEACHATE MONITORING WELL

● LEACHATE DETECTION AND SECONDARY CONTAINMENT SYSTEM MANHOLE

NOTE:
THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT.

Golder Associates
Ottawa, Ontario, Canada

SCALE	AS SHOWN
DATE	7 Nov. 2013
DESIGN	M.L.F.
CAD	M.L.F.
CHECK	P.L.E.
REVIEW	P.A.S.

FILE No. 1211250045-V1-EAr-14.1.2-1.dwg
PROJECT No. 12-1125-0045 REV.

TITLE

PROPOSED GROUNDWATER AND SURFACE WATER MONITORING LOCATIONS

ENVIRONMENTAL ASSESSMENT OF THE
CAPITAL REGION RESOURCE RECOVERY CENTRE

FIGURE
14.1.2-1

Leachate sampling is proposed at the connection to the leachate pre-treatment facility and from three monitoring wells that will be completed within the leachate collection system drainage blanket. Leachate levels will be measured during each leachate sampling event in each leachate sump and leachate monitoring wells in the landfill (as they are constructed in conjunction with the landfill development phasing plan). The leachate monitoring well locations are shown on Figure 14.1.2-1.

The groundwater and leachate monitoring will occur three times per year (except as noted below), commencing the year prior to the start of operations, in the spring, summer and fall using the comprehensive list of parameters one time (plus hardness and a full VOC scan, including 1,4-dioxane) and the reduced list (plus manganese, TKN, potassium and hardness) the other two times as outlined in O. Reg. 232/98 (MOE, 1998a). Sentinel groundwater monitoring wells will be sampled in the spring and fall only. Water levels in the LDSCS manholes will be checked quarterly; this information will used to gain an understanding of the rate of groundwater inflow to the system.

14.1.2.2 Geotechnical

It is proposed that a geotechnical monitoring program be implemented for the purposes of:

- Confirming that the performance/behaviour of the underlying foundation soils is consistent with those expected based on the geotechnical investigation program and analyses, to thereby confirm the applicability of the design recommendations provided; and
- Providing the information needed to optimize the design and/or operation of the landfill, as construction and filling progress.

The following monitoring components are recommended:

- Subgrade settlement monitoring;
- Unit weight of the as-placed waste; and
- Lateral displacements of the silty clay beneath the perimeter berm of the landfill should be monitored by means of inclinometers and surface survey point/monuments.

It is also proposed that the rate of porewater pressure dissipation in the underlying clay be monitored by means of vibrating wire piezometers installed at the time of landfill cell construction at various depths in the upper portion of the silty clay deposit.

14.1.3 Surface Water

Run-off from completed Site areas flows to SWM ponds and from there is directed to on-Site ditches or the Simpson Drain. There are three discharge points from the Site at the eastern property boundary. The surface water sampling stations are located at each of these discharge points as well as from the Simpson Drain as it enters the Site at the western property boundary. The sampling locations are shown on Figure 14.1.2-1. Surface water monitoring will include an estimate of flow, where appropriate, and the collection and analysis of surface water samples. The frequency of sampling is proposed to coincide with the groundwater monitoring program in the spring, summer and fall, with an additional sampling session to occur after a heavy rainfall event. Collected samples will be analyzed for the comprehensive list of parameters one time and the reduced list on the other two times as outlined in O. Reg. 232/98 (MOE, 1998a). Surface water monitoring will begin in 2014 to supplement baseline data. Monitoring locations BSW10 and BSW11 will be removed from the program once the landfill becomes operational.

14.1.4 Biology

Alteration of the surface water regime has the potential to affect streamflow in downstream sections of aquatic systems associated with watercourses and ditches within the Site. Changes in flow downstream could affect fish habitat by reducing the amount of habitat, increasing the deposition of fines in habitats and decreasing the amount of in-stream vegetation for cover.

Although it is expected that these changes in flow will be minimal and not ecologically important, a surface water monitoring program as outlined in Section 14.1.3 will be implemented post-development.

Benthic invertebrate community samples will be collected on a bi-annual basis during operations. To be able to compare the monitoring results to the baseline data, the samples will be collected and analysed in the same manner and the descriptors of the benthic invertebrate community will include taxa presence/absence, taxa richness and percent dominance at each sampling station. Because benthic invertebrates live their entire aquatic lives on, or in, the sediments, they tend to be relatively sensitive to changes in the sediments such as contaminant loadings. This sensitivity can result in changes in community composition, abundance and tropic structure over time. These community changes can represent long-term trends in water quality. The need for continued monitoring during the post-closure period would be evaluated during the development of the detailed closure plan. Sediment samples at the same survey stations will also be collected and analysed. Benthic and sediment monitoring is recommended at sampling stations B5, B6, B8, B9 and downstream of B5 and B7 as shown on Figure 8.7-1.

Monitoring for barn swallow, following the creation of the new habitat, will be conducted for a period of three years and a mitigation and restoration record will be maintained for an additional two years, following the requirements of O. Reg. 323/13 (MNR, 2013b).

As part of the closure plan, a rehabilitation plan will be developed and implemented to re-establish vegetation communities in the project footprint, subject to determination of the final end use plan for the Site. A mix of native species should be planted in order to establish a natural, native community post-closure. The vegetation cover will be surveyed to monitor its success. If there are deficiencies, such as weed encroachment, dead plants or evidence of erosion, the area will be supplemented with additional plantings of the most successful species.

14.1.5 Land Use & Socio-economic

A communication plan, including a Community Liaison Committee, as well as telephone number and email address to communicate directly with CRRRC personnel, will be developed to provide various means to allow and encourage residents and businesses in the Site-vicinity to communicate with CRRRC personnel and to report any concerns, and to ask questions related to air quality and odour, noise and traffic.

14.1.6 Cultural Heritage & Archaeology

No monitoring proposed.

14.1.7 Agriculture

As noted above, a communication plan, including a Community Liaison Committee, as well as telephone number and email address to communicate directly with CRRRC personnel, will be developed to provide various means to allow and encourage farmers in the Site-vicinity to communicate with CRRRC personnel and to report any concerns, and to ask questions related to air quality and odour, noise and traffic.

14.1.8 Traffic

No monitoring proposed.

14.1.9 Facilities Monitoring

For optimal operations of the various diversion and landfill related facilities, on-going monitoring of equipment performance will be required. This would include monitoring of the organics processing facility, compost processing, LFG system, leachate pre-treatment facility and PHC contaminated soil treatment facility. The details will be established in the ECA issued by the MOECC for these components of the CRRRC.

14.2 Contingency Plans

In the event that the monitoring programs detect unexpected problems or show that assumptions used in the assessment are incorrect, it may be necessary to implement contingency measures to further reduce the potential for any adverse environmental effects associated with the CRRRC. The proposed contingency measures are described below. Further details on these conceptual contingency measures are provided in Section 8.0 of the D&O Report, Volume IV,.

14.2.1 Groundwater

In the event that the leachate collection system beneath the landfill component has failed and monitoring results suggest leachate is getting into the groundwater system on-Site, the following contingency measures could be implemented. The intercepted leachate-impacted groundwater collected in the LDSCS could be pumped for treatment and act as the secondary containment system for the landfill. At this time, additional groundwater monitoring wells could also be installed between the sentinel monitoring wells (P1 series and P2 series) and the property boundary. Additionally, or alternatively, a series of purge wells through the cover of the landfill and into the granular blanket of the leachate collection system could be installed and leachate removed by pumping to leachate treatment. Typically, this type of a contingency is triggered by premature failure of the leachate collection system, such that a mound is formed within the landfill. The benefit of having purge wells installed into the leachate collection system is that leachate is contained within the landfill and collected prior to getting diluted with non-leachate-impacted groundwater. Details regarding purge well installation, such as the number and spacing, would be determined in consultation with the MOECC based on the area and level of leachate mound control required.

If, despite the presence of the LDSCS it is necessary to cut off flow through any or all of the perimeter berm, surficial silty sand layer or silty layer, would be to install a low permeability cut-off barrier inside the Site boundary. Options available for the barrier include a soil-bentonite wall constructed using the slurry trench method or an interlocking sheet pile wall (steel or PVC sheet piling). This would contain the leachate/groundwater on-Site, which would then continue to be removed from the leachate collection system.

MOECC approval to implement any of the above contingency measures would be obtained.

In the event that the liner systems associated with ponds in the leachate pre-treatment facility and primary reactor cells in the organics processing facility are compromised, materials would be removed and the liner repaired or replaced.

14.2.2 Surface Water

In the event that leachate-impacted water was to reach either SWM ponds or ditches, the source of the impact would be determined and then intercepted, as required. If necessary, the affected pond and/or ditches could then be emptied through a temporary pumping operation and the pumped water could be combined with the leachate and directed to the leachate pre-treatment facility.

14.2.3 Leachate Treatment Facility

Table 14.2.3-1 provides a summary of operational conditions that may be encountered at the on-Site leachate pre-treatment facility and contingency and/or maintenance options that could be undertaken.

Table 14.2.3-1: Leachate Pre-Treatment Facility Contingencies

Operational Condition	Contingency Options
Higher Flows than Design	Treatment process can be operated at up to 1,200 cubic metres per day with minimal effect on effluent quality.
Lower Flows than Design	Treatment process can be operated with fewer leachate digestion tanks operating to reduce flows. Alternatively, leachate digestion tanks and mixed liquor holding tanks can be operated at approximately 25% of their design flow without affecting system performance.
Higher metals loading or toxic constituents than assumed	Provision within the treatment building will be made to direct raw leachate from the initial equalization tank to a chemical mixing tank and clarifier before flowing through the biological treatment processes to remove excess metals.
Disruption to hauling treated liquid effluent	During normal operations, the effluent storage pond will be kept at a minimum volume so that in the event of a disruption to the hauled effluent program, the operator has approximately two weeks of storage at the design flows to fix the issue. If the operator chooses, the flow rate through the treatment system can be temporarily reduced and leachate stored in the leachate storage pond in order to gain greater than two weeks storage in the effluent storage pond. Pumping from the leachate collection system beneath the landfill can be temporarily reduced or suspended.

14.2.4 Landfill Gas (LFG) Collection System

14.2.4.1 LFG Odours or Insufficient Quantity of Collected LFG

If required to control odours or to augment the quantity of collected LFG recovered, vertical LFG extraction wells could be installed following the completion of individual landfill phases. Vertical LFG extraction wells could be located in individual phases already completed to final contours, specifically in areas of thicker waste and where horizontal collectors may have become blocked due to settlement. Vertical LFG extraction wells should be equipped with a wellhead to allow for the monitoring of LFG quality and pressure, measurement of LFG flow rates, and a valve to facilitate the regulation and balancing of LFG flow. Each vertical LFG extraction well would be connected to the LFG header pipe via lateral piping.

14.2.4.2 Unexpected LFG System Component Failure

In the event of the failure of a component that is connected to the programmable logic controller (e.g., LFG analyzer), the LFG system will automatically shut down and send an alarm via the autodialler.

A supply of typical spare parts will be maintained on-Site to allow for the timely replacement of failed components and to minimize down-time of the LFG collection system.

15.0 SUMMARY OF COMMITMENTS

Compliance monitoring of the CRRRC will be undertaken to confirm that it has been constructed, implemented and/or operated in accordance with the commitments made during the preparation of the EA and the conditions of the EAA. This section lists the commitments made by Taggart Miller during the TOR (Table 15-1) and during the EA study process (Table 15-2). The EA study commitments include the in-design mitigation measures and best management practices described in Section 11.1 of the EASR. This list does not include items that will be legally required according to existing provincial regulation, such as O. Reg. 232/98 (MOE, 1998a).

Table 15-1: List of Commitments made by Taggart Miller during Development of the TOR

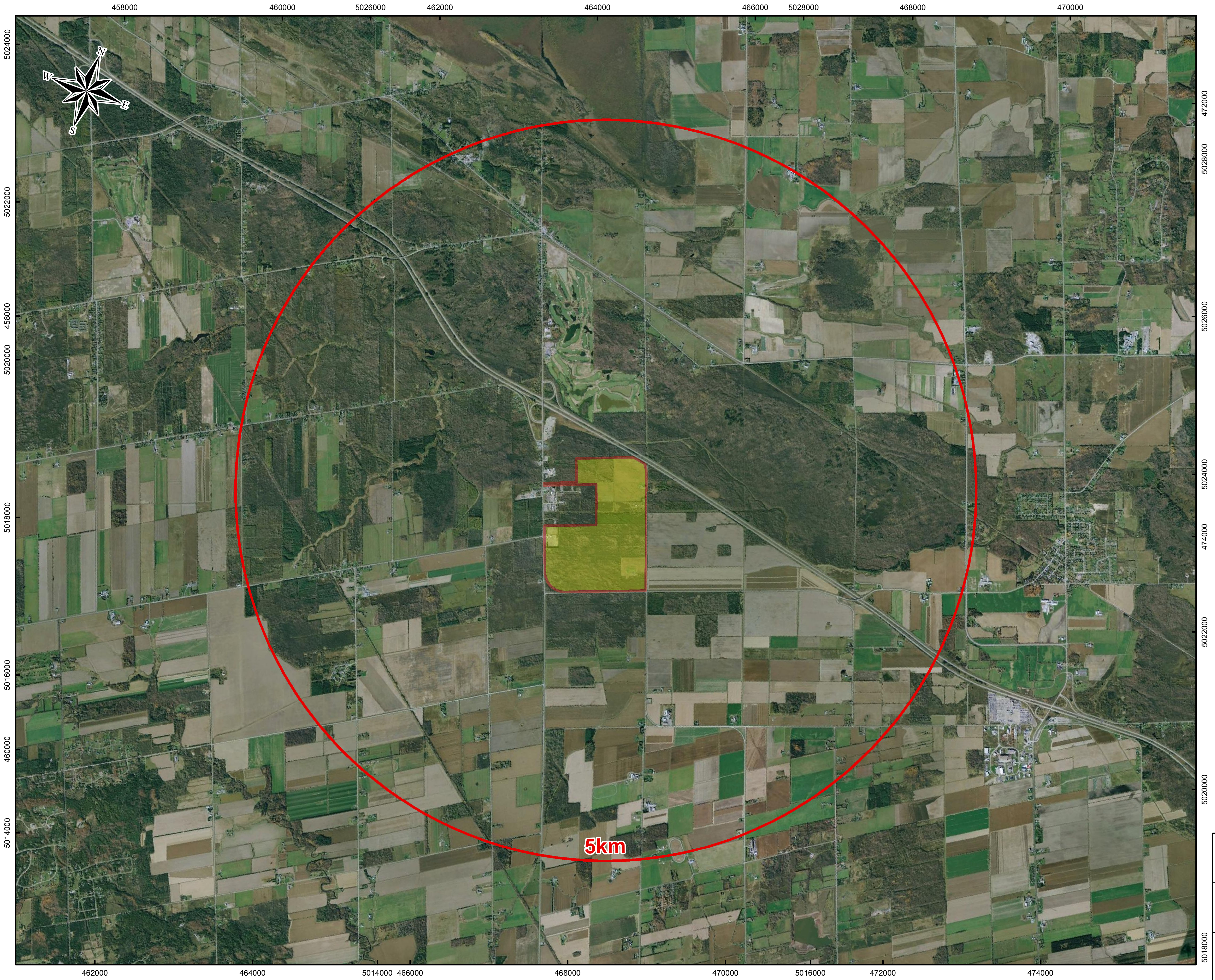
ID	Commitment *(Location of Where Commitment was Made)*	Status
A	▪ For the proposed CRRRC project, Taggart Miller is proposing to provide a Property Value Protection Plan (PVPP) to property owners within a certain distance from the property and to engage the community to develop the details of the plan during the EA process. *(Section 12.1 in the TOR)*	<u>Ongoing</u> Taggart Miller presented information about PVPP at Open House #4 on June 5, 2013. A map showing a 5 kilometre radius was presented and Taggart Miller solicited comments on PVPP. At that time no comments on PVPP were received in writing. Open House #4 is described in the Consultation Record (Volume II). Taggart Miller circulated a fall newsletter on October 31, 2013 that described a possible 5 kilometre radius for the PVPP. At that time only one individual wrote in to determine if their property would be eligible. The details are provided in the Consultation Record (Volume II). Taggart Miller is proposing a PVPP with the following conceptual elements, the details of which may be refined through discussion with the proposed community liaison committee (CLC): ▪ A zone of 5 kilometre around the Boundary Road Site (as suggested by the City of Ottawa for other waste management sites in the City) as shown on Figure 15-1; ▪ Only residential properties within the 5 kilometre zone owned or optioned on or before January 1, 2013 are eligible for PVPP and only on a one time basis; ▪ The program will be available from the time the CRRRC receives all necessary approvals to proceed until closure of the landfill component of the CRRRC; ▪ The PVPP is intended to provide assurance to residential owners in the 5 kilometre zone that they will be able to receive the fair market value of his or her land as though the CRRRC did not exist;

ID	**Commitment** ***(Location of Where Commitment was Made)***	**Status**
		Prior to listing the property, the owner would notify Taggart Miller that the sale will be pursuant to the PVPP and enter into an agreement with Taggart Miller; ▪ Taggart Miller would retain a qualified appraiser to estimate the value of the property as if the CRRRC does not exist; ▪ If the owner does not accept the appraisal, they would retain a qualified appraiser (cost to be split with Taggart Miller) to estimate the value of the property as if the CRRRC does not exist; ▪ If the difference between the two appraised values is less than 10%, the two values would be averaged to establish a value for the purposes of the PVPP; ▪ If the difference between the two values is more than 10%, the two appraisers would choose a third appraiser whose appraisal would be final and binding for the purposes of the PVPP; ▪ Following the establishment of the appraised value, the owner would list the property at the appraised value; ▪ Taggart Miller would top up the purchase price of the property to the PVPP appraised value in the event of a bona fide arm’s length sale at less than that value; ▪ If the proposed sale is for less than 90% of the PVPP appraised value, TM would have the option to purchase the property itself rather than topping up the sale price; and ▪ The PVPP would not apply to subsequent purchasers of the land.
B	▪ There may also be other components of an overall community benefits plan to be determined through discussion with the local community during the EA process. *(Section 12.1 in the TOR)*	Refer to Table 15-2, Commitment 71.
C	▪ Taggart Miller commit to provide facilities and capacity for recovery of resources and diversion of materials from disposal for wastes that are generated by the IC&I and C&D sectors upon opening of the operation of the CRRRC. Both the diversion and disposal components will be implemented at a scale appropriate for the level of business that might	<u>Ongoing.</u> During the EA, the details regarding the design and operation of the diversion facilities have been developed in more detail, including anticipated diversion rates of each facility and the overall facility as described in Section 9.0 of this EASR. Further details on the facilities themselves and their operations can be found in Section 10.0 of this EASR

ID	**Commitment** ***(Location of Where Commitment was Made)***	**Status**
	reasonably be expected during the initial period of Site operation. The facilities will be scalable and their capacity will be increased over time in order to respond efficiently to changing market conditions and to any new government regulations mandating increased IC&I diversion. *(Section 12.1 in the TOR)*	and in the D&O Report (Volume IV). The actual implementation will occur after all required approvals are in place.
D	▪ Taggart Miller will carry out a cumulative effects assessment as a component of the EA. *(Section 12.1 in the TOR)*	Completed. The cumulative effects assessment is described in Section 13.0 of this EASR.
E	▪ The draft EA will be made available for public review and comment before the final EA is submitted. A 7 week comment period is contemplated. *(Section 12.1 in the TOR and letter from Taggart Miller to MOECC dated November 16, 2012)*	Completed The draft EA was made available for review and comment for a seven week comment period prior to preparation of the final EA for submission.
F	▪ If the Boundary Road Site is identified as preferred, Taggart Miller will continue to interact with local community associations. *(Section 9.3 in the TOR)*	Ongoing.
G	▪ All public consultation sessions will be hosted in both English and French. *(Section 9.3 in the TOR and Notice of Approval)*	Completed. The Open Houses and workshop conducted as part of this EA and the website and distributed material were provided in English and French.
H	▪ Special workshops will be held based on interest indicated from stakeholders. *(Section 9.3 in the TOR, Notice of Approval and letter from Taggart Miller to MOECC dated November 16, 2012)*	Completed. Based on feedback from stakeholders, a workshop on groundwater associated with the Boundary Road Site was held during this EA.
I	▪ Open House #3 will be presented to both communities where the two sites being considered are located. *(Section 9.3 in the TOR, Notice of Approval and letter from Taggart Miller to MOECC dated November 16, 2012)*	Completed. Open House #3 was presented in two sessions, one in Russell and one in Carlsbad Springs.

ID	**Commitment** ***(Location of Where Commitment was Made)***	**Status**
J	- Taggart Miller will provide draft materials at key EA milestones on the CRRRC website. *(Section 9.3 in the TOR)*	<u>Completed.</u> All Open House and workshop material was provided on the project website in a timely manner. In addition, a report describing the reasons for selection of the Boundary Road Site as preferred was posted on the website for information and comment (none received). Further, the completed draft EASR submission package was posted on the website when made available for public review.
K	- Following approval of TOR Taggart Miller will contact the identified Aboriginal communities and invite discussions on the work plans and EA process to ensure that Aboriginal community concerns and input are received and incorporated. *(Section 9.3.1 in the TOR)*	<u>Completed.</u> All of the Aboriginal groups with a potential interest in the project were requested during the Terms of Reference approval process to indicate to the MOECC whether they wished to be involved in the preparation of the EA. To our knowledge none of these groups other than the AOO indicated such an interest. Notwithstanding, Taggart Miller has continued to advise each group identified during the TOR of planned Open Houses and the workshop related to the EA and the review of the draft EA, and of our willingness to organize a separate information session or smaller discussion group on the subjects covered in the Open House/workshop/draft EA such as work plans and the EA process. These notifications have occurred by phone followed by an e-mail for each Open House, workshop and distribution of the draft EA. Only the Mohawk Council of Akwesasne requested a meeting following any of these points of contact. Discussions that have occurred with Aboriginal communities are summarized below in chronological order. In February 2013, the Chief of the Algonquins of Ottawa attended Open House #3 during the EA, reviewed the information presented and indicated that he did not see a concern with the project. A meeting was organized with representatives of the Algonquins of Ontario (AOO) in April of 2013 to provide an update on the project and the EA and answer questions. The AOO indicated that it had no concerns with the project proceeding at the conclusion of that meeting. During a subsequent project update meeting in October 2013 with the AOO, a one page overview of the project was requested and subsequently provided to

ID	**Commitment** ***(Location of Where Commitment was Made)***	**Status**
		the AOO for use in their internal consultations. In July 2014 the consulting team and a Taggart Miller representative met with representatives of the Mohawk Council of Akwesasne at the request of the Council following receipt of the draft EA. A brief presentation was provided outlining the proponent, the project and its evolution, presenting the layout and structure of the Draft Environmental Study Report, reviewing some results of the environmental assessment and summarizing aboriginal outreach to date.
L	▪ Taggart Miller commit to develop a conceptual monitoring framework during preparation of the EA including compliance monitoring and effects monitoring. *(Section 12.2 in the TOR)*	<u>Completed.</u> Conceptual compliance and effects monitoring has been described in Sections 14.0 and 15.0 of the EA.
M	▪ Taggart Miller will refine the purpose statement, if required, during the EA *(Section 3.0 of the TOR and letter from Taggart Miller to MOECC dated November 16, 2012)*	<u>Completed.</u> Described in Section 1.6 of the EA.
N	▪ Taggart Miller will provide the draft and final main environmental assessment report in both French and English *(Section 9.3 of the TOR and Letter from Taggart Miller to MOECC dated November 16, 2012)*	<u>Completed.</u> The draft main EA has been made available in both French and English. The final main EA has also been prepared in both French and English.
O	▪ Taggart Miller commit to assess potential effects on the Mer Bleue and include the findings in the EA report, if the Boundary Road Site is selected as preferred *(Section 8.3.3 of the TOR and Letter from Taggart Miller to MOECC dated November 16, 2012)*	<u>Completed.</u> Assessment details can be found in Sections 11.5.3 and 11.6.1.



Path: N:\Active\Spatial_IM\Miller_Paving_Ltd\CRRRC\GIS\MXDs\12-1125-0045\Reporting\Phase4000\Vol.1\12112500045-4000-Vol1-15-1.mxd

LEGEND

🟨 PROPERTY BOUNDARY

🟥 5 Km BUFFER FROM PROPERTY BOUNDARY

NOTE

THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT

REFERENCE

BACKGROUND IMAGERY SAVED FROM GOOGLE EARTH PRO CORPORATION AND ITS DATA SUPPLIERS.
AERIAL PHOTOGRAPHS PURCHASED FROM THE CITY OF OTTAWA.
LAND INFORMATION ONTARIO (LIO) DATA PRODUCED BY GOLDER ASSOCIATES LTD. UNDER LICENCE FROM ONTARIO MINISTRY OF NATURAL RESOURCES, © QUEENS PRINTER 2012.
PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83
COORDINATE SYSTEM: UTM ZONE 18

1,400 700 0 1,400

SCALE 1:50,000 METRES

PROJECT

ENVIRONMENTAL ASSESSMENT OF THE
CAPITAL REGION RESOURCE RECOVERY CENTRE

TITLE

PROPERTY VALUE PROTECTION AREA

Golder Associates
Ottawa, Ontario

PROJECT No. 12-1125-0045		
DESIGN	FN	DEC. 2013
GIS	BR/PM	DEC. 2013
CHECK	PLE	AUG. 2014
REVIEW	PAS	AUG. 2014

SCALE AS SHOWN REV. 0.0

FIGURE 15-1

Table 15-2: List of Commitments made by Taggart Miller during the EA

Number	Environmental Component (if applicable)	Commitment *(Location of Where Commitment was Made in the EA Document Package)*	Project Phase
1	–	The Environmental Monitoring Plan will be a standalone document in the EPA Application. *(EASR – Section 14.1)*	Pre-construction
2	–	Implementation of all required Site effects monitoring and reporting programs. *(EASR – Section 14.0 and Volume IV – Section 7.0)*	Construction, operations and post-closure
3	Atmosphere	Maximize drive-through road patterns on-Site to minimize need for use of back-up alarms. *(EASR – Section 11.1 and TSD #2)*	Construction and operations
4		Paved roads in the northern part of the Site. *(EASR – Section 11.1 and TSD #3)*	Construction and operations
5		Berms to attenuate noise as required, i.e., from the active face of the landfill, entrance and on-Site haul roads, as required. *(EASR – Section 11.1 and TSD #2)*	Construction and operations
6		Truck waiting area inside the Site. *(EASR – Section 11.1, TSD #2 and TSD #3)*	Construction and operations
7		Maintain existing vegetation in buffer around Site perimeter or, where required construct perimeter screening berms with plantings on top. *(EASR – Section 11.1 and TSD #3)*	Construction and operations
8		Receiving of organics, and materials at the MRF and C&D processing facility, inside buildings. *(EASR – Section 11.1, TSD #2 and TSD #3)*	Operations
9		Biofilters on the exhaust of air from within the organics processing and PHC contaminated soil treatment facilities. *(EASR – Section 11.1 and TSD #3)*	Construction and operations
10		Dust collection system consisting of a bag house and cyclone on exhaust air from the MRF and C&D processing buildings. *(EASR – Section 11.1 and TSD #3)*	Construction and operations
11		Low permeability cover of organics primary reactor cells and PHC contaminated soil treatment cells. *(EASR – Section 11.1 and TSD #3)*	Operations
12		Flare for combustion of biogas captured from the organics processing and from the landfill. *(EASR – Section 11.1 and TSD #3)*	Operations
13		LFG collection system approach using horizontal collection from within the waste, installed during the filling period. *(EASR – Section 11.1 and TSD #3)*	Construction and operations
14		Truck tire wash for vehicles leaving the landfill area. *(EASR – Section 11.1 and TSD #3)*	Operations

Number	Environmental Component (if applicable)	**Commitment** ***(Location of Where Commitment was Made in the EA Document Package)***	Project Phase
15		Place compacted granular materials and, if required, surface sealing on regularly used Site construction roads. *(EASR – Section 11.1 and TSD #3)*	Construction and operations
16		Use of typical best management practices for dust suppression, (e.g., covering vehicle loads, use of water or other suppressants, etc.) *(EASR – Section 11.1 and TSD #3)*	Construction and operations
17		Use equipment that complies with appropriate emission standards. *(EASR – Section 11.1 and TSD #3)*	Construction and operations
18		Minimize idling of vehicles on-Site. *(EASR – Section 11.1 and TSD #3)*	Construction and operations
19		Restrict the use of heavy equipment to daytime hours as best possible. *(EASR – Section 11.1 and TSD #2)*	Construction and operations
20		Maintain vehicles and equipment, and ensure they have noise suppression equipment. *(EASR – Section 11.1 and TSD #2)*	Construction and operations
21		Control speed limit for traffic on-Site. *(EASR – Section 11.1 and TSD #2)*	Operations
22		Time the frequency of turning of compost piles to avoid development of anaerobic conditions. *(EASR – Section 11.1 and Volume IV)*	Operations
23		Introduction of oxygen into the anaerobically digested organics reactors to establish aerobic conditions prior to uncovering them. *(EASR – Section 11.1 and Volume IV)*	Operations
24		Manage the working face of the landfill effectively to minimize potential for odorous emissions. *(EASR – Section 11.1 and TSD #3)*	Operations
25		Apply appropriate daily cover on landfill. *(EASR – Section 11.1 and TSD #3)*	Operations
26		Minimize the area of uncovered waste. *(EASR – Section 11.1 and TSD #3)*	Operations
27		Placement of final cover progressively on completed portions of the landfill component. *(EASR – Section 11.1 and Volume IV)*	Operations
28		Provide for odour control measures for leachate holding and treated effluent ponds. *(EASR – Section 11.1 and TSD #3)*	Operations and post-closure

Number	Environmental Component (if applicable)	Commitment *(Location of Where Commitment was Made in the EA Document Package)*	Project Phase
29		Annually determine status of development applications on vacant land where sensitive land use could occur to assess requirement for noise mitigation. *(EASR – Section 11.10 and TSD #2)*	Operations
30	Geology and Hydrogeology (Groundwater)	Engineered leachate/liquid containment for the landfill, leachate ponds, and organics processing and PHC treatment cells. *(EASR – Section 11.1 and Volume III)*	Construction, operations and post-closure
31		Perimeter liner system cut-off for the landfill, together with leachate collection system and LDSCS. *(EASR – Section 11.1 and Volume III)*	Construction, operations and post-closure
32		Adequate buffer width between landfill component and property boundary. *(EASR – Section 11.1 and Volume III)*	Construction and operations
33		Provide construction quality control on all liner and collection system installations. *(EASR – Section 11.1 and Volume IV)*	Construction and operations
34		Provide monitoring and maintenance of leachate collection system and LDSCS components. *(EASR – Section 11.1 and Volume IV)*	Operations and post-closure
35		Inspect construction and operating equipment regularly and repair promptly if found to be leaking. *(EASR – Section 11.1 and Volume IV)*	Operations and post-closure
36		Geotechnical monitoring of landfill settlement. *(EASR – Section 11.1 and Volume III)*	Operations and post-closure
37	Surface Water	Design surface water management systems to separate leachate and liquids from processing from clean surface water runoff. *(EASR – Section 11.1 and Volume IV)*	Prior to operations
38		Divert clean runoff to swales, ditches and ponds. *(EASR – Section 11.1 and Volume IV)*	Construction and operations
39		Design ditch systems to convey design storm flows. *(EASR – Section 11.1 and Volume IV)*	Prior to operations
40		Control post-development discharge flows to match pre-development conditions as close as possible. *(EASR – Section 11.1 and Volume IV)*	Prior to and during operations
41		Enhanced sediment removal in SWM system design. *(EASR – Section 11.1 and Volume IV)*	Prior to and during operations
42		Sedimentation and erosion control measures. *(EASR – Section 11.1 and Volume IV)*	Construction, prior to and during operations

Number	Environmental Component (if applicable)	Commitment *(Location of Where Commitment was Made in the EA Document Package)*	Project Phase
43		Design and construct the component liners and leachate / liquid collection systems to safeguard surface water resources. *(EASR – Section 11.1 and Volume III)*	Prior to operations and construction
44		Implementation of a sediment and erosion control plan during construction and operations. *(EASR – Section 11.1 and Volume IV)*	Prior to operations, construction and operations
45		Re-vegetate final landfill cover. *(EASR – Section 11.1 and Volume IV)*	Operations and post-closure
46		Provide monitoring and maintenance of stormwater ponds; provide valve(s) on ponds, where necessary depending on ongoing water quality monitoring, to be able to batch-discharge water from the ponds. *(EASR – Section 11.1 and Volume IV)*	Operations and post-closure
47		Provide monitoring and maintenance of leachate/liquid collection systems. *(EASR – Section 11.1 and Volume IV)*	Operations and post-closure
48		Use best management practices for erosion control until vegetation cover is established. *(EASR – Section 11.1 and Volume IV)*	Construction, operations and post-closure
49		Manage surface water on-Site; control off-Site stormwater discharge. *(EASR – Section 11.1 and Volume IV)*	Operations and post-closure
50		Operate, store and maintain (e.g., re-fuel, lubricate) all equipment and associated materials in an area away from surface water features in a manner that minimizes the potential for the entry of any deleterious substance into water bodies. *(EASR – Section 11.1 and Volume IV)*	Operations
51		Inspect construction and operating equipment regularly and repair promptly if found to be leaking. *(EASR – Section 11.1 and Volume IV)*	Construction and operations
52		Develop a spill response plan. *(EASR – Section 11.1 and Volume IV)*	Prior to construction and operations
53		Develop a Sediment and Erosion Control Plan as part of the City of Ottawa Site Plan Approval Process, for the EPA application and in support of permit applications to the SNC. *(Volume II, Appendix K*)	Prior to construction

Number	Environmental Component (if applicable)	**Commitment** *(Location of Where Commitment was Made in the EA Document Package)*	Project Phase
54	Biology	Maintain existing perimeter vegetative buffers where possible. *(EASR – Section 11.1 and TSD #4)*	Prior to construction and operations
55		Remove vegetative cover progressively in sequence with Site development. *(EASR – Section 11.1 and TSD #4)*	Construction and operations
56		Stabilize and re-vegetate (or use other materials appropriate to Site conditions) areas of soil disturbed/exposed during construction. *(EASR – Section 11.1 and TSD #4)*	Construction, operations and post-closure
57		To the extent practical, limit the extent of disturbed areas and soil stockpiles, control their orientation (with respect to prevailing wind directions) and for piles to be left in place for a prolonged period of time seed to establish vegetation. *(EASR – Section 11.1 and TSD #4)*	Construction and operations
58		Schedule construction activities to minimize area and duration of soil exposure, to the extent practical. *(EASR – Section 11.1 and TSD #4)*	Construction and operations
59		Ongoing review of condition of revegetation and maintenance. *(EASR – Section 11.1 and TSD #4)*	Operations and post-closure
60		Apply best management practices in applying chemical dust suppressants, fertilizers, pesticides and herbicides, and minimize their use to the extent possible. *(EASR – Section 11.1 and TSD #4)*	Construction, operations and post-closure
61		Conduct all vegetation clearing activities outside the breeding bird season. *(EASR – Section 11.1 and TSD #4)*	Construction and operations
62		Prepare a worker awareness program to avoid harm to milksnake (a species of concern), if they are in the Site-vicinity. *(EASR – Section 11.1 and TSD #4)*	Construction and operations
63		Manage waste effectively to avoid attracting nuisance wildlife and pests, control the nuisance wildlife populations as permitted and required, and conduct periodic inspections to monitor effectiveness of the pest control. *(EASR – Section 11.1 and TSD #4)*	Construction and operations
64		Review significant wildlife habitat (SWH) with the City of Ottawa during its planning and permitting process. (*Volume II, Appendix K*)	Prior to construction
65		Obtain authorization from the MNR under the Endangered Species Act prior to submitting the planning application to the City of Ottawa as a result of barn swallow nests in the northeastern corner of the Site. *(Volume II, Appendix K*)	Prior to construction

Number	Environmental Component (if applicable)	Commitment *(Location of Where Commitment was Made in the EA Document Package)*	Project Phase
66		No vegetation clearing between April 15 and August 15 unless a qualified biologist has checked for nests first. *(Volume II, Appendix K*)	Construction
67	Land Use & Socio-economic and Agriculture	Maintain appropriate buffer between proposed on-Site activities and off-Site land uses. *(EASR – Section 11.1 and TSD #5)*	Construction and operations
68		Control off-Site nuisance emissions, i.e., air, odour, dust in accordance with MOECC standards. *(EASR – Section 11.1 and TSD #3)*	Construction and operations
69		Maintain perimeter vegetative buffers where possible; construct screening features where there is not already a significant stand of trees. *(EASR – Section 11.1 and TSD #5)*	Construction and operations
70		Provide Property Value Protection Plan *(EASR – Section 11.1 and EASR Section 15.0)*	Construction and operations
71		Provide Community Benefits - an annual per tonne royalty of $0.47 has been offered to a local community association, to be administered by a new community based group. There has however been no response to this offer.	Operations
72		Purchase goods and services locally where reasonably possible. *(EASR – Section 11.1 and TSD #5)*	Construction and operations
73		Minimize on-Site generation and accumulation of litter. *(EASR – Section 11.1, TSD #5 and Volume IV)*	Construction and operations
74		Use litter fencing to control windborne trash from leaving Site. *(EASR – Section 11.1, TSD#5 and Volume IV)*	Operations
75		Regularly clean up litter both on-Site and in the Site-vicinity. *(EASR – Section 11.1, TSD #5 and Volume IV)*	Operations
76		Establish procedure to register and address complaints. *(EASR – Section 11.1 and TSD #5)*	Prior to construction and operations
77		Use best efforts to establish a community liaison committee. *(EASR – Section 11.1 and EASR Section 15.0)*	Prior to operations
78	Culture and Heritage Resources	Should any archaeological resources be discovered, cease all alteration of the Site immediately and engage a licensed consultant archaeologist to carry out archaeological fieldwork. *(EASR – Section 11.1 and TSD #6)*	Construction and operations
79		Should any human remains be discovered, the police or coroner and the Registrar of Cemeteries at the Ministry of Consumer Services must be notified. *(EASR – Section 11.1 and TSD #6)*	Construction and operations

Number	Environmental Component (if applicable)	**Commitment** ***(Location of Where Commitment was Made in the EA Document Package)***	Project Phase
80		If during the process of development any archaeological resources or human remains of potential Aboriginal interest are encountered, the Algonquins of Ontario Consultation Office will be contacted. *(EASR – Section 11.1)*	Construction and operations
81	Traffic	Provide required intersection improvements at the Site access location off Boundary Road (left turn lane into the Site). *(EASR – Section 11.1 and TSD #9)*	Prior to operations
82		Provide on-Site queuing area of sufficient capacity to avoid truck queuing on Boundary Road. *(EASR – Section 11.1, TSD #9 and Volume IV)*	Prior to operations

Note: Taggart Miller will report compliance monitoring to the MOECC annually regarding the status of these commitments until such time as all commitments are completed or addressed in EPA/OWRA conditions of approval.

15.1 Amending Procedure

This EA has identified two very specific scenarios when amending procedures for the EA may be required, in Sections 10.5 and 10.9. In addition, there may be times when it may be necessary to modify the undertaking. This could occur because the environmental setting has changed since the project was approved or there is a new technology of which the proponent would like to take advantage. The purpose of this amending procedure is to allow Taggart Miller to make minor modifications to this EA in these circumstances.

Assuming that the Minister of the Environment approves this EA, this amending procedure would apply to minor amendments such as:

- Unforeseen site-specific problems encountered during detailed design, construction and/or operation;
- New technology or improvements in design that provide greater environmental benefits and/or less or equivalent negative effects;
- Items identified in other approvals processes; and
- Changes to regulatory requirements (either new or amended).

Taggart Miller would document and discuss any proposed minor modifications to the approved EA in advance with the MOECC. Some examples of possible minor amendments include using leachate storage tanks instead of ponds and modifications to the preferred leachate management option as a result of other approval processes. Taggart Miller will consider the implications of the proposed change on the net effects, stakeholders and the EA commitments and propose mitigation measures, if necessary. Taggart Miller will request concurrence from the Director of the MOECC Environmental Approvals Branch (EAB) prior to implementing the proposed minor amendment.

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APPENDIX A

Approved TOR

January 2013

PROPOSED TERMS OF REFERENCE FOR ENVIRONMENTAL ASSESSMENT OF THE PROPOSED CAPITAL REGION RESOURCE RECOVERY CENTRE

VOLUME 1

TAGGART
GROUP OF COMPANIES

THE
MILLER
GROUP

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ACRONYMS, UNITS AND GLOSSARY OF TERMS

Definition of Acronyms

Acronym	**Definition**
CAZ	Contaminant Attenuation Zone
C&D	Construction & Demolition
CDD	Conceptual Design Document
CLI	Canada Lands Inventory
C of A	Certificate of Approval
CRRRC	Capital Region Resource Recovery Centre
D&O	Design and Operations (report)
EA	Environmental Assessment
EAA	*Environmental Assessment Act*
EAC-SC	Environmental Advisory Committee Sub-committee, Twp. of Russell
EASR	Environmental Assessment Study Report
ECA	Environmental Compliance Approval
EPA	*Environmental Protection Act*
GRT	Government Review Team
IC&I	Industrial, Commercial & Institutional
MNR	Ministry of Natural Resources
MOE	Ministry of the Environment
MSW	Municipal Solid Waste
O. Reg.	Ontario Regulation
OWRA	*Ontario Water Resources Act*
SD	Supporting Document
Taggart Miller	Taggart Miller Environmental Services
TOR	Terms of Reference
TSD	Technical Support Document
UCPR	United Counties of Prescott Russell

Definition of Units

ha	hectare
km	kilometre
m	metre
m^3	cubic metres

Glossary of Terms

Term	Definition
Approval	Permission granted by an authorized individual or organization for an undertaking to proceed.
Buffer area	That part of a landfill site that is not a waste fill area.
Certificate of Approval (Waste)	An approval issued by the Ministry of the Environment for the establishment and operation of a waste management site/facility. Now referred to as an Environmental Compliance Approval.
Design and operations (D&O) plan	A document required for obtaining an Environmental Compliance Approval, which describes in detail the function, elements or features of the landfill site/facility, and how a landfill site/facility would function including its monitoring and control/management systems.
Design capacity (Total Disposal Volume)	The maximum total volume of air space available for disposal of waste at a landfill site for a particular design (typically in m^3).
Diversion Facilities	Processing of incoming waste streams to recover or convert materials for subsequent use or re-use and thereby divert them from disposal.
Environment	As defined by the *Environmental Assessment Act,* environment means: (a) air, land or water, (b) plant and animal life, including human life, (c) the social, economic and cultural conditions that influence the life of humans or a community, (d) any building, structure, machine or other device or thing made by humans, (e) any solid, liquid, gas, odour, heat, sound, vibration or radiation resulting directly or indirectly from human activities, or (f) any part or combination of the foregoing and the interrelationships between any two or more of them (ecosystem approach).
Environmental Compliance Approval	An approval issued by the Ministry of the Environment for the establishment and operation of a waste management site/facility.
Evaluation criteria	Evaluation criteria are considerations or factors taken into account in assessing the advantages and disadvantages of various alternatives being considered.
Haul route	Private and/or public roadway(s) used by vehicles transporting waste to and from a waste management facility, usually excluding a highway.
Indicators	Indicators are specific characteristics of the evaluation criteria that can be measured or determined in some way.
Landfill site	An approved site/facility used for the final disposal of waste.

Glossary of Terms

Term	Definition
Leachate	Liquid that drains from solid waste in a landfill and which contains dissolved, suspended and/or microbial contaminants from the breakdown of this waste.
Natural Environment	The air, land and water, or any combination or part thereof, of the Province of Ontario.
Non-putrescible	Waste material not containing significant quantities of organic or other decomposable material.
Proponent	A person who: (a) carries out or proposes to carry out an undertaking, or (b) is the owner or person having charge, management or control of an undertaking per the *Environmental Assessment Act*
Service Area	The geographical area from which a waste management facility is permitted to receive waste materials for processing and/or disposal.
(the) Site	The property proposed for the CRRRC Project.
(the) undertaking	The proposed Capital Region Resource Recovery Centre as described in this Terms of Reference and the final environmental assessment documents.

1.0 INTRODUCTION

1.1 Purpose of the TOR

This document is the proposed Terms of Reference (TOR) for the environmental assessment (EA) of a new proposed integrated waste management facility - Capital Region Resource Recovery Centre (CRRRC) – to be located in the Capital Region of eastern Ontario. If approved, the CRRRC would provide facilities and capacity for recovery of resources and diversion of materials from disposal for wastes that are generated by the Industrial, Commercial and Institutional (IC&I) and Construction and Demolition (C&D) sectors in Ottawa and eastern Ontario. It would also provide landfill disposal capacity on the same Site for post-diversion residuals and materials that are not diverted. Taggart Miller Environmental Services (Taggart Miller) is the proponent for this undertaking.

This TOR is being submitted to the Ontario Minister of the Environment (the Minister) for approval under the Ontario *Environmental Assessment Act* (EAA). If approved, the TOR provides the framework for the EA studies that will follow.

1.2 Background

Taggart Miller is a joint venture formed to pursue, obtain approvals for and operate the proposed CRRRC. The partners are Taggart Investments Inc. and Miller Waste Systems Inc.

The Taggart group of companies is an Ottawa-based, Canadian family-owned business specializing in civil infrastructure construction with other operating companies providing general contracting/construction management services; are proponents of a wide range of housing developments from single family to high rise condominiums; and, the acquisition, development and management of industrial sites, commercial office and retail space and residential real estate. Taggart Investments Inc. is part of the Taggart group of companies, with interests in construction, engineering and property management.

Miller Waste Systems Inc. is also a family-owned Canadian company providing waste management services in Ontario, Manitoba and the Maritimes. Miller Waste Systems Inc. designs, builds and operates facilities to provide long term, economically viable waste management solutions (collection, recycling, diversion, transfer) for municipalities and private sector customers. Miller Waste Systems Inc. has recently secured collection contracts for a significant portion of Ottawa's residential waste and is interested in the opportunity to extend its services more broadly in the Capital Region and eastern Ontario. (Ottawa's residential waste is disposed at the City's Trail Road waste facility and would not go to the proposed CRRRC).

The Province of Ontario and the City of Ottawa have clearly stated objectives to significantly increase the diversion of IC&I and C&D waste materials from disposal. As discussed elsewhere in these TOR and in **Supporting Document #1**, current diversion rates are significantly below City and provincial targets. Taggart Miller believes it can significantly assist in achieving these objectives by developing and operating a new integrated waste management facility. The facility would primarily serve Ottawa and secondarily portions of eastern Ontario for waste materials generated by the IC&I and C&D sectors. The facility would provide increased materials resource recovery capacity for waste from these sectors. Since it is currently not (and may never be technically or economically) possible to divert all materials from disposal, there will be a need for residuals disposal. The proposed integrated waste management facility would help meet the current provincial and municipal diversion goals.

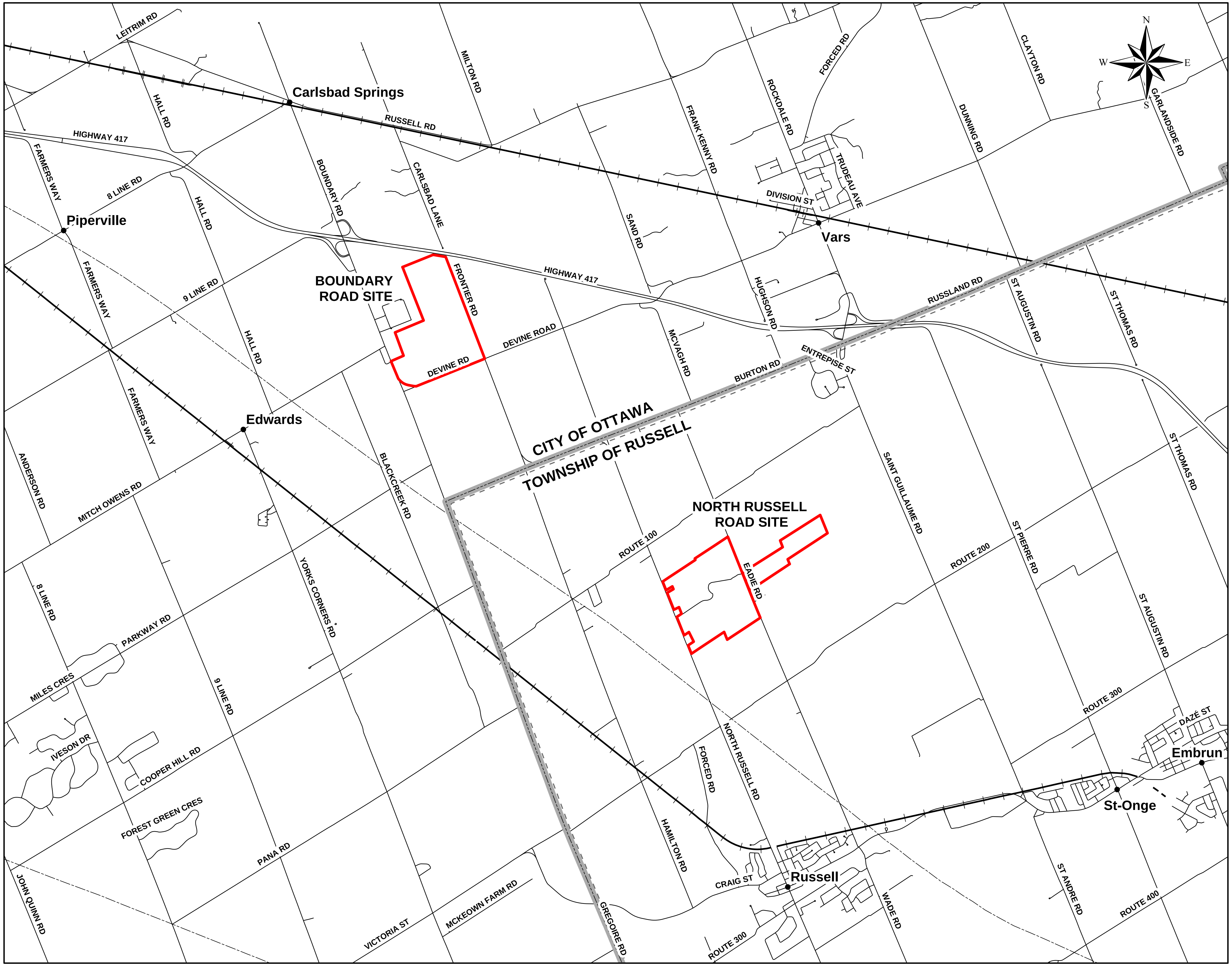
1.3 Location of Proposed CRRRC Facility

Taggart Miller has identified and secured two potential Sites for development of the proposed project. The locations of the two Alternative Sites are shown on **Figure 1-1**.

One Site - the North Russell Road Site - is located in the northwest part of the Township of Russell about three kilometres east of the boundary with the City of Ottawa, about five kilometres south of Provincial Highway 417 between the Boundary Road and Vars exits, and approximately three kilometres north of the Village of Russell boundary, and approximately four kilometres north of the centre of the Village. Taggart Miller owns, or has options to purchase, contiguous lands at this location totalling about 193 hectares (about 476 acres) on Part of Lots 18 and 19, Concessions III and IV, Township of Russell.

The second Site - the Boundary Road Site - is located in the east part of the City of Ottawa just southeast of the Highway 417/Boundary Road interchange. The property is located on the east side of Boundary Road, north of Devine Road and west of Frontier Road, and east of an existing industrial park. Taggart Miller has acquired about 175 hectares (430 acres) of land on Lots 23 to 25, Concession XI, Township of Cumberland.

If additional lands are acquired by Taggart Miller for development of the proposed project, they will be added to the defined Site and included in the Environmental Assessment.



LEGEND

● POPULATED PLACE NAME

ROADWAY

RAIL

UTILITY

TOWNSHIP OF RUSSELL BOUNDARY

CITY OF OTTAWA BOUNDARY

1 0.5 0 1 2 3

SCALE 1:60,000 KILOMETRES

REFERENCE

DIGITAL NRVIS MNR DATA PRODUCED BY GOLDER ASSOCIATES LTD., USED UNDER LICENSE © QUEEN'S PRINTER OF ONTARIO.
PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 18

PROJECT
TERMS OF REFERENCE FOR ENVIRONMENTAL
ASSESSMENT OF THE CAPITAL REGION
RESOURCE RECOVERY CENTRE

TITLE
ALTERNATIVE SITE LOCATION PLAN

Golder Associates
Ottawa, Ontario

PROJECT No. 09-1125-1008-7000			SCALE AS SHOWN	REV. 0
DESIGN	BGS	22 Feb. 08	FIGURE 1-1	
GIS	PJM	26 Jul. 2012		
CHECK	PLE	7 Sept. 2012		
REVIEW	PAS	7 Sept. 2012		

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2.0 THE ENVIRONMENTAL ASSESSMENT PROCESS

This section describes the environmental assessment (EA) process applicable to the undertaking.

2.1 Ontario Environmental Assessment Act

Ontario Regulation (O. Reg.) 101/07 for Waste Management Projects, which was made under the EAA, states (in part) that some waste management projects, regardless of whether the proponent is public or private sector, are designated under the Act[1]. According to Section 2 of O. Reg. 101/07, a new landfill is subject to an EA if it exceeds a total volume of more than 100,000 m^3. The disposal component of the proposed CRRRC will exceed this threshold. Accordingly, the landfill component of Taggart Miller's undertaking is subject to an individual EA process. The diversion components of the proposal are subject only to the EPA and the OWRA. Taggart Miller have however elected to make the entire CRRRC (i.e., both the diversion and disposal components) subject to the EAA.

An EA under the EAA is a planning study that among other things assesses environmental effects and advantages and disadvantages of the 'undertaking'. The 'environment' is considered in broad terms that include the natural, social, cultural and economic aspects of the environment. In an individual EA, the first step in the process is to develop a proposed TOR for the EA studies. The TOR is submitted to the MOE for review. As noted above, once approved, the TOR becomes the framework under which the EA must be prepared.

On November 10, 2010, Taggart Miller initiated the EA process by publishing a Notice of Commencement of the EA in local newspapers, on Taggart Miller's EA website, and by mail to the Government Review Team (GRT), Aboriginal communities and other identified community stakeholders. A copy of the Notice of Commencement is contained in the Consultation Record (see **Volume 2** of this TOR submission).

2.2 Purpose and Organization of Terms of Reference

The TOR and its Appendices and Supporting Documents consist of three volumes; Volume 1 - Terms of Reference, and its appendices (this volume); Volume 2 - Consultation Record for the development of the TOR, and; Volume 3 – Supporting Document #1.

Volume 1 is organized into the following sections and appendices:

- **Section 1** provides an introduction to the TOR and background information.
- **Section 2** describes the environmental assessment process, presents the purpose and organization of the TOR, includes the submission statement (i.e., how the TOR is being submitted for approval), identifies the proponent, and discusses flexibility in the TOR.
- **Section 3** provides a statement of the purpose of the undertaking.
- **Section 4** provides a summary of the analysis of the opportunity for the undertaking (discussed in greater detail in **Volume 3 - Supporting Document #1**).
- **Section 5** provides a summary of the assessment of alternatives to the undertaking.

---

[1] Ministry of the Environment, 2007. Ontario Regulation 250/11 (Amending Ontario Regulation 101/07), Waste Management Projects. Made under the Ontario Environmental Assessment Act. Revised June 2011

- **Section 6** provides the conceptual description of the diversion facilities proposed to be constructed and operated at the proposed CRRRC.
- **Section 7** provides an overview of the existing conditions in the study areas that may be affected by the undertaking for each of the two alternative Sites.
- **Section 8** provides the proposed EA methodology.
- **Section 9** summarizes the consultation plan for developing this TOR and preparing the EA.
- **Section 10** discusses the proposed schedule for preparing the EA and other approval applications.
- **Section 11** describes other approvals that may be required.
- **Section 12** provides statements of commitments by the proponent to be completed during the EA.
- **Appendices** to the TOR consist of: Appendix A - Criteria for Comparative Evaluation of t**he Alternat**ive Sites; Appendix B- Alternative Haul Ro**u**te and Leachate Treatment Assessment Criteria, and; Appendix C - EA/EPA Work Plans for each of the Alternate Sites.

Volume 2 presents the record of the consultation process for the development of the TOR.

Volume 3 contains Supporting Document #1, which describes Taggart Miller's analysis of the opportunity and of the preferred approach for Taggart Miller to respond to this opportunity.

2.3 Identification of Proponent

Taggart Miller Environmental Services (Taggart Miller) is the proponent for the proposed undertaking. The contact for this undertaking is as follows:

Mr. Hubert Bourque
Project Manager/Directeur de projet
Taggart Miller Environmental Services
c/o 225 Metcalfe Street, Suite 708
Ottawa, Ontario K2P 1P9
Tel: 613-454-5580
Fax: 613-454-5581
Email: hjbourque@crrrc.ca

2.4 Terms of Reference Submission Statement (How the Environmental Assessment Will be Prepared)

These proposed TOR are submitted to the MOE for approval pursuant to subsections 6(1) and 6.1(3) of the EAA. As contemplated by subsection 6(2)(c) of the EAA, these proposed TOR set out in detail the requirements for the preparation of the environmental assessment. The environmental assessment of the proposed CRRRC will focus on identifying the preferred Site, the configuration of the preferred Site, impact assessment of the preferred Site development concept, and leachate treatment options. The analysis of the opportunity and the assessment of Alternatives To the undertaking are summarized in this TOR and in more detail in **Supporting Document #1**.

The rationale for the undertaking and an assessment of alternatives to the undertaking are contained in **Supporting Document #1** to these proposed TOR. The rationale for the undertaking is summarized in Section 4.0. The assessment of Alternatives To considered a number of options as summarized in Section 5.0 of the TOR and described in further detail in **Supporting Document #1**. Alternative 3 - establish diversion facilities on a Taggart Miller Site and manage residuals disposal by means of a new landfill on the same Site – was determined to be within the proponent's ability, experience and expertise to implement and to provide at an affordable, competitive cost to Taggart Miller and to IC&I and C&D sector customers, and was identified as the preferred alternative.

Once a preferred site and a preferred site development concept are identified in the initial steps of the EA, Taggart Miller will assess the potential impacts associated with all components of the proposed integrated diversion and disposal facility in the EA. In addition, an assessment of cumulative effects of the proposed project and of any existing or certain and probable planned projects in the area of the Site will be completed as part of the EA. While the application for EPA approval will only be submitted after EA approval, the supporting documentation package for the EA application will contain the information necessary to support an EPA application, such that the reviewers have detailed information on the proposed project at the time of considering the application for EA approval.

The environmental assessment will contain the following:

(a) a description of the undertaking

(b) a description of and a statement of the rationale for,

  i. the undertaking, and

  ii. the alternative methods of carrying out the undertaking.

(c) A description of,

  i. the environment that will be affected or that might reasonably be expected to be affected, directly or indirectly,

  ii. the effects that will be caused or that might reasonably be expected to be caused to the environment, and

  iii. the actions necessary or that may reasonably be expected to be necessary to prevent, change, mitigate or remedy the effects upon or the effects that might reasonably be expected upon the environment, by the undertaking and the alternative methods of carrying out the undertaking in accordance with the provisions of these TOR;

(d) an evaluation of the advantages and disadvantages to the environment of the undertaking and the alternative methods of carrying out the undertaking; and

(e) a description of any consultation about the undertaking by the proponent and the results of the consultation.

2.5 Flexibility of Terms of Reference

While these TOR are intended to set out in detail the requirements for preparing the EA, this document does not and cannot present every detail of every aspect of the proposed EA. Furthermore, it is possible that, in carrying out the EA contemplated in the proposed TOR, minor variations may be necessary or desirable. Such variations may include the following:

- Minor changes in methodology or an alteration in the level of details in the studies contemplated by these TOR. This may be in response to studies in the EA that show effects to be greater or less than previously anticipated or due to the content and quality of information available from data sources; and
- Modifications to the proposed public consultation program.

The modifications described above and similar modifications would be considered minor changes to the TOR that could be accommodated within the framework of these TOR without seeking approval for an amendment to these TOR. Taggart Miller would document and discuss any proposed minor modifications to the TOR in advance with the MOE.

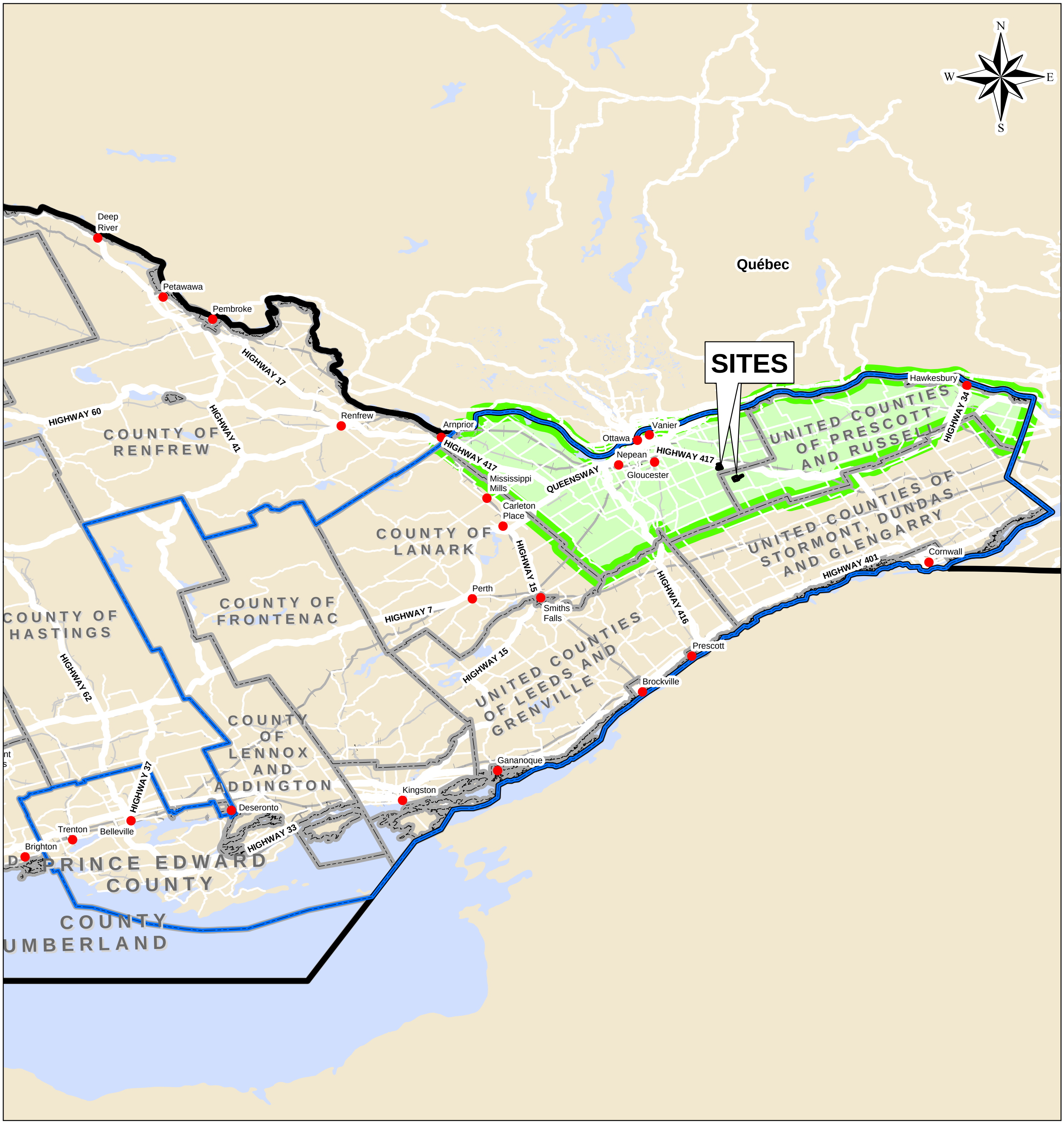
3.0 PURPOSE OF THE PROPOSED UNDERTAKING

The purpose of the proposed undertaking is:

To provide facilities and capacity for recovery of resources and diversion of materials from disposal for wastes that are generated by the Industrial, Commercial and Institutional (IC&I) and Construction and Demolition (C&D) sectors in Ottawa and eastern Ontario. It would also provide landfill disposal capacity on the same site for post-diversion residuals and materials that are not diverted.

The proposed service area is shown on Figure 3-1 and consists of the City of Ottawa, and the Counties of Prescott-Russell; Stormont, Dundas and Glengarry; Lanark; Leeds & Grenville; Frontenac; Lennox and Addington; and, Prince Edward. It is anticipated that the CRRRC would receive waste primarily from the Capital region.

The purpose statement may be refined as necessary or appropriate during the EA.



LEGEND

● PLACE NAME

▭ PROVINCIAL BOUNDARY

▭ UPPER TIER MUNICIPALITY

▭ PROPOSED SERVICE AREA

🟩 EXPECTED PRIMARY SERVICE AREA

0 12.5 25 50 75 100

SCALE 1:2,000,000 KILOMETRES / KILOMÉTRES

REFERENCE

DIGITAL NRVIS MNR DATA PRODUCED BY GOLDER ASSOCIATES LTD.,
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PROJECTION: MODIFIED TRANSVERSE MERCATOR DATUM: NAD 83
COORDINATE SYSTEM: MTM ZONE 9

PROJECT

TERMS OF REFERENCE FOR ENVIRONMENTAL ASSESSMENT
OF THE CAPITAL REGION RESOURCE RECOVERY CENTRE

TITLE

PROPOSED SERVICE AREA

Golder Associates
Ottawa, Ontario

PROJECT No. 09-1125-1008			SCALE AS SHOWN	REV. 0
DESIGN	PLE	Aug. 2011	FIGURE 3-1	
GIS	JEM/BR	10 Jul. 2012		
CHECK	PLE	7 Sept. 2012		
REVIEW	PAS	7 Sept. 2012		

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4.0 RATIONALE FOR AND DESCRIPTION OF THE UNDERTAKING

4.1 Overview

Taggart Miller undertook an analysis in order to understand whether there was an opportunity to provide waste management services focused on resource recovery of IC&I and C&D wastes in the Capital Region and eastern Ontario. The analysis is presented in **Supporting Document #1** to these TOR and is summarized below.

Taggart Miller's analysis considered current market conditions and how these conditions might affect the opportunity. The study looked at established provincial and municipal programs, goals and policies, and identified existing facilities. It also considered factors affecting current and likely future diversion rates for IC&I and C&D waste materials.

The Province has identified increased diversion from landfill of IC&I and C&D waste materials as a waste management priority[2]. Taggart Miller found that province-wide progress in reducing the amount of waste going to dispoal has stalled, primarily due to lack of progress in diverting IC&I and C&D waste materials that comprise about two thirds of the overall waste generation. In view of the large percentage of the total waste stream that is comprised of IC&I and C&D waste, and the present low rate of diversion being achieved of about 13 to 14 %, the IC&I and C&D sector represents the greatest opportunity for increasing overall waste diversion. The City of Ottawa has recognized that diversion of IC&I and C&D wastes is encumbered by the lack of affordable diversion services and facilities, and has indicated that waste recovery facilities and stable markets need to be established within a financially feasible distance of Ottawa.[3] Current market conditions present an opportunity for the provision of additional waste management services for IC&I and C&D wastes in the Capital Region and eastern Ontario.

4.2 Opportunity Analysis

4.2.1 Identifying an Opportunity

There is a well established and clearly stated desire, expressed both by the Province of Ontario and the City of Ottawa, to significantly increase diversion of materials from disposal for the IC&I and C&D sector. Taggart Miller conducted an analysis to determine how it could respond to this business opportunity to provide waste management services in the Capital Region and eastern Ontario. In addition to residential and IC&I and C&D wastes, Taggart Miller also considered other waste materials that must be managed, such as contaminated and surplus soils that originate from land development and construction projects. Taggart Miller's analysis, including the supporting references, is presented in detail in Sections 1.0 and 2.0 of **Volume 3 – Supporting Document #1** and summarized in this section.

The provision of services and systems for collection and diversion of materials from residential sources and disposal of residuals is a municipal responsibility. However, the collection, diversion and disposal of IC&I and C&D materials is largely left to direct contract arrangements between the private sector generators and privately owned collection, diversion and disposal facilities. At this time, and in the absence of new provincial regulation, any decision by individual IC&I and C&D waste generators to divert their IC&I waste materials is mostly voluntary.

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[2] Ministry of the Environment, 2008. EBR Registry Number: 010-4676. Web reference: http://www.ebr.gov.on.ca/ERS-WEB-External/displaynoticecontent.do?noticeId=MTA0NjEy&statusId=MTU2Njg2&language=en

[3] Discussion Paper, *Phase 2 Reference Document, Ottawa's 30-Year Waste Plan*. June 2012.

Despite provincial policy statements on achieving 60% diversion of wastes from landfill, only limited progress has been made province-wide for the IC&I sector. The MOE proposed in 2008 that one of the key "building blocks" to achieving the long-term vision of "zero waste" would be an increase in the diversion of IC&I waste[4]. Similarly, the City of Ottawa has stated objectives to divert IC&I and C&D waste from landfilling, but these efforts too have met with limited success. The City can only exercise very limited control on or influence over the way IC&I and C&D waste materials are managed by the private sector. It is estimated that only about 12 to 14% of IC&I and C&D waste materials in the Capital Region and provincially are diverted from disposal. The private sector has not invested sufficiently in facilities in the Ottawa area (and the Province) to process recyclables from the IC&I / C&D sector to achieve the provincial and local diversion objectives. As a result, the majority of IC&I and C&D wastes still go to disposal. The majority of participants in the City of Ottawa's current consultation process on a 30 year waste management plan feel it is important to find local waste management solutions. Taggart Miller believe there is a need and an opportunity for additional diversion infrastructure in the Capital Region for diversion of IC&I and C&D waste materials. The City has indicated recently that local businesses and institutions are encumbered in their waste diversion efforts by the lack of affordable diversion services.

Based on the *foregoing factors and analysis, as presented in detail in* ***Supporting Document #1****, Taggart Miller concluded that there is an opportunity to provide new environmentally safe waste management services for IC&I and C&D wastes in eastern Ontario*.

4.2.2 Quantifying the Opportunity

Taggart Miller then undertook an assessment to quantify and better understand the opportunity to provide these services to the IC&I and C&D sector. The assessment is presented in Section 3.0 of **Supporting Document #1**. A potential service area was identified, consisting of the City of Ottawa and a selected area of eastern Ontario. The existing known diversion and disposal facilities for IC&I and C&D waste materials were identified. The most up-to-date data available to Taggart Miller on waste generation and diversion within the potential service area was obtained and compiled, and future IC&I and C&D waste generation and materials requiring management by diversion and disposal were estimated. A well-established approach to estimate waste generation volume (for IC&I / C&D) as a direct function of population was used - future IC&I and C&D waste generation quantities were assumed to increase with increasing population. Statistics on current population were derived from published Statistics Canada sources (Statistics Canada, 2010) and City of Ottawa data (2010) and used to estimate future IC&I and C&D waste generation volumes.

The amount of IC&I and C&D waste required to be managed over time by a combination of increased diversion and disposal is the total waste generated minus the amount currently diverted. These values were extrapolated out 35 years in the future to quantify the need today and in the future. The planning period used was 2016 to 2046, corresponding to a 30 year planning period from the projected timing of commencing operations for the proposed CRRRC.

The known main diversion and recycling facilities currently available to the IC&I and C&D sector in the City of Ottawa and surrounding eastern Ontario area include:

- Tomlinson Environmental Services;

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[4] Ministry of the Environment, 2008. EBR Registry Number: 010-4676. Web reference: http://www.ebr.gov.on.ca/ERS-WEB-External/displaynoticecontent.do?noticeId=MTA0NjEy&statusId=MTU2Njg2&language=en

- Metro Waste Recycling Inc.;
- Tomlinson Environmental Services (former Goulbourn Sanitation); and
- Laflèche Environmental.

The proposed service area includes municipalities that are within a feasible and reasonable transportation distance of the site (e.g., about 200 km). Publicly owned possible disposal options in the anticipated primary service area that were considered include:

- City of Ottawa Trail Road Landfill; and
- City of Ottawa Springhill Landfill.

Plasco Energy Group, although a privately owned company, is currently seeking to develop a facility to manage a portion of the residential waste from the City of Ottawa.

Except for residuals from C&D processing at the Springhill Landfill, these facilities generally deal with disposal of residential waste, and therefore do not serve the IC&I and C&D waste generators that are the opportunity targeted by the CRRRC.

Privately-owned landfill disposal sites that presently service, or have the potential to service IC&I and C&D generated in eastern Ontario include:

- Waste Management's Ottawa (Carp Road) Landfill (currently not receiving waste, EA process to re-open the landfill in progress);
- BFI Navan Landfill; and
- Laflèche Environmental.

The quantity of waste currently and projected to be generated from the IC&I and C&D sectors was estimated, together with the amount of waste that could actually be handled by the above-mentioned facilities. A generation rate of 833 kilograms of IC&I and C&D waste per capita per year for the City of Ottawa in 2010 was utilized. The IC&I and C&D waste generation rate outside the City of Ottawa but within the proposed service area was estimated to be 567 kg/capita in 2008. Each of these generation rates were increased throughout the 35 year assessment period by 1.2% based on the projected population increase. For this analysis, the current diversion rate of IC&I waste materials was held constant throughout the 35 year assessment period, as there is no reasonable basis to assume anything else at this point, absent investment in facilities like the proposed CRRRC. For the licensed disposal sites, assumptions were made on the annual amount of IC&I and C&D wastes they are likely to receive for disposal, and the period of time until their approved capacity is consumed was also estimated. The difference between the quantity of waste to be managed and the existing diversion rate and approved disposal capacity was considered both with and without the approval of re-opening the Waste Management Ottawa landfill.

Based on the current diversion rates and the indicated population growth, the quantity of IC&I and C&D material requiring management over the analysis / planning period is approximately 1,000,000 tonnes per year using 2010 as the base year, increasing gradually to approximately 1,500,000 tonnes in 2046. If re-opening of the Waste Management Ottawa Landfill is approved, and assuming it commenced operations in 2015, this would improve the available waste management capacity by 400,000 tonnes of disposal per year. Combined the existing landfills (including a re-opened Waste Management Ottawa site) would be expected to satisfy a good portion of the projected annual need for IC&I and C&D waste management through 2025 (although doing little to increase diversion from disposal). The effect of the Waste Management Ottawa Landfill not being approved to re-open would be to increase the waste-management deficit by 400,000 tonnes per year. It is acknowledged that the available waste disposal capacity in the Capital Region is larger than described above if the total approved annual disposal rate at the Laflèche site is considered; however, if this full annual capacity were to be actually utilized, the remaining approved operating life of this site would be correspondingly decreased and currently approved capacity would still be estimated to be depleted around 2025. After this time, which is relatively short in terms of waste management planning, an IC&I and C&D waste management deficit would remain as described below. See Figures 4.2-1 and 4.2-2 below.

Figure 4.2-1: Proposed Service Area IC&I Waste Generation, Diversion and Existing Disposal (with WM Ottawa Landfill Re-opened)

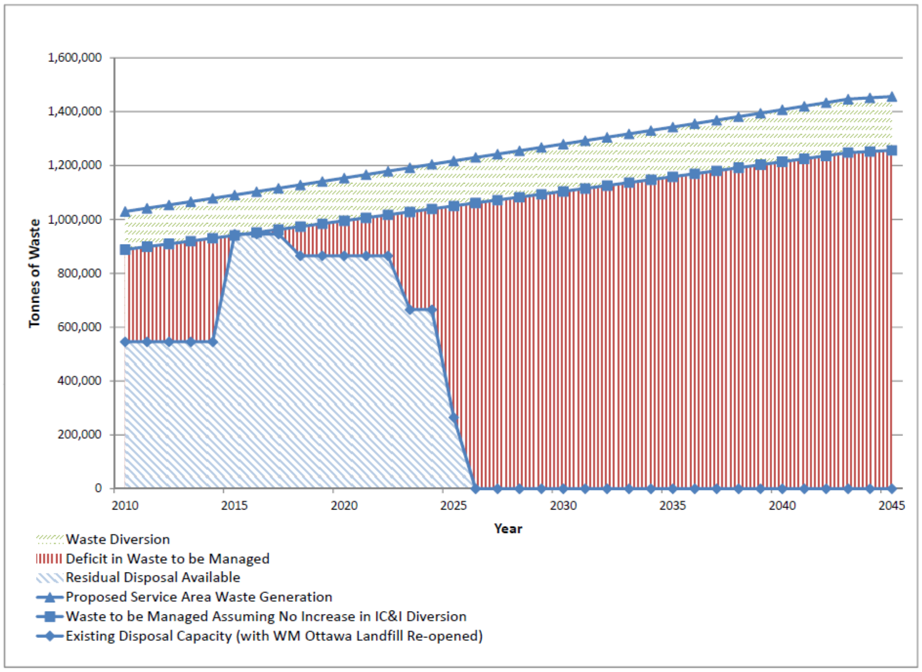
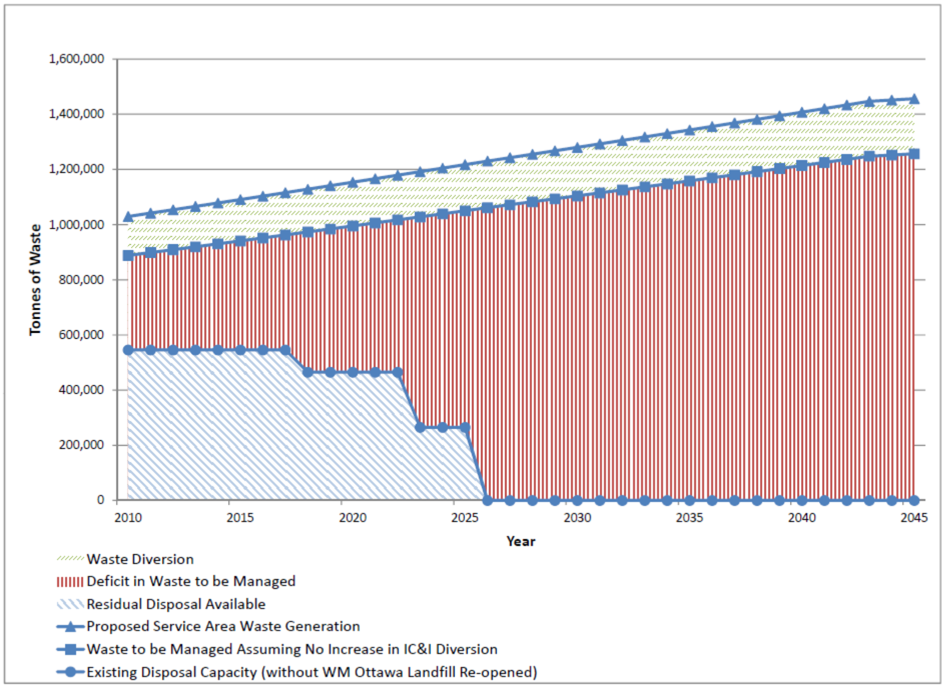


Figure 4.2-2: Proposed Service Area IC&I Waste Generation, Diversion and Existing Disposal (without Re-opening of WM Ottawa Landfill)



The analysis concluded that in the absence of increased diversion capacity/rates and/or additional approved disposal capacity, there could be a IC&I and C&D waste management capacity deficit in the proposed service area of anywhere from 350,000 tonnes per year to 1,250,000 tonnes per year in the period between 2015 and 2046. The current transfer of approximately 200,000 tonnes[5] of Ottawa area IC&I waste for disposal elsewhere reflects the current diversion and disposal deficit in the proposed service area. It is believed that waste from the Capital Region is currently exported to privately owned facilities New York State, as well as in the Gatineau, Quebec area. The current deficit in availability of facilities to manage IC&I and C&D waste in the service area is also demonstrated by the transfer of waste from the Kingston and Belleville areas for disposal in New York State.

*Based on the detailed assessment presented in Section 3.0 of **Supporting Document #1**, and summarized above, Tagger Miller concluded that there is a clear opportunity and need for IC&I and C&D waste management services in the Capital Region and eastern Ontario over the 2016-2046 planning period, and that it is in a good position to respond to this opportunity/need*. *Without the private sector taking the lead on investments in diversion and residuals disposal infrastructure of the sort envisaged by Taggart Miller with respect to this proposed integrated waste management facility, there is no reasonable prospect of meeting local or provincial diversion goals given the current waste management infrastructure in the proposed service area.*

An overview of the alternatives that Taggart Miller considered to respond to this opportunity are discussed in Section 5.0 of the TOR, together with the screening assessment conducted to decide on the alternative that Taggart Miller determined was preferred to pursue for the proposed CRRRC. Additional details on the Alternatives To screening assessment that Taggart Miller conducted are described in Section 4.0 of **Supporting Document #1.**

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[5] 2010 and 2011 Annual Reports for BFI Canada Inc. 2628 Glenfield Drive, Ottawa, Ontario, Certificate of Approval No. 7652-76KQN7.

5.0 ASSESSMENT OF ALTERNATIVES TO THE UNDERTAKING

After concluding that there was a clear opportunity and need for waste management services to the IC&I and C&D sector in eastern Ontario over the 2016-2046 planning period, Taggart Miller conducted an assessment to determine the best way to respond to this opportunity. In EA terms this is referred to as “Alternatives To” the proposed undertaking. The assessment of Alternatives To is contained in Section 4.0 of **Supporting Document #1** and summarized below.

In order to better meet the waste management needs of their business, the Taggart group of companies commenced a search for a suitable site for a waste management facility within the Capital Region prior to the announcement of this project in 2010. Identification of a potentially suitable property was judged to be one that would meet the following basic requirements:

- The property should be of sufficient size (at least 400 acres), and be relatively square/rectangular in shape;
- No obvious material land use constraints;
- The property should be fairly close to a major (400 series) highway to provide an access route, and should also be sited so that truck routes would allow a minimal amount of site-related traffic from having to travel through urban or village centres; and
- The property should be in reasonable proximity to the centre of waste generation in the Capital Region.

The parcel of land comprising the licensed Hanson Brick quarry, located east of North Russell Road between Routes 100 and 200 in the north portion of Russell Township, was identified as being well situated within the Capital Region, meeting the above noted criteria. When the property was available for sale (as a result of the former owners shutting their brick manufacturing operations in Ottawa), negotiations began and were successfully completed eighteen months later. Once the additional lands adjacent to the quarry parcel itself that would be required to create an optimum integrated waste management project site had been assembled, the Taggart group and Miller Waste Systems formed a joint venture to evaluate and pursue this business opportunity together.

Through various means of consultation commencing after announcement of the project in November 2010, members of the public in Russell Township expressed concerns about the merits of the proposed North Russell Road Site (“good project, wrong site” was the title of the initial homepage of the “Dump the Dump Now” group website). It was suggested that Taggart Miller should be considering a site closer to major transportation routes and with fewer immediate neighbours. It was also suggested that Taggart Miller should be looking for a site in the City of Ottawa given that the proposed facility would be primarily servicing businesses located in the City.

Taggart Miller was ultimately able to identify an alternative site with many of the characteristics that members of the pubic had suggested Taggart Miller should be considering. Through negotiations over a period of 12 months, that site was secured. The alternative Site is located on the east side of Boundary Road, north of Devine Road and west of Frontier Road. This property is within the City of Ottawa, close to the Highway 417/Boundary Road interchange, adjacent to an existing Industrial Park with few existing immediate neighbours. The Site is underlain by a thick deposit of silty clay soil. Of interest, the Site is within the area identified by the Regional Municipality of Ottawa-Carleton as the preferred location for a new regional landfill site in the late 1980’s, prior to the Region abandoning its waste management master plan study.

The locations of the North Russell Road Site and the Boundary Road Site are shown on **Figure 1-1**. Taggart Miller considers that both sites are suitable for the CRRRC project, and proposes to compare the characteristics of the two Sites in the first step of the EA study process to identify the preferred Site for the project.

As described previously, the primary objective of the project is to establish a long term business for recovery of resources from the IC&I and C&D sector and diversion of these IC&I and C&D waste materials from disposal. However, there will be process residuals as well as materials that are not diverted which will require disposal, particularly given the relatively undeveloped IC&I diversion market and the limitations of current diversion technology.

Taggart Miller identified a number of alternative ways to address the diversion and disposal opportunity, as follows:

Alternative 1 - Do-Nothing;

Alternative 2 - establish diversion facilities on a Taggart Miller Site and transfer residuals to other existing disposal sites in Ottawa, in eastern Ontario or in New York State;

Alternative 3 - establish diversion facilities on a Taggart Miller Site and manage residuals disposal by means of a new landfill on the same Site;

Alternative 4 - establish diversion facilities on one of the Taggart Miller Sites and manage residuals disposal by means of a landfill located off-Site at the other Taggart Miller Site; and

Alternative 5 - establish diversion facilities on one of the Taggart Miller Sites and manage residuals disposal by means of a thermal conversion facility on the same Site.

A screening assessment of the identified alternatives was conducted by considering the following questions:

- Does the alternative realistically address the identified opportunity?
- Is the alternative financially realistic and viable for Taggart Miller in terms of economic risks and benefits?, and
- Is the alternative within Taggart Miller's ability to implement?

Taggart Miller also considered if the alternatives were likely to be approvable (i.e., meet applicable environmental requirements, standards and policies); as all were judged as likely to be approvable, this screening criterion is not presented. In addition, Taggart Miller considered if the alternatives were likely to use proven technology. As all alternatives were judged to be likely to use proven technology; this screening criterion is also not presented.

The advantages and disadvantages of the alternatives were also considered.

The results of the screening assessment are presented in **Table 5-1** below.

Table 5-1: Feasibility Screening of Alternatives

Screening Questions	**1** **Do Nothing**	**2** **Diversion on a Taggart Miller Site, residuals disposal at other existing sites in Ottawa, eastern Ontario or New York State**	**3** **Diversion on a Taggart Miller Site, residuals disposal on the same Site**	**4** **Diversion on a Taggart Miller Site, residuals disposal at a landfill on the other Taggart Miller Site**	**5** **Diversion on a Taggart Miller Site; residuals disposal using thermal technologies on the same Site**
Does the alternative realistically address the identified opportunity?	No	Yes	Yes	Yes	Yes
Is the alternative financially realistic and viable for Taggart Miller in terms of economic risks and benefits?	N/A	No. For an integrated waste management facility focused on IC&I waste diversion to be able to cost-effectively deliver these services to the market, and to justify the upfront investment in diversion facilities in a competitive environment against disposal only options and in the absence of established end markets for material, Taggart Miller has concluded it is essential to have the diversion and disposal components available on the same Site	Yes	No. For an integrated waste management facility focused on IC&I waste diversion to be able to cost-effectively deliver these services to the market, and to justify the upfront investment in diversion facilities in a competitive environment against disposal only options and in the absence of established end markets for material, Taggart Miller has concluded it is essential to have the diversion and disposal components available on the same Site	No. This would involve very large capital costs to construct. Without a guaranteed waste stream for a long period of operation, and with the need to rely on a landfill elsewhere to dispose of residuals and residues, Taggart Miller has concluded this is unaffordable and economically far too uncertain

Screening Questions	1 Do Nothing	2 Diversion on a Taggart Miller Site, residuals disposal at other existing sites in Ottawa, eastern Ontario or New York State	3 Diversion on a Taggart Miller Site, residuals disposal on the same Site	4 Diversion on a Taggart Miller Site, residuals disposal at a landfill on the other Taggart Miller Site	5 Diversion on a Taggart Miller Site; residuals disposal using thermal technologies on the same Site
Is the alternative within Taggart Miller's ability to implement?	N/A	Yes. Taggart Miller has the internal resources to operate a diversion business	Yes. Taggart Miller has the internal resources to operate both a diversion business and a landfill	Yes. Taggart Miller has the internal resources to operate both a diversion business and a landfill	No. This is not within Taggart Miller's core business competence

A summary of the identified advantages and disadvantages of the alternatives is presented below.

Alternative 1 - Do-Nothing: The Do Nothing alternative means not proceeding with a project to provide diversion of IC&I and C&D materials from disposal, which does nothing to provide the facilities required to assist Ottawa or the secondary service area in achieving the goal of increased IC&I and C&D diversion.

Advantages: None.

Disadvantages: This does not address the opportunity/need, nor does it satisfy Taggart Miller's desire to pursue this business opportunity.

Conclusion: This alternative was not given further consideration.

Alternative 2 - Establish diversion facilities on a Taggart Miller Site and transfer residuals to other disposal sites in Ottawa, in eastern Ontario or in New York State.

Advantages: This alternative would achieve the objective of establishing IC&I and C&D diversion facilities.

Disadvantages: There would be a reliance on other facilities at other locations owned by third parties to manage the disposal of residuals. Many of these facilities have limitations such as:

- Within the City of Ottawa, the BFI Navan landfill is only licensed to accept non-putrescible wastes and therefore would not be able to accept some of the residuals remaining after diversion. The City's Trail Waste Facility is intended to satisfy the City's long term needs for residential waste disposal, i.e., not for disposal of post-diversion IC&I and C&D residuals. The Springhill landfill has a limited remaining approved capacity and corresponding operating life at its current rate of capacity consumption, and its service area is limited to the former Osgoode Township and for residuals from the C&D recycling facility on the site. Waste Management's Ottawa Landfill has reached capacity and is closed to receipt of waste pending the completion of an approvals process to re-open; as such, the availability of disposal capacity at this site is uncertain at this time. Further, the expansion capacity currently being sought is for only 10 years, whereas the planning period being used by Taggart Miller is 30 years to 2046;

- The Laflèche facility in North Stormont Township is appropriately licensed to be able to accept materials for disposal and was considered; however if it operates at or near its approved annual capacity it will have exhausted its approved capacity around 2017. Even at approximately half its annual capacity the landfill will have exhausted its approved capacity around 2025, potentially leaving Taggart Miller without disposal capacity for 20 years of its 30 year planning period; and
- For transfer of residuals for disposal in landfill sites in New York State, it would be necessary to use a transfer facility for haulage either to the disposal location or to the existing privately owned transfer station in the east part of Ottawa. Reliance on disposal in the United States, access to which would depend on continued unconstrained cross-border transport, adds another level of complexity and risk.

Taggart Miller also noted that having the diversion and disposal components on the same Site minimizes the environmental footprint of the overall facility, as well as the transportation impacts (including the potential for traffic related accidents) of taking non-diverted materials from the Taggart Miller diversion facility Site to an off-site disposal location. Moreover and fundamentally, Taggart Miller are proposing an innovative waste diversion facility to serve a generator market, and produce recovered materials for end markets, that largely do not currently exist. To justify the investment and be able to provide cost-effective services to the marketplace, Taggart Miller believe it is essential to have the disposal component for residuals and materials that are not diverted on the same Site.

Conclusion: Use of off-site disposal options does not provide a reliable long term solution, nor was it judged to be sufficiently operationally or economically viable to justify the diversion facility investments by Taggart Miller.

Alternative 3 - Establish diversion facilities on a Taggart Miller Site and dispose of residuals and non-diverted material by landfill on the same Site.

Advantages: This alternative is entirely within Taggart Miller's control. It enables Taggart Miller to confidently make the significant investment in innovative diversion facilities in a competitive marketplace in the absence of established end markets for recovered materials and products.

Having both the diversion and disposal components on the same Site minimizes the environmental footprint of the overall facility, as well as the transportation impacts (including the potential for traffic related accidents) of taking non-diverted materials from the Site to an off-site disposal location.

Disadvantages: None identified.

Conclusion: This alternative provides a reliable and cost-effective long-term solution to justify the diversion facility investment by Taggart Miller.

Alternative 4 - Establish diversion facilities on one of the Taggart Miller Sites and manage residuals disposal by means of a landfill on the other Taggart Miller Site.

Advantages: This alternative would achieve the objective of establishing IC&I and C&D diversion facilities.

Disadvantages: As noted above, to justify the investment and be able to provide cost-effective services to the marketplace, Taggart Miller believe it is essential to have the disposal component for residuals and non-diverted waste available on the same Site.

Putting the diversion components of the facility on one Taggart Miller Site and the disposal component on the other one would also more or less double the environmental footprint of the facility for no apparent advantage. In addition, there would be increased transportation impacts associated with movement of residuals and non-diverted material from one Site to the other.

Conclusion: This alternative has no apparent advantages over Alternative 3 and a number of disadvantages.

Alternative 5 - Establish diversion facilities on one of the Taggart Miller Sites and manage residuals disposal by means of a thermal conversion facility on the same Site.

Advantages: Having both the diversion and disposal components on the same Site minimizes the environmental footprint of the overall facility, as well as the transportation impacts (including the potential for traffic related accidents) of taking non-diverted materials to an off-Site disposal location. It also puts the diversion and disposal components under Taggart Miller's control, which Taggart Miller believes is essential to justify the investment in diversion facilities.

Disadvantages: Thermal conversion technology alternatives typically involve very large capital costs to construct.

To be economically viable, thermal technologies require a long term (20 year plus) guaranteed waste supply contract (typically with a large municipality or municipalities responsible for managing the waste generated by their residents); this is not achievable for the IC&I and C&D sector where waste management arrangements are made individually and directly between the private sector customers and the privately owned diversion and disposal facilities under short term contracts.

Such thermal technologies, without a guaranteed waste stream (such as a long-term municipal collection and disposal contract) for a long period of operation, are in Taggart Miller's conclusion unaffordable and economically far too uncertain.

Moreover, Taggart Miller does not have the technical or business experience to operate a thermal destruction plant.

Conclusion: Taggart Miller concluded that this alternative is beyond their capacity to implement, and is not economical or competitive for the IC&I / C&D waste stream.

Based on the results of this assessment, Taggart Miller concluded that Alternative 3 - establish diversion facilities on a Taggart Miller Site and manage residuals disposal by means of a landfill on the same Site - was the only reasonable and economically feasible alternative for Taggart Miller to pursue.

5.1 Conceptual Description of the Undertaking

The proposed undertaking comprises the establishment of a new and innovative integrated waste management facility located on the Site identified as preferred for the project. The primary focus of the proposed CRRRC is diversion of IC&I and C&D waste materials from disposal through recycling and other processes. Wastes and process residuals that are not diverted will be disposed in a landfill on the Site.

It is envisaged that the facility would receive solid non-hazardous materials from the IC&I and C&D sectors originating primarily from within the Capital Region and secondarily from seven counties in eastern Ontario.

The diversion rate that can be achieved over time at the proposed integrated waste management facility will depend on many factors, including the types of waste received at the site, the amount of source separation, the markets for recovered materials, and the ability and need to provide a cost competitive waste management solution for IC&I and C&D customers. Government regulations can and likely will drive development in the IC&I and C&D diversion marketplace. Based on experience and the types of diversion facilities proposed to be constructed at the proposed CRRRC (as described in Section 6.0 of the proposed TOR), it is Taggart Miller's view that under the current regulatory structure, and by taking advantage of preferential rates for the production of renewable energy from anaerobic digestion, it should be possible over time to achieve 30 to 40% diversion of the incoming IC&I and C&D waste stream. Quality and composition of incoming materials will be important determinants of ultimate diversion rates, as will development of end markets for recovered material. Additional government regulations could significantly enhance this diversion rate.

Taggart Miller will assume for the purposes of the EA that the proposed CRRRC will accept waste at a rate of approximately 1,000 to 1,500 tonnes per day. Assuming a facility that is open 300 days per year, this is equivalent to annual waste receipts of the order of 300,000 to 450,000 tonnes per year. Using the possible diversion rate of 30 to 40 % of the incoming material from disposal, a typical waste density (0.8 tonnes/m^3), and a 4:1 waste to cover ratio, the corresponding landfill air space requirement to support the diversion facilities for a 30 year operating period ranges from about 8 to 14 million m^3. For the purposes of the EA, Taggart Miller has assumed the landfill airspace requirement is likely to be in the 8 to 12 million m^3 range. EA impact studies will be carried out on the landfill airspace for which EA approval is ultimately sought. The airspace will be defined by the preferred Site development concept. This will enable the diversion facilities to operate for a sufficient period of time without being prematurely limited by the availability of on-site residuals disposal.

The actual rate of landfill airspace consumption would depend on the annual tonnage received and the amount that can be diverted over time by the on-site facilities. It is contemplated that the disposal cells would be developed progressively in stages as required, with approvals required from MOE under conditions in the EPA Environmental Compliance Approval on a stage by stage basis.

Additional information on the proposed diversion facility components of the proposed CRRRC is provided in the next section of these proposed TOR.

6.0 CONCEPTUAL DESCRIPTION OF PROPOSED CRRRC DIVERSION FACILITIES

The initial stages of the proposed IC&I and C&D diversion components at the CRRRC site will be developed as part of the initial site development, together with the first cell(s) of the disposal component and other infrastructure required to operate the new integrated waste management facility. Both the diversion and disposal components will be implemented at a scale appropriate for the level of business that might reasonably be expected during the initial period of site operation. The facilities will be scalable and their capacity will be increased over time in order to respond efficiently to changing market conditions and to any new government regulations mandating increased IC&I diversion.

There is currently limited source separation of IC&I and C&D waste materials in Ottawa and, as such, much of the IC&I and C&D materials are mixed (one exception, compared to other materials, is greater source separation of corrugated cardboard). This is an important factor in deciding on the types of diversion facilities that are appropriate and in the way they are designed, as well as in considering what diversion can be realistically and practically achieved in the early years of the CRRRC.

One of the key factors in successfully and effectively operating a diversion business is the development of relatively local markets where possible for the recovered materials. Taggart Miller is presently doing this in the other areas in which they operate diversion facilities, and expect to do the same in the Ottawa / eastern Ontario area.

Another important factor in the amount of material that can be diverted is the quality of the recovered material itself, which is typically improved by reducing mixing with other waste materials. As part of providing waste diversion and residuals disposal services, Taggart Miller propose to work with their IC&I and C&D customers, e.g., through ongoing education and provision of appropriate collection receptacles as end markets develop, to increase source separation of materials that are targeted for diversion, thereby enabling more cost efficient diversion of higher quality materials and achieving an overall increase in the potential diversion rate.

In addition to IC&I and C&D wastes, other materials must be managed, such as contaminated and surplus soils that originate from land development and construction projects. Contaminated soils that are classified as non-hazardous (in eastern Ontario, contaminated soils are most frequently impacted by petroleum hydrocarbons or metals) are typically taken to landfill sites. There is also a facility in eastern Ontario (Laflèche-Leblanc) that is licensed to treat contaminated soils for subsequent re-use. Ontario regulations as they apply to site redevelopment projects mean that soils that are surplus to the site needs often cannot be taken to other sites, and as such, licensed landfills are the recipients of these surplus soils. In the Ottawa area alone, it is estimated that the quantities requiring management amount to several hundred thousand cubic metres per year (City of Ottawa, 2007b). Treated soils could be used at the CRRRC for daily cover at the landfill component or for other purposes such as berming, on-site construction, on-site roads, site grading, etc., where appropriate, or provided to off-Site users as appropriate.

Taggart Miller proposes the following diversion facilities/operations for the CRRRC at this time:

- Material Recovery Facility (MRF);
- C&D Recycling;
- Organics Processing;
- Hydrocarbon contaminated soil treatment;
- Surplus soil management;
- Drop off for separated materials or for separation of materials; and
- Leaf and yard materials composting (if there is enough material available)

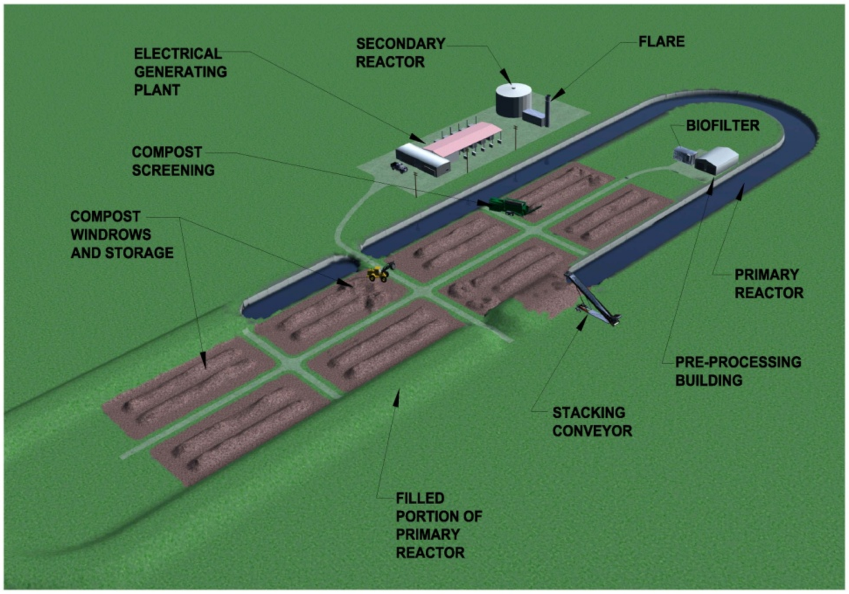
Each of these proposed diversion components are conceptually described below.

The Material Recovery Facility (MRF) will process and recover IC&I materials, and be designed to handle both mixed materials and source separated loads. The MRF operation will take place within a building, and basically consists of dumping from the haulage vehicles onto a tipping floor and then placing the materials onto equipment that uses a combination of both automated and manual sorting processes to separate out and recover designated materials according to their composition (plastic, metal, glass, paper, cardboard), with the remainder going to disposal.

C&D Recycling will be carried out to recover waste materials received from construction and demolition projects, which are typically received at the site in roll off bins. Incoming loads would be segregated initially according to their main material components (mostly concrete, mostly wood (clean or dirty), mostly asphalt, etc.), which can then be further sorted for appropriate processing. The C&D recycling plant is typically an outdoor operation, although some components can be enclosed or partially enclosed. For example, metal is recovered directly; wood is often chipped or shredded for composting or made into mulch; asphalt is ground for re-use; and concrete is crushed. Materials that cannot be recovered will go to disposal.

An Organics Processing Facility will be constructed to remove the organics component from those portions of the IC&I waste stream that contain a sufficient amount of organics. Taggart Miller are currently proposing the implementation of a unique anaerobic digestion process that takes place within a covered facility, and is specifically designed to process the organics contained either within the highly variable mixed IC&I waste stream or source separated organics. The facility components and process train would consist of:

- A building within which the organic materials are initially stored and pre-processed until there is adequate quantity for processing; the building would be kept under negative pressure and exhausted through a bio-filter for odour control and storage times would be minimal;



- The primary reactor would have a liner to contain and capture the liquor generated by the organics processing. The organic material would be blended with a bulking agent and then placed in the lined cell; both air injection and gas collection piping would be installed within the material and the material then covered to form a sealed system that is kept under negative pressure. The cell would be completed with vegetated cover; the treatment process will take several hundred days to complete, resulting in a much higher level of stabilization and conversion of many potentially odorous compounds to a stable, non-odorous form;
- The collected liquor would be conveyed to a secondary reactor and converted to methane and carbon dioxide. The spent liquor would then be recirculated through the primary reactor. Decomposition of the organics will also generate methane gas. The gas will initially be sent to an on-Site flare. When in sufficient quantity, it would be sent to an electrical generation plant where the electricity may be used on-Site or connected to the grid if possible. If the gas is insufficient in quantity or for other reasons, it would continue to be sent to an on-site flare; and
- Once the organics decomposition is complete, the section of the primary reactor will be converted to aerobic operation to stabilize the treated material before it is removed and placed in an outdoor windrow composting area to undergo further treatment. The stabilized organics are screened to remove bulking agent and plastics, then could be used off-Site in agriculture as fertilizer or, if it contains unacceptable constituents, used on-Site for landfill cover or disposed.
- Once the organics decomposition is complete, the section of the primary reactor will be converted to aerobic operation to stabilize the treated material before it is removed and placed in an outdoor windrow

composting area to undergo further treatment. The stabilized organics are screened to remove bulking agent and plastics, then could be used off-Site in agriculture as fertilizer or, if it contains unacceptable constituents, used on-Site for landfill cover or disposed.

- If the proposed anaerobic digestion process described above is not initially approved by the MOE at commercial scale, Taggart Miller are willing to proceed with the above technology at a demonstration scale prior to proceeding with a full scale facility. If for whatever reason this technology is not approved by MOE, Taggart Miller will propose and utilize one or more other organics processing technologies that will meet all environmental requirements for approval by the MOE. If it becomes necessary to change the organics processing technology from that assessed in the EA, an amending procedure will be provided in the EA.

Decomposition of organic material within a landfill increases the strength of collected leachate requiring treatment, and results in the generation of landfill gas and potential odour releases. Organics processing prior to landfilling of residuals as proposed at the CRRRC will result in a more stabilized residual material and be beneficial in minimizing the potential environmental impact of the landfill.

Treatment of hydrocarbon contaminated soils. The CRRRC would treat these soils using a straightforward bio-treatment approach within lined and covered treatment cells; these cells could be located and constructed on various parts of the site over time. It is expected that the majority of the treated soils would be re-used on site.

The management of surplus uncontaminated soils or rock received from construction projects would involve stockpiling of these materials for re-use as daily cover for the waste or for other on-Site uses.

A typical grade-separated drop off facility to facilitate separation of recoverable materials from that requiring disposal would be provided. In addition, provision would be made for the acceptance of source separated leaf and yard waste materials, i.e., from landscaping and property maintenance contractors, which could either be co-processed with the organics in the anaerobic digestion process or in the open windrow composting operation.

The positioning of these diversion components within the overall CRRRC site development plan will be integrated with the disposal component and other Site works during the EA. Additional diversion components may be added to the CRRRC over time, as technology and/or the end markets develop.

7.0 EXISTING ENVIRONMENTAL CONDITIONS

The various aspects of the environment described in relation to existing conditions are: atmosphere, geology and hydrogeology, surface water, biology, cultural and heritage resources, land use and socio-economic, agriculture, and traffic. This section presents an overview of existing environmental conditions for each of the North Russell Road Site and the Boundary Road Site.

7.1 North Russell Road Site

- **Atmosphere Environment**

  The air quality in the Site vicinity is typical of air quality of rural eastern Ontario. Agricultural activities on the Site and in the Site-vicinity, as well as road traffic, contribute to baseline air quality/odour levels and occurrences, and noise levels. During operations, quarry activities on the Site also contributed to the background air (i.e., dust) and noise levels in the Site- vicinity. Site specific air, odour and noise information is limited and more detailed studies of background levels will be conducted during the environmental assessment if this Site is determined to be the preferred Site.

- **Geology and Hydrogeology Environment**

  The Site lies within a flat lying clay landscape with little topographic relief, interrupted by ridges of glacial till and/or bedrock. The Site is located within an extensive north-south trending deposit of glacial till soil, which typically consists of sandy silt to silty sand, with gravel, a trace of clay and variable cobble and boulder content. The till cover over the bedrock is relatively thin, likely varying from about zero metres to four metres, and below much of the site is underlain by shale bedrock of the Queenston Formation. Regionally, the till feature protrudes up through, and is surrounded by, an extensive deposit of marine silty clay. The thickness of the clay generally increases with distance from the till ridge feature, to about 30 metres thick; the clay is generally underlain by a basal gravelly till deposit followed by bedrock.

  The results of studies completed by the Geological Survey of Canada indicates that there is a continuous, narrow, north-south oriented esker (coarse gravel) feature, extending about 40 kilometres from near the Ottawa River in the north to between Winchester and Chesterville in the south. In the northern portion of the esker and in the portion south of about Morewood, the esker is often exposed at surface and in some locations has been developed as sand and gravel pits. In the central portion, the esker is buried beneath a thick deposit of silty clay and rests on top of the bedrock surface. The studies report that in the area between about Limoges and south of Russell/Embrun, the esker core is an approximately 200 metre wide zone, located just over 4 kilometres east of Eadie Road (at the intersection of Route 200 and St. Pierre Road) and trending slightly northeast, buried within a 25 to 30 metre thick deposit of silty clay soil. This esker is an important source of existing and potential groundwater supply, currently supplying water to a number of communities, (i.e., Vars, Limoges, Winchester and Chesterville). The majority of recharge to the esker is thought to occur from direct precipitation on areas where the granular esker materials are exposed, although some recharge may also occur via the basal till unit.

  In terms of the bedrock geology, the area of the property is shown as underlain by Queenston shale, which is the youngest formation of sedimentary rock in eastern Ontario. Queenston shale is a red, laminated to thickly bedded calcareous siltstone and shale. The property is located near the middle of a band of shale, which on published bedrock geology maps is shown as extending about 4 km west-east by 15 km north-south. Based on preliminary site investigation work carried out by Taggart Miller, it has been found that about half way across the portion of the Site east of Eadie Road the soil thickness starts to increase, the shale is absent and the bedrock is limestone, i.e., the shale band is not as extensive in the eastward direction as interpreted on published mapping. The contacts between bedrock formations are typically caused by a series of near-vertical faults, which caused down-throwing of adjacent blocks of bedrock. To the south, the uppermost bedrock is limestone, while to the southwest and north it is Carlsbad formation layered shale and limestone.

In terms of regional hydrogeology, the groundwater flow direction in the bedrock and basal till is generally east to northeast. Based on preliminary investigations at the Site, groundwater flow on the Site is generally towards the east/northeast, with a local component of westerly shallow flow indicated in the western most portion of the Site.

Water supply to homes and farms in the rural area within which the Site is located relies on individual wells. Published information for the general area suggests that most wells obtain their groundwater from zones within the shale and limestone. Where the bedrock is overlain by the clay deposit, wells often obtain their water from a permeable zone at the soil to bedrock contact. In general, water quality gets poorer with depth, associated with the age of the water. Well depths vary considerably due to the changes in geological setting. The majority of the development within the villages of Russell and Embrun connected to a municipal water supply from the City of Ottawa in 2010, although some locations remain on individual wells.

- **Surface Water Environment**

  The Site lies within the Castor River watershed, which is managed by South Nation Conservation (SNC). Drainage in the area is mainly by a network of agricultural ditches, municipal drains and small creeks. The Fournier Municipal Drain runs through and along the north side and through the east portion of the Concession IV part of the Site. On-Site there are three lower lying areas where intermittent watercourses originate on the property and provide the current drainage. There is also standing water present within the existing quarry and there is no drainage outlet to the quarry. The local drainage networks in the area eventually flow south to the Castor River, located about 4.5 kilometres south of the Site. The Castor River enters the South Nation River about 20 kilometres downstream of Russell, which in turn eventually discharges to the Ottawa River. The Castor River is a relatively small river with quite low flows during the summer period and at other times of year.

- **Biology Environment** (terrestrial and aquatic ecosystems)

  The Site contains a mosaic of agricultural croplands and pasture, interspersed with cultural meadows (e.g. fallow fields) treed and shrubby hedgerows, scattered small woodlots and low-lying swamp areas. Based on the findings of preliminary field surveys carried out by the proponent during their assessment of project feasibility, the plant communities on the site are primarily those that are typical of an agricultural landscape and are common in the Ottawa area. A good proportion of the plants found on the Site are early succession ‘waste’ area species. The habitats and species observed on the Site during preliminary field surveys are typical of agricultural landscapes in the region. Assessments of potential significant or sensitive species, including Species At Risk, will be required as part of the EA studies, with reference to the current SAR species list and following the protocols agreed to with the MNR.

On-site watercourses were identified as the three depressed areas that contain intermittent watercourses, and the Fournier Municipal Drain on the east side of Eadie Road. The Fournier Drain also only flows intermittently, with its main flow during the year coming from the discharge of water from the quarry when it is being pumped. During preliminary field surveys, no fish were observed in any of these watercourses. The water contained in the existing quarry, when it is recharging after permitted pumping that has been conducted annually for many years as part of quarry operations, does not constitute aquatic habitat.

- **Land Use and Socio-economic Environment** (current and planned future land uses)

The Site is located within the Township of Russell, which is a municipality within the United Counties of Prescott-Russell. The Township has a significant rural agricultural community and some rural residential development, with local commercial and institutional development within the Villages of Russell and Embrun. Russell and Embrun are located approximately 3 km south and 6 km southeast, respectively, of the closest limits of the Site. There has and continues to be growth through residential development, with the concentration being within the Villages and some in the rural areas mainly along existing rural road frontages; a large number of these residents are employed within the nearby City of Ottawa. The Township does not have significant industrial or commercial development, other than a partially developed industrial business park to the northeast of the Site. It is located at the southwest corner of the Highway 417/Vars Interchange (exit 88). It is envisaged that future development will be focused within the Villages; expansion of the boundaries of the Villages of Russell and Embrun on Rural designated lands has been suggested to provide additional lands for local development and for recreational/community use areas. There are no Rural designated lands between the Villages and the Site; that land is designated as protected Agriculture.

The existing land use in the area of the Site is primarily agricultural with accessory residential units. There are a limited number of rural residential uses on small lots. There are about 30 residences within 500 metres of the proposed CRRRC property boundaries; there are also some farm related uses.

There is a 43 rural lot subdivision (Stanley Crescent) located along Route 100 about 1 km to the west/northwest of the west boundary of the site. A cemetery is located on the west side of North Russell Road opposite the west end of the site. A 107 hectare portion of the overall 193 hectare site is licensed under the Aggregate Resources Act for shale extraction.

Land use for the area is subject to the United Counties of Prescott-Russell Official Plan. The portion of the site licensed for quarry operations is designated as Aggregate Extraction; the remainder of the site is designated as Agricultural Resource. The surrounding lands are also designated as Agricultural Resource.

From a visual perspective, the Site is situated on a local rise in what is otherwise fairly flat terrain. Much of the area has been historically cleared for agricultural purposes, with some natural features remaining in the form of local woodlots and treed fence lines.

- **Agriculture Environment**

The majority of the land area in the study area is agricultural croplands and pasture, interspersed with cultural meadows (e.g., fallow fields), treed and shrubby hedgerows, scattered small woodlots and some low lying poorly drained areas. The County Official Plan identifies the western portion of the site as having a Class 1 agricultural capability, and the eastern portion as Class 2; this is based on the Canada Land Inventory (CLI) for Soils mapping. Based on a Site-specific preliminary assessment of agricultural soil capability, there appears to be a discrepancy between the findings of this assessment and the CLI. Based on the Site work, only a small area is indicated to be Class 3 and the remainder is considered to be Class 4.

At present, the on-site lands are not cultivated except for a few fields in the south part of the property. The remainder are used for a variety of uses including pasture/hay, forested areas, and the shale quarry. Based on preliminary on-Site work, the presence of agricultural improvements such as tile drainage in the fields is not apparent.

- **Cultural and Heritage Resources Environment**

  There are no registered heritage buildings or archaeological sites in the Site-vicinity or within a three km radius. Based on preliminary work and guidance provided by the Ministry of Tourism, Culture and Sports, due to the presence of wet low lying lands in the Site-Vicinity, the lands are categorized as having a moderate potential for pre-contact archaeological resources. There is historical data that indicates that the properties were used for agriculture as early as the beginning of the nineteenth century.

- **Traffic Environment**

  Traffic is comprised of infrastructure and traffic conditions. The closest major provincial highway to the Site/study area is provincial Highway 417, located approximately 5 km north of the Site. Highway 417 interchanges are located at Boundary Road (exit 96) and Vars/St. Guillaume Road (exit 88), some 9 km northwest and 5 km northeast, respectively, of the Site. Based on the proposed service area for the proposed CRRRC, it is expected that the majority of site-related traffic would use the Vars and/or the Boundary Road exits should the North Russell Road Site be preferred. The road network between the interchanges and the site consists of rural collector and rural arterial roads owned by the City of Ottawa or the Township of Russell.

  On the west side of the site is North Russell Road, a two lane rural road that runs north-south from Burton Road to the Village of Russell approximately 3 km to the south of the south boundary of the site. Eadie Road, a secondary rural road, divides the western and eastern portions of the site lands. Access between the Village of Russell and Highway 417 utilizes both Boundary Road and North Russell Road. Access between the Village of Embrun and Highway 417 mainly utilizes St. Guillaume Road.

  There are no airport facilities in the Site-vicinity that could potentially be affected by the proposed undertaking.

Shale Extraction: Historically, a portion of the Site was used for the extraction of shale for brick making. If the North Russell Road is identified as preferred for the project, the former use of the Site for shale extraction will be considered in the EA when describing the existing environment. The central and eastern parts of the Site property were formerly owned by Hanson Brick, and consist of a quarry licensed under the Aggregate Resources Act for shale extraction. The existing quarry has operated for about a century; approximately 1 million cubic metres of shale has been extracted over this period, such that the existing quarry covers an area of about 15 hectares to a depth of about 8 to 11 metres below ground surface. Published information estimates that the majority (about 93%) of the Queenston Formation shale resources in Ontario are located in the Niagara escarpment area of southern Ontario, with the shale in Russell Township representing about 7%[6]. The reserve in the licensed quarry on the Site is reported to represent less than 1% of the reserve in Ontario. The extracted shale is used for the manufacture of bricks. In Ontario, brick manufacturing is predominantly carried out at two major facilities in southern Ontario by Hanson Canada Brick and Brampton Brick; these are located close to the much larger Queenston shale deposit/quarries and close to the major market for manufactured brick, the two key economic factors in this industry. Prior to Taggart Miller purchasing the Site, it was owned and operated by Hanson Brick, which also operated a brick manufacturing facility on Highway 31 at Rideau Road in south Ottawa. In 2006, Hanson Brick decided to discontinue quarry operations and brick manufacturing in the Ottawa area and consolidate their Ontario operations at their southern Ontario facility because it was no longer economically viable to continue in eastern Ontario. In addition to being farther from a major market, the chemical-physical properties of the Queenston shale in Russell Township are less favourable than those of the Formation in southern Ontario, making the manufacture of brick more expensive due to the need for additional physical processing and an additive to plasticize the shale.

7.2 Boundary Road Site

- **Atmosphere Environment**

  The air quality in the Site vicinity is typical of air quality in rural eastern Ontario. The baseline air quality, noise and odours are primarily the result of a combination of the adjacent Highway 417 and Boundary Road traffic, the activities in the industrial park immediately to the west, and agricultural operations located in the area of the site. Site specific air, noise and odour information is limited and more detailed studies of existing background levels will be conducted during the environmental assessment if this Site is determined to be the preferred Site.

- **Geology and Hydrogeology Environment**

  The Boundary Road Site lies within a flat lying clay landscape with little topographic relief, interrupted by ridges of glacial till and/or bedrock. The Site and surrounding areas are underlain by an extensive and thick deposit of silty clay soil of marine origin. The upper 1 to 2 m zone consists of a discontinuous surface sand layer overlying weathered silty clay; this is underlain by the remainder of the silty clay deposit to a total depth of about 30 to 35 m in the area of the Site. The clay deposit is in turn underlain by about 1.5 to 5 m of a basal gravelly glacial till, followed by bedrock.

  From previous geotechnical investigations in the area of the Site, it is known that below the upper weathered zone of the deposit the clay has a soft consistency to a depth of about 10 m, below which its shear strength gradually increases with depth and becomes stiff. The silty clay is a high plasticity soil with high natural water content, typical of the deposit in this area.

  Published mapping by the Geological Survey of Canada shows that the bedrock beneath the majority of the site consists of interbedded shale and limestone of the Carlsbad formation; the total thickness of this bedrock unit is reported to be in the range of about 115 to 150m.

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[6] Guillet, G.R. and Joyce, I.H., 1987. The Clay and Shale Industries of Ontario. Report Prepared for the Ministry of Natural Resources.

In the absence of effective drainage in this flat lying terrain, the groundwater level in this fine grained soil is at, near or above the ground surface throughout much of the year. In view of its low permeability characteristic, there is anticipated to be limited horizontal or vertical groundwater flow in the silty clay deposit; groundwater movement in the silty clay deposit would be very locally influenced adjacent to ditches or other watercourses. The silty clay deposit is known to be an aquitard, which would not allow recharge of the basal till and bedrock. Groundwater flow occurs in the basal till and bedrock; the direction of regional groundwater flow in these zones is indicated to be towards the northeast.

Water supply to residences, farms and industrial properties in the area of the Site utilizes individual wells. Drilled wells in this area are able to obtain their water supply from the basal till / bedrock contact zone or from within the upper part of the bedrock. The yield of water from this zone is usually adequate in quantity for domestic use, with well yields reported to typically range from 15 to 25 litres/minute, and up to 45 to 65 litres/minute in certain wells. In the immediate vicinity of the Site, the few wells registered in the MOE Water Well Information System are completed in the basal till/bedrock contact zone and are indicated to yield enough water for domestic use. However, the groundwater quality in the vicinity of the Site is reported as salty, sulphurous or mineralized; the presence of methane gas in the groundwater is also reported. Because of this naturally poor water quality at depth, shallow dug wells are typically use to provide a water supply from the upper sand layer and weathered clay zone; some residents use bottled water for consumption because of concerns about bacterial contamination in the dug wells. These natural groundwater quality problems are known to exist as far as 3 or 4 km to the north of the Site to the area of Carlsbad Springs and also to the west. In the mid 1990s the City of Ottawa extended the municipal water supply to Carlsbad Springs for this reason. Further to the southwest and southeast, drilled wells completed in the basal till are reported in the MOE well records as providing fresh groundwater quality.

- **Surface Water Environment**

The Site drains northward into the Bear Brook Subwatershed, which is managed by South Nation Conservation. Drains that cross the Site, consisting of old farm field drainage that has not been maintained and a Municipal Drain, flow to the east and pass beneath Highway 417 and discharge to Shaw’s Creek just to the west of Vars; Shaw’s Creek flows northward about 5 km and enters Bear Brook, which flows east about 30 km to eventually enter the South Nation River. There are also roadside ditches along Devine and Frontier Roads that also drain eastward. At present, drainage on the Site is not well established and the land is poorly drained.

There are two municipal drains on or in the immediate area of the Site. The Simpson Municipal Drain is oriented west to east and is located about two-thirds of the way north along the north-south dimension of the property; this provides the drainage outlet for the most of the northern part of the Site as well as the Industrial Park to the west and a section of Boundary Road. To the north of Highway 417 is the Regimbald Municipal Drain, which receives runoff from the very northern portion of the Site and enters the Simpson Drain just after it crosses beneath Highway 417. An old farm ditch that crosses the southern part of the Site also makes its way eastward and enters Shaw’s Creek at the confluence with the Simpson Drain. These two Drains are classified as intermittent flow meaning they do not provide high quality aquatic habitat.

- **Biology Environment** (terrestrial and aquatic ecosystems)

Based on published information and preliminary field surveys carried out by the proponent, the Site consists of a mosaic of immature forest re-establishing on land previously used for farming, and deciduous thickets. There is also an area of naturalized white spruce plantation. In the northwest corner is a woodlot dominated by immature white birch, with agricultural crop fields in much of the remainder of the northern portion of the Site. Assessments of potential significant or sensitive species, including Species At Risk, will be required as part of the EA studies should the Boundary Road Site be preferred, following the protocols agreed to with the MNR. The Simpson Municipal Drain provides drainage for a large part of the Site; elsewhere, former agricultural drainage ditches are heavily vegetated with thickets and are functioning poorly, resulting in wet conditions across much of the Site.

- **Land Use and Socio-economic Environment** (current and planned future land uses)

The Site is located within the east end of the City of Ottawa, which is a major urban center. The portion of the City within which the Site is located is characterized by a provincial highway corridor, a partially developed rural industrial park, and a combination of general rural and agricultural uses. The closest developed area is the Village of Edwards about 2 km to the west; separated from the Site by the Highway 417 corridor are the Village of Vars about 5.5 km to the east and the Village of Carlsbad Springs about 3 km to the north. A 43 rural lot subdivision is located within the Township of Russell along Route 100 about 4 km to the south of the Site. A golf course is located north of the Site across the Highway 417 corridor

The land use and zoning to the west of the Site fronting on Boundary Road is Rural Heavy Industrial (RH), as is a limited portion of the Site. The Site itself is otherwise zoned General Rural, as is the land to the south and west. Lands to the east are mainly zoned Agricultural Resource and are used for this purpose. There are 4 known residences within 500 metres of the proposed CRRRC site boundaries.

From a visual perspective, the Site is situated in flat terrain, and is generally well screened from Boundary Road by trees.

- **Agriculture Environment**

The majority of the Site was historically cleared for farming, however those efforts were not pursued and the Site has been allowed to re-vegetate. The high water table associated with poor drainage presents a significant constraint to agricultural use. Only the very northern part of the Site is now used for row crops. The Site lands are zoned General Rural or Rural Industrial, so they are not included in Agricultural zoning. There appears to be a discrepancy between the published soils mapping, the Canada Land Inventory (CLI) agricultural classification rating system and the CLI capability mapping. The soils mapping shows the northern part of the Site as underlain by St. Thomas sandy loam (ST6) and the south portion by Manotick fine sand (M6), both level land with poor drainage. The CLI rating system classifies the ST6 unit as Class 5FW' (low Fertility, poor Drainage) agricultural capability, and the M6 unit as Class 4FW', i.e., indicating the capability for agriculture across the Site as Class 4 or lower. However, the CLI mapping shows the southern part of the Site as being classified as Class 3W, i.e. Class 3 agricultural capability. Lands to the east, southeast and south are used for agricultural purposes, either crops to the east or livestock some distance to the southeast.

- **Cultural and Heritage Resources Environment**

  Based on preliminary work, there are no registered archaeological sites on the Site or within a three kilometre radius. Due to the flat topography and poorly drained soils, guidance provided by the Ministry of Tourism, Culture and Sports and regional assessment carried out by the City of Ottawa, the majority of the Site is indicated to have low archaeological potential. The north end of the Site is interpreted to have possibly contained an abandoned arm of Bear Brook Creek, and so is considered to have moderate potential for pre-contact archaeological resources.

- **Traffic Environment**

  Traffic is comprised of infrastructure and traffic conditions. The closest major provincial highway to the Site/study area is provincial Highway 417, located along the north boundary of the Site. The closest Highway 417 interchange is just northwest of the Site at Boundary Road (exit 96), with the Vars/St. Guillaume Road (exit 88) some 6 km to the east. Based on the proposed service area for the proposed CRRRC, it is expected that the most of site-related traffic would use the Boundary Road exit. The road network between this interchange and the Site consists of two arterial roads, Boundary Road and Devine Road (Regional Road 8) owned by the City of Ottawa. Boundary Road provides one of the two main routes from Highway 417 southward to the Village of Russell, as well as to Edwards located to the west along Mitch Owens Road.

  There are no airport facilities in the Site-vicinity that could potentially be affected by the proposed undertaking.

8.0 ENVIRONMENTAL ASSESSMENT METHODOLOGY

This section of the TOR provides an overview of the proposed approach to the environmental assessment (EA) of the proposed Capital Region Resource Recovery Centre (CRRRC), as well as the related EPA/OWRA work. The CRRRC, if approved, would provide facilities and capacity for recovery of resources and diversion of material from disposal generated by the industrial, commercial and institutional (IC&I) and construction and demolition (C&D) sectors primarily in Ottawa and secondarily a portion of eastern Ontario, for management and utilization of surplus and contaminated soils, as well as landfill disposal capacity for material that is not diverted.

A flow chart illustrating the EA/EPA process to be followed for the CRRRC project is provided on **Figure 8-1**.

Work plans for the individual environmental components/technical disciplines to be used to better define baseline conditions and for the assessment of impacts/effects from the preferred Site development concept for both of the Sites accompany this document in **Appendix C**. Work plans have been included for both Sites as the preferred Site has not yet been identified.

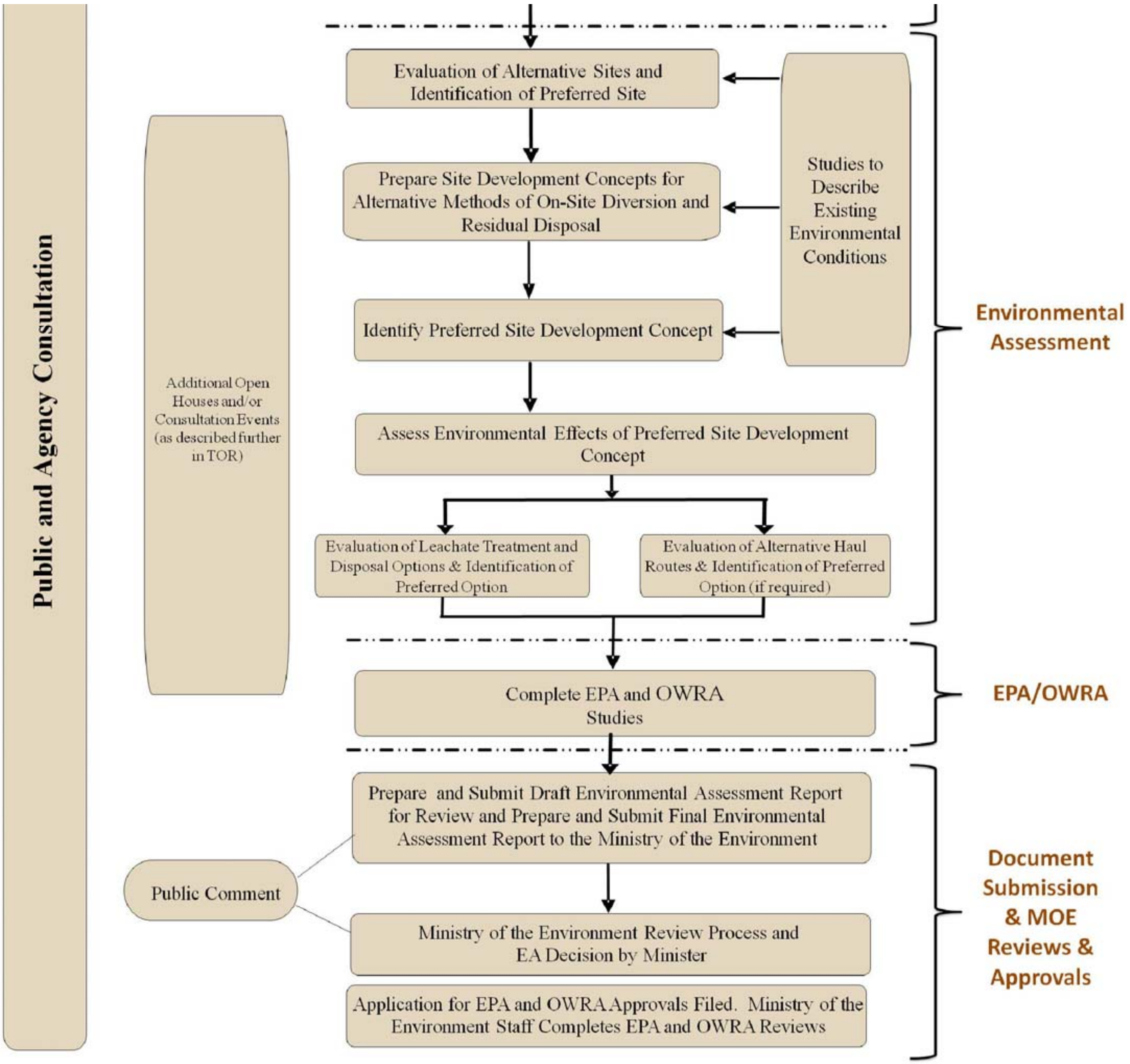
During preparation of the TOR, comments were solicited from the public and the GRT on the draft work plans for the North Russell Road Site, as well as on the draft EA methodology. This was done before the alternative Boundary Road Site was included for consideration in the EA. Comments received on these draft documents were considered as applicable in revising the proposed EA methodology, in preparing the proposed work plans for the Boundary Road Site, and in revisions to the work plans for the North Russell Road Site.

The contemplated activities to complete the EPA evaluation and documentation preparation (as well as that required under the *Ontario Water Resources Act* (OWRA)), are also outlined in this section. While the EPA application for the CRRRC will only be submitted after an EA approval is received, the information necessary to support the EPA application will accompany the EA application.

8.1 Comparative Evaluation of Alternative Sites and Identification of Preferred Site

As noted above, two properties that are owned or have been optioned by Taggart Miller have been identified for the proposed CRRRC (the Alternative Sites). The location of the Alternative Sites is shown on **Figure 1-1**. The Alternative Sites are described below:

- **North Russell Road Site** - located in the northwest part of the Township of Russell about three kilometres east of the boundary with the City of Ottawa, and about five kilometres south of Provincial Highway 417 between the Boundary Road and Vars exits. The property consists of about 193 hectares (476 acres) of contiguous lands on Part of Lots 18 and 19, Concessions III and IV, Township of Russell; and
- **Boundary Road Site** - located in the east part of the City of Ottawa, in the former Township of Cumberland and just southeast of the Highway 417/Boundary Road interchange. The property is on the east side of Boundary Road, east of an existing industrial park, north of Devine Road and west of Frontier Road and totals about 175 hectares (430 acres) of land on Lots 23 to 25, Concession 11, Township of Cumberland.



Golder Associates
Ottawa, Ontario

FILE No. 0911251008-9000-TOR_Chart_10Jul12.dwg

PROJECT No. P.L.E. REV. 0

SCALE NA

DATE Sept. 2012

DESIGN M.F.

CADD P.J.M./B.R.

CHECK P.L.E.

REVIEW P.A.S.

TITLE

EA / EPA PROCESS FLOW CHART

TERMS OF REFERENCE FOR ENVIRONMENTAL ASSESSMENT OF THE
CAPITAL REGION RESOURCE RECOVERY CENTRE

FIGURE **8-1**

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The first step in the EA process will be the identification of the preferred Site for the proposed diversion facilities and landfill that comprise the CRRRC. This will be done based on a comparison of information about each of the two Alternative Sites available from published information and from preliminary investigations/assessments on or in the vicinity of each of the Sites. The Alternative Sites will be compared using the components, criteria, indicators and data sources presented in **Appendix A** to the TOR. The comparative evaluation would take into account as appropriate the relative importance or ranking of the different site evaluation environmental components as established by the public consultation process, (i.e., although all are relevant, certain criteria may be considered more important than others).

The components cover the broad range of environment to be considered under the EAA. The components and criteria proposed for use in the evaluation of the Alternative Sites are as follows:

Component	Assessment Criteria
Atmosphere	Which site is preferred regarding potential effects due to air quality and noise?
Geology, Hydrogeology & Geotechnical	Which site is preferred for protection of groundwater?
Surface Water	Which site is preferred for protection of surface water quality?
Biology	Which site is preferred for protection of terrestrial and aquatic biological systems?
Land Use & Socio-economic	Which site is more compatible with current and proposed planned future land uses in the Site-vicinity?
	Which site is preferred for the protection of mineral aggregate resources?
Culture & Heritage Resources	Which site is preferred for the protection of archaeological and heritage resources, and cultural heritage landscapes?
Agriculture	Which site is preferred regarding potential for effects on agriculture?
Design and Operations	Which site is preferred regarding the anticipated amount of engineering required to assure MOE groundwater quality criteria are met at the property boundary?
Traffic	Which site is preferred regarding potential effects from Site-related truck traffic?

Based on the public input received during the TOR consultation process, as documented in **Volume 2 – Consultation Record** and summarized in Section 9.4, the following grouping of components is proposed in terms of relative importance for the comparative evaluation of the Alternative Sites:

- Most Important: Geology, Hydrogeology & Geotechnical; Atmospheric; Land Use & Socio-economic; Traffic;
- Important: Surface Water; Agriculture; Biology; Design & Operations; and
- Less Important: Culture & Heritage Resources

The assessment will also include a listing of the relative advantages and disadvantages of each Alternative Site. The outcome of this step will be the identification of the preferred Site for the undertaking. The EA and EPA studies and impact assessment will be undertaken for the preferred Site, following the methodology described in the following sections and in **Appendix C**. Subject to the results of the process described in Sections 8.1.1 and 8.3.3 below, the other Site will be dropped from further consideration.

8.1.1 Additional Considerations if North Russell Road Site Identified as the Preferred Site for the CRRRC

It is recognized that it can be considered challenging to characterize and adequately monitor all potential contaminant pathways in the subsurface in fractured bedrock due to the complex fracture networks that can exist. Practicable contingency measures can also be challenging to implement in a fractured bedrock environment. **If the North Russell Road site is identified as otherwise preferred**, the following initial work is proposed:

- The geology, hydrogeology & geotechnical work plan to describe the regional setting and determine the Site-specific geological and hydrogeological characteristics would be completed ahead of all other work. The key objective of this part of the assessment will be to demonstrate that the proposed CRRRC landfill is capable of satisfying the requirements of O.Reg. 232/98 in terms of groundwater protection, monitoring and contingency planning on the North Russell Road site. Consultation with the appropriate MOE/GRT technical reviewers on the planning and details of the technical work plans would be carried out prior to commencing the work.

The purpose of this assessment is to obtain the support of the MOE from a groundwater protection perspective to proceed with the EA on the North Russell Road Site. If concurrence is not obtained, then Taggart Miller would eliminate the North Russell Road Site from further consideration and proceed with the EA and EPA assessments on the Boundary Road Site as described in Section 8.2. No further site selection process would be undertaken as the Boundary Road Site would be the only remaining site.

8.2 EA and EPA Assessments of the Preferred Site for the CRRRC

8.2.1 Overall Approach

Taggart Miller is proposing that the EA/EPA/OWRA assessment of the preferred Site identified by the process described in Section 8.1 take place in three phases. The proposed phases and work consists of the following tasks:

Phase 1: EA

- Task 1: Complete Assessment of Existing Environment;
- Task 2: Identify Preferred Site Development Concept;
- Task 3: Assess Environmental Effects of Preferred Site Development Concept;
- Task 4: Assessment of Alternative Haul Routes and Identify Preferred Route;
- Task 5: Evaluate Leachate Management Options and Identify Preferred Option; and,
- Task 6: Cumulative Impact Assessment.

Phase 2: EPA & OWRA

- Task 7: Complete EPA/OWRA Level Assessments for the Proposed CRRRC. (EPA and OWRA formal applications will only be submitted following EA approval)

Phase 3: Documentation and Submission

- Task 8: Finalize and Submit EAA/EPA/OWRA Documentation.

8.2.2 Environmental Components

The environmental components proposed for use in the assessment of environmental impacts of the preferred Site are as follows:

- Atmosphere;
- Geology, Hydrogeology & Geotechnical;
- Surface Water;
- Biology;
- Land Use & Socio-economic;
- Cultural & Heritage Resources;
- Agriculture;
- Design and Operations; and
- Traffic.

8.2.3 Study Areas

Data for the site-specific components of the EA has been and will be collected and analyzed for three study areas, as follows:

- Site – the lands secured by Taggart Miller for the proposed Capital Region Resource Recovery Centre at the preferred site ("the Site");
- Site-vicinity – the lands in the vicinity of the Site (generally within 500 m of the Site boundaries, but may be enlarged as determined appropriate for specific environmental components[7]); and
- Haul Routes – the main haul/access route(s) to the Site from Highway 417.

A 500 metre Site-vicinity study area around each of the Sites is shown on **Figure 8.2.3-1**.

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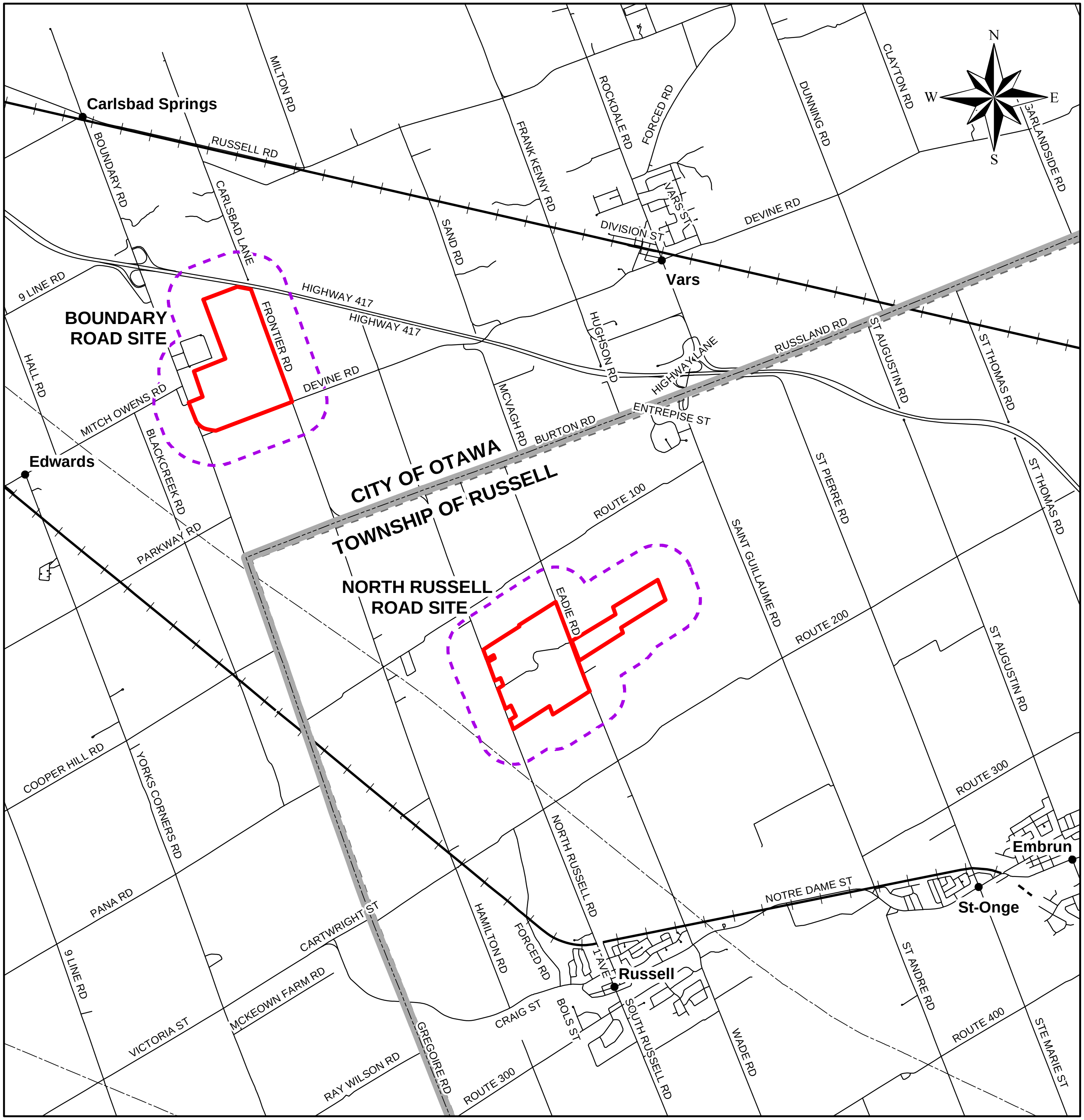
[7] *For example, for the surface water component, the Site-vicinity study area would be enlarged to the sub-watershed boundaries.*



LEGEND

- ● POPULATED PLACE NAME
- RAIL
- ROADWAY
- UTILITY
- TOWNSHIP OF RUSSELL BOUNDARY
- SITE-VICINITY (500m)
- CITY OF OTTAWA BOUNDARY

1 0.5 0 1 2 3

SCALE 1:80,000 KILOMETRES

NOTE

APPROPRIATE STUDY AREA BOUNDARIES WILL BE DETERMINED FOR EACH ENVIRONMENTAL COMPONENT DURING THE EA.

REFERENCE

DIGITAL NRVIS MNR DATA PRODUCED BY GOLDER ASSOCIATES LTD., USED UNDER LICENSE © QUEEN'S PRINTER OF ONTARIO.
PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83
COORDINATE SYSTEM: UTM ZONE 18

PROJECT TERMS OF REFERENCE FOR ENVIRONMENTAL ASSESSMENT OF THE CAPITAL REGION RESOURCE RECOVERY CENTRE

TITLE

STUDY AREA MAP

Golder Associates
Ottawa, Ontario

PROJECT No. 09-1125-1008-9000			SCALE AS SHOWN	REV. 0.0
DESIGN	PLE	31 Oct. 2012	FIGURE 8.2.3-1	
GIS	BR	30 Nov. 2012		
CHECK	PLE	30 Nov. 2012		
REVIEW	PAS	30 Nov. 2012		

Path: N:\Active\GIS\Clients\HansonBrick\GIS\Projects\0911251008\ArcGIS\Phase_9000 TOR\09-1125-1008-9000-8.2.3-1-StudyAreaMap.mxd

8.3 Scope of Work Plan for Phase 1

Phase 1 consists of six tasks (described below) that will assess the broad environmental effects of the Site that has been selected as preferred.

8.3.1 Task 1: Complete Assessment of Existing Environment

An initial overview of existing environmental conditions on each of the alternative Sites is provided in Section 7.0 of the TOR.

The existing environment that could potentially be affected by the project will be further described by the study team with regard to the proposed Study Areas for each of the proposed components listed in section 8.2.2. The project team will collect information and/or conduct studies (desktop and field) to describe the components and sub-components following the methodology described in the individual work plans provided in **Appendix C**.

8.3.2 Task 2: Identify Preferred Site Development Concept

Alternative site development concepts are different ways that the CRRRC project, i.e., diversion facilities, residual disposal landfill cells and other project components, can be implemented on the preferred Site. The potential layouts for the disposal component of the CRRRC are constrained by a number of physical factors that include the need to accommodate the land areas required for the diversion facilities and other Site operational requirements. The disposal facility will require sufficient airspace in order that capacity is available for residuals for the 30 year planning period used by Taggart Miller in considering the CRRRC. The residual disposal cells will also have to satisfy the requirements of Ontario Regulation 232/98 Landfill Standards.

Alternative Site development concepts will be prepared for the preferred Site once sufficient information on existing baseline environmental conditions has been obtained from published information sources, Site investigation, technical analysis and consultation/meetings with various agencies as described in the detailed work plans in **Appendix C**.

The site-specific considerations and constraints are generally expected to include the following:

- Adequate buffers between facility components and the property boundaries;
- Geometry and geotechnical considerations, i.e., maximum height of disposal cell, side slopes and top slopes of the disposal cell, both below grade and above grade, expected settlements of the subgrade soils under the applied load of the landfilled material;
- The geological conditions in order to establish an appropriate base level/elevation for diversion and/or disposal components;
- Consideration of the volume of excavated material to be managed on the Site; and
- Proximity to and types of neighbouring land uses.

The application of these considerations and constraints on the preferred Site will provide the land area within which the components of the CRRRC project can be laid out.

Based on Taggart Miller's current understanding of the conditions on and adjacent to each of the Alternative Sites, it is expected that at least two alternative Site development concepts will be presented for public consultation.

Each of the alternative Site development concepts methods will be described at a sufficient level of detail (i.e., conceptual designs) in terms of design and operational characteristics so that the individual environmental components that could potentially be affected can be identified. This will include a site plan and cross-sections, and an appropriate level of detail on the various project components. Public, Aboriginal community and MOE input will be sought on the alternative site development concepts and in particular on the basis for preferring one concept over another. Subject to input received on the concepts and other considerations, it is envisioned that the primary criterion used to determine the preferred Site development concept will be land use compatibility with neighbouring properties.

The outcome of this step will be the identification of the preferred Site development concept.

As the detailed impact assessments for the preferred Site development concept (Task 3) are completed, it may be necessary to modify or refine certain aspects of the preferred Site development concept. It is expected that any such modifications and refinements will be relatively small adjustments or refinements.

8.3.3 Task 3: Assess Environmental Effects of Preferred Site Development Concept

Using the methodology described for the preferred Site in the work plans in Appendix C, the project team members will assess the effects of the preferred Site development concept (i.e., the combined effects of the diversion facilities, the residuals disposal landfill and associated activities, including in-design mitigation measures) on the environment. This impact assessment will be done for each component of the environment, within the appropriate study areas, using existing environmental conditions (Task 1) and the conceptual design for the preferred Site development concept including in-design mitigation (Task 2). The assessments will generally be done at an EPA level of detail, in order to support both EA and EPA review and approvals purposes by the regulatory agencies.

Assessment of future environmental conditions associated with the preferred Site development concept will be provided by each discipline following the methodology provided in the work plans. If the assessment indicates that any additional mitigation measures are required to achieve site compliance with Provincial standards, they will be developed and the assessment repeated incorporating these measures. The project team will update and revise the conceptual design to include any additional mitigation measures. The final conceptual design will be documented in the EA/EPA Study Report, and the remaining "net effects" will be documented.

In relation to the Boundary Road Site, the Mer Bleue is recognized as an internationally significant wetland, a Class One provincially significant wetland and an Area of Natural and Scientific Interest. If the Boundary Road Site is identified as the preferred Site for the project, an assessment of the potential effects of the project on the Mer Bleue (located 3.5 kilometres to the northwest) will be provided in the EA.

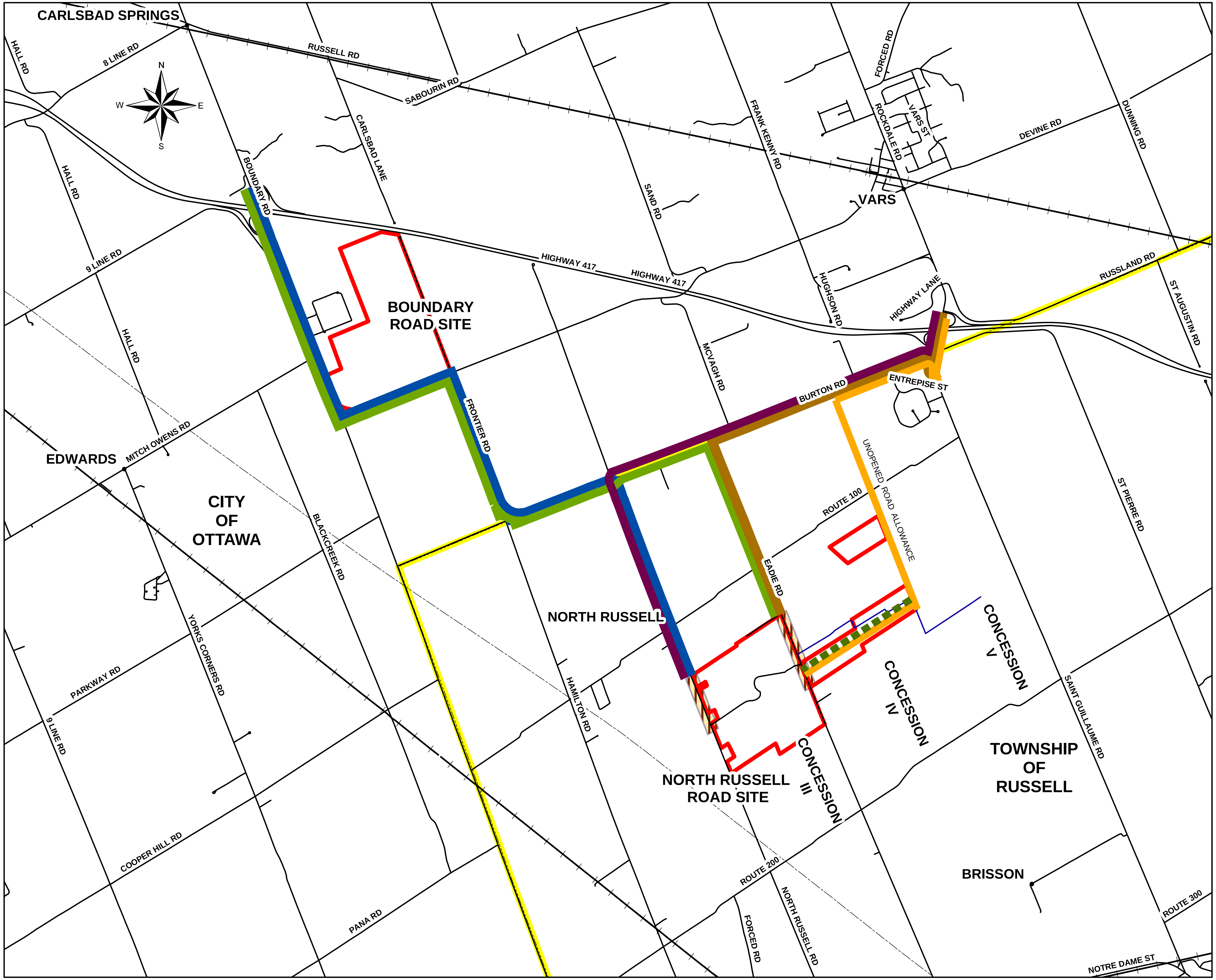
If during the detailed impact assessment of the preferred Site development concept, it is determined that the preferred concept design is unlikely to receive subsequent approval under the EPA or OWRA due to unacceptable net effects (i.e., no further refinement of mitigation is possible) or is not feasible due to technical reasons, then it would be eliminated from further consideration at that time and the second preferred Site development concept would be subjected to the detailed impact assessment. If none of the Site development concepts on the preferred Site are found to be approvable/feasible, then Taggart Miller would reconsider the use of the other Site for the proposed CRRRC.

8.3.4 Task 4: Assessment of Alternative Haul Routes and Identify Preferred Route

8.3.4.1 Boundary Road Site Haul Route

The Boundary Road Site is located on the north side of Devine Road. Devine Road is a City of Ottawa two lane rural arterial road, an extension of Mitch Owens Road (Ottawa Road 8) to the west and its east limit terminating of the east side of Vars. Boundary Road (Ottawa Road 41) is also a two lane arterial road. Frontier Road, along the eastern boundary of the property, is described as a two lane rural collector road, although the dead end portion north of Devine Road would serve mainly only to access the Site.

It is anticipated that almost all Site-related traffic for this Site would be from the north from Highway 417 via the Boundary Road interchange. A small percentage of traffic might also access this Site from the west via Mitch Owens Road. It is anticipated that the Site access would either be off Frontier Road or Boundary Road. The position of the Boundary Road Site relative to the haul route from Highway 417 is shown on **Figure 8.3.4-1**.



LEGEND

— ROADWAY

┼ RAILWAY

-·- UTILITY LINE

▭ CITY OF OTTAWA BOUNDARY

🟥 LIMITS OF OWNED OR OPTIONED PROPERTY

▥ POTENTIAL LOCATION OF SITE ACCESS

ALTERNATIVE HAUL ROUTE / ACCESS LOCATION

NORTH RUSSELL ROAD SITE

🟦 1) BOUNDARY ROAD EXIT TO NORTH RUSSELL ROAD ACCESS

🟩 2) BOUNDARY ROAD EXIT TO EADIE ROAD ACCESS

🟪 3) VARS EXIT TO NORTH RUSSELL ROAD ACCESS

🟫 4) VARS EXIT TO EADIE ROAD ACCESS

🟧 5) VARS EXIT TO UNOPENED ROAD ALLOWANCE

▪ ▪ ▪ INTERNAL HAUL ROAD

REFERENCE

DIGITAL NRVIS MNR DATA PRODUCED BY GOLDER ASSOCIATES LTD., USED UNDER LICENSE © QUEEN'S PRINTER OF ONTARIO
PROJECTION: MODIFIED TRANSVERSE MERCATOR DATUM: NAD 83
COORDINATE SYSTEM: MTM ZONE 9

1,000 0 1,000
SCALE 1:45,000 METRES

PROJECT
TERMS OF REFERENCE FOR ENVIRONMENTAL ASSESSMENT OF THE CAPITAL REGION RESOURCE RECOVERY CENTRE

TITLE
PROPOSED ALTERNATIVE
HAUL ROUTES / SITE ACCESS LOCATIONS

Golder Associates
Ottawa, Ontario

PROJECT No. 09-1125-1008			SCALE AS SHOWN	REV. 0
DESIGN	PLE	Aug. 2011	FIGURE	
GIS	PJM/BR	11 Jul. 2012	8.3.4-1	
CHECK	PLE	7 Sept. 2012		
REVIEW	PAS	7 Sept. 2012		

Path: N:\Active\GIS\Clients\HansonBrick\GIS\Projects\0911251008\ArcGIS\Phase_9000 TOR\0911251008-9000-8.3.4-1_26Jul2012.mxd

8.3.4.2 North Russell Road Site Haul Route Alternatives

The Site in Russell Township is located on Concession III between North Russell Road on the west and Eadie Road on the east; the other portion of the Site is located on Concession IV on the east side of Eadie Road, with frontage along Eadie Road.

North Russell Road is a two lane rural road providing a link between the Village of Russell and Highway 417; Eadie Road is a two lane secondary rural road. It is anticipated that the haul route for most Site-related traffic would be from Highway 417 to the north, using either the exit at Boundary Road (exit 96) and/or Vars/St. Guillaume Road (exit 88). The travel distance using existing roads from the Highway 417/Boundary Road interchange to Burton Road and then to the Site via North Russell Road is about 8.5 kilometres, while from the Highway 417/Vars interchange to the Site via Eadie Road is about 5 kilometres. A third alternative haul route approach to accessing the Site would be by constructing a new road south off Burton Road along the unopened road allowance between Concessions IV and V to access the east end of the portion of the Site located east of Eadie Road; an on-Site road would then be built across this portion of the Site and cross Eadie Road to access the CRRRC development. The travel distance via this route from the Highway 417/Vars interchange to the east end of this land is about 4 kilometres.

The portions of the road network north of and including Burton Road are under the jurisdiction of the City of Ottawa; the remainder belong to the Township of Russell. The alternative haul routes that will be evaluated for the North Russell Road Site, should it be the preferred Site, are as follows and as illustrated on **Figure 8.3.4-1**:

- Alternative 1 – Boundary Road exit to North Russell Road access;
- Alternative 2 – Boundary Road exit to Eadie Road access;
- Alternative 3 – Vars exit to North Russell Road access;
- Alternative 4 – Vars exit to Eadie Road access; and
- Alternative 5 – Vars exit to Unopened Road Allowance access.

8.3.4.3 Assessment Methodology

The haul route assessment will be conducted as summarized below:

- Describe the existing road network along the alternative haul routes from the applicable Highway 417 interchange(s) to the Site (number and type of intersections, number and direction of turns, existing road width, existing road condition and drainage, existing pavement structure on Devine, Frontier, North Russell and Eadie Roads (using available information or if necessary by drilling investigation));
- Establish potential Site access locations applicable to each Site, i.e., from Frontier Road or Boundary Road for the Boundary Road Site; from each of North Russell and Eadie Roads for the North Russell Road Site;
- Describe the land use along each of the alternative haul routes to each Site, i.e., existing land use, number of properties, number of residences and businesses, including agricultural activities;
- Establish the existing traffic patterns and road/intersection performance along each of the alternative haul routes that use existing roads;

- Predict the expected volume and distribution of Site-related traffic and assess its effect on each of the alternative haul routes, e.g., required road and intersection improvements and/or new construction, additional safety measures, number of residences, agricultural entrances and use of roads by farm equipment; and
- For the North Russell Road Site, compare the results of the assessment and select the preferred haul route using the indicators provided in **Appendix B** titled Alternative Haul Route and Leachate Treatment Assessment Criteria. The potential impacts associated with Site-related traffic and any required mitigation measures would be identified for the preferred haul route once confirmed as described below.

For the Boundary Road Site, as there is only one primary haul route to the Site (off Highway 417 at the Boundary Road exit), the results of this assessment will focus only on potential traffic impacts associated with Site-related traffic, and identify any required mitigation measures associated with traffic.

For the North Russell Road Site, the results of this comparative assessment will identify the preferred haul route and site access location from Highway 417 to this Site. Any material constraints to its implementation will also be assessed. If for some reason it is found to not be possible to implement what has otherwise been identified as the preferred haul route/Site access, then it would be dropped from further consideration and a similar constraint analysis carried out of the second (and then, if necessary, the third, etc.) preferred haul route/Site access. This process would result in final identification of the preferred Site haul route/access location for the North Russell Road Site, as well as any required mitigation measures associated with traffic.

8.3.5 Task 5: Evaluate Leachate Management Options and Identify Preferred Option

The provision of leachate treatment is a key component of the organics processing and disposal components of the proposed CRRRC. Based on existing leachate management and treatment being provided at other disposal sites and the current regulatory approvals requirements, it is expected to be possible to construct an on-Site leachate treatment plant, which will achieve a high quality effluent to allow discharge into the local surface water system. It is proposed to use this on-Site treatment approach as a basis for comparison with any other alternatives available to Taggart Miller. A detailed plan for evaluation of leachate treatment alternatives will be developed, following the general methodology below:

- Screen potential on-site leachate treatment technologies; outcome will be a short list of potential technologies;
- Select a preferred on-Site treatment option based on demonstrated performance and cost-effectiveness;
- Identify potential off-Site leachate receiver/treatment alternatives (i.e., discharge to existing or upgraded off-Site treatment facilities with or without on-Site treatment or pre-treatment; combination with sewage treatment);
- Determine off-Site leachate receiver/treatment alternatives available to Taggart Miller;
- Describe potential alternatives to convey leachate to available off-Site leachate treatment alternatives, (i.e., trucking, pipeline); outcome will be short list of conveyance alternatives;
- Develop leachate management system options; and
- If a viable off-site leachate management option(s) is identified, a comparison of the alternative leachate management options will be carried out using the evaluation criteria provided in **Appendix B** to the TOR.

Contingency and emergency measures will also be considered. The preferred leachate management alternative will be identified.

The results of the evaluations will be described in the EA portion of the EA/EPA documentation. The results will be carried forward to serve as the basis for the level of design that is appropriate for EPA and OWRA approvals. It is possible that all matters necessary to confirm potential off-Site alternatives will not be in place at this stage in the EA. As such, it may be necessary to subsequently amend the identified preferred leachate management alternative; an amending procedure related to the leachate management option will be provided in the EA.

8.3.6 Task 6: Cumulative Impact Assessment

The assessment of cumulative effects has not historically been a component of provincial EAs, however Taggart Miller are proposing to complete this type of assessment for the proposed CRRRC project. The net effects of the proposed CRRRC project, as determined by the analysis conducted in Task 3, will be combined with the predicted effects of other existing and identified certain and probable projects in the area of the Site, where the effects would overlap. The evaluation would consider potential effects on the various components of the environment used in Task 3 to determine if there are any unacceptable predicted cumulative impacts, as measured against applicable regulatory standards. The study area for the cumulative impact assessment of the undertaking will be determined based on the potential for CRRRC project effects to interact with those of other projects, as determined by the impact assessment studies for the proposed CRRRC.

8.4 Scope of Work Plan for Phase 2

8.4.1 Task 7: Complete EPA Level Activities for the Proposed CRRRC

The Phase 1 – EA studies will have identified the preferred site development alternative and assessed its predicted effects on the environment. The assessments in Phase 1 will be carried out to the level of detail appropriate for the submission of applications under the EPA and OWRA. The EA documents, together with the EPA/OWRA supporting documentation will be submitted as a single package (contained in several individual volumes) to the MOE. Applications for EPA/OWRA approval will be submitted once EA approval is received. The submitted materials are intended to meet the requirements of all of the MOE approval processes for the proposed undertaking (overall Site development, residuals disposal component, diversion components and ancillary operational features). Depending on the EA conditions of approval or comments received on the EA, it may be necessary to supplement the EPA/OWRA documentation previously submitted; this would be done in the form of addenda or, if required, resubmission of modified EPA/OWRA reports.

The completed applications for EPA approval for the facility will be supported by three documents as follows:

- Hydrogeology Study Report;
- Design and Operations Report; and
- Financial Assurance Report.

The **Hydrogeology Study Report** will be prepared as part of the EA study, and also serve as one of the supporting documents for EPA approval. Its purpose is to describe the existing geological, hydrogeological, hydrological and geotechnical conditions, and the detailed prediction of impacts associated with the preferred Site development alternative for the CRRRC. Groundwater and surface water monitoring programs will be presented along with contingency plans and a trigger mechanism for implementing them.

The **Design and Operations (D&O) Report** supports the Sections 9 and 27 EPA and OWRA Section 53 applications and will include the following assessments/designs and component reports:

- Stormwater Management;
- Leachate Management;
- Acoustic Assessment;
- Air Quality and Odour Assessment; and
- Site D&O.

Stormwater Management

The stormwater management design for the facility will require OWRA approval. The EA studies will present the overall approach to stormwater management for the Site and the required size of the stormwater management ponds based on modelling results and conceptual level designs. In Task 7, the stormwater management system design will be refined based on the phasing and final grading plans for the overall Site development. Design drawings, suitable for OWRA approval, will be prepared. The final alignment, sizing and conveyance capacity of drainage ditches will also be assessed. Consultation with the local Conservation Authority may be required to obtain their input and any approvals associated with construction of the stormwater management ponds and other drainage works.

Leachate Management

The evaluation of leachate management alternatives (Task 5) will identify the preferred approach (subject to any unresolved matters concerning potential off-Site alternatives as described above), which in turn will define the content of the leachate management report. This could range from on-Site treatment for discharge to the local surface water environment, to on-site pre-treatment for conveyance for additional treatment and discharge elsewhere, to conveyance for treatment elsewhere (possibly combined with municipal sewage). An OWRA approval may be required for leachate treatment and disposal, and a leachate management report will be prepared as an appendix to the D&O report, and in support of an application for OWRA approval (if necessary).

Acoustic Assessment

A noise analysis will be conducted for on-Site stationary sources in the EA studies and will include any proposed noise mitigation measures to meet the noise level limit for landfill operations in accordance with the MOE Noise Guideline for Landfills, October 1998. For EPA approval, this information, as well as any additional modelling work (if necessary), will be documented in accordance with the specific MOE requirements for an Acoustic Assessment Report for all stationary noise sources on the Site. The details of the quantitative noise assessment will be provided in an appendix to the D&O report, and summarized within the text of the D&O report. An appropriate noise monitoring program will also be prepared. The Acoustic Assessment Report will be used in support of an application for an EPA Approval (Air and Noise).

Air Quality and Odour Assessment

The air quality and odour assessment will be carried out to an EPA level of detail as part of the EA studies, and reported in a technical document in support of the Environmental Study Report. For EPA approval, this assessment will be documented in accordance with the MOE requirements for an Emission Summary and Dispersion Modelling (ESDM) report; the ESDM report will be used to support the application for an EPA Approval (Air and Noise). Prior to conducting the work, consultation with MOE will have been carried out to agree on the dispersion modelling approach and input parameters. Preparation of the ESDM report requires a compilation of all proposed sources of emissions, preparing emission estimates from these sources and comparison with MOE Standards and Guidelines for maximum allowable air quality concentrations at off-site receivers. Operational plans to control air emissions, i.e., dust and odours, will be provided, together with an appropriate monitoring program, in an appendix to the D&O report, and summarized within the D&O report.

Design and Operations

The Phase 1 – EA studies contain conceptual designs for the overall Site development and components, including the residuals disposal landfill. In this task, EPA level designs will be prepared for the proposed undertaking to address such topics as base grades, final contours, waste capacity, materials balance, Site access, entrance, on-site roads, visual and noise screening, fencing, signage, landfill development phasing and schedule, excavated material management, operating conditions, staffing, procedures, waste placement, buffers, leachate containment and collection and management and landfill gas management. Site monitoring programs, trigger mechanisms and contingency measures will be provided. Some of the requirements for these matters are described in Ont. Reg. 232/98.

The remaining document to be prepared is a **Financial Assurance Report**. The report presents the assumptions and financial calculations to establish a financial reserve for Site closure and post-closure care and contingency measures. The approach will be consistent with the MOE requirements.

8.5 Scope of Work Plan for Phase 3

Phase 3 is related to submission of the EA application and documentation package.

8.5.1 Task 8: Finalize and Submit EAA/EPA/OWRA Documentation & Applications

As noted above, the EA study report along with the information necessary to support subsequent EPA/OWRA applications (hydrogeology report, design & operations report, and financial assurance report), will be submitted as a single package to the MOE. It is noted that the financial assurance report is only a component of the EPA application requirements and not part of the EA application or approval. Details of the submission requirements will be finalized through consultation with MOE Approvals Branch. It is anticipated that this combined submission will meet the requirements of all of the MOE approval processes for the proposed undertaking, with the understanding that the formal EPA/OWRA applications can only be submitted once the EA is approved. The documentation will be submitted for EA approval. On receipt of EA approval, the EPA/OWRA applications will be submitted. Following receipt of EA approval and depending on comments received during the EA and/or EA conditions of approval, it may be necessary to supplement the EPA/OWRA documentation previously submitted; the modifications would take the form of addenda or, only if required, resubmission of modified reports.

It is anticipated that the documentation will be submitted in several volumes. The EA study will be presented in an EA/EPA Study Report. Key information and findings from the individual disciplines will be submitted as appendices to the EA/EPA Study Report. There will be a separate volume for the Consultation Record. The Hydrogeology, Design and Operations and Financial Assurance will be provided as separate volumes for ease of their subsequent use as supporting documents for the EPA and OWRA applications.

9.0 CONSULTATION

Section 5.1 of the *Environmental Assessment Act* states that consultation with "such persons as may be interested" should take place during the preparation of the TOR. Section 6(3) of the Environmental Assessment Act also requires a proponent to describe this consultation and its results.

Taggart Miller conducted a consultation program during the development of these proposed TOR that included three Open House sessions; workshops; presentations to various groups; meetings with individual property owners adjacent to the Sites and others with a potential interest in the project; tours of various existing Miller Waste Systems' diversion facilities; interaction with the Township of Russell's CRRRC Sub-committee of the Environmental Advisory Committee and their retained consultant, meetings with the Carlsbad Springs Community Association, and with the Vars Community Association, and; a project website www.crrrc.ca.

Consultation related to the development of the TOR is documented in the **Volume 2 – Consultation Record** provided with this TOR submission and summarized below in Section 9.1. The main issues and concerns raised by the stakeholders are also provided in the **Consultation Record** and summarized in tables that present the concern and the method in which it has been considered in the preparation of the TOR. The most commonly received comments are summarized in Section 9.2.

The proposed Consultation Plan to be conducted for the EA is presented in Section 9.3.

9.1 Summary of Consultation Activities during Development of the TOR

A summary of the main consultation activities carried out during preparation of these TOR is provided below; complete information on these activities is provided in **Volume 2 – Consultation Record**. For each activity the public, Aboriginal communities and/or the GRT were invited to participate as noted below, as described in detail in **Volume 2 – Consultation Record** and as described in Section 9.1.1 of this report.

Open House #1

Open House (OH) #1 occurred on November 25, 2010 and was organized to discuss the proposed project and the North Russell Road Site and the Terms of Reference and Environmental Assessment processes. The Open House welcomed the public from 2:00 pm until 9:00 pm at the Russell Arena in the Village of Russell. An information centre format was used where members of the public were invited to review information panels and ask questions of the consulting team and company representatives. Approximately 600 members of the public attended OH #1.

When attendees arrived at the Open House, they were asked to sign in, and were given a comment sheet asking general questions about the proposed integrated waste management facility. A total of 137 comment sheets were completed at the Open House and deposited in the comment box. An additional 17 comment sheets were received following the Open House by mail and email and are included in the final report for a total of 154 completed comment sheets.

Each comment sheet had five questions as follows:

1) Are you aware that about 200,000 to 250,000 tonnes of commercial waste is currently being shipped per year over the border to the US from the Ottawa area? Do you think this is an issue, and do you think local solutions should be found for that waste stream?

2) The province's objective is to divert 60% of commercial waste from disposal; however there are currently virtually no facilities in the Capital Region to process and recover materials and divert commercial waste from disposal. Do you think this is an issue?

3) The open house materials presented today list a number of alternatives to the possible CRRRC facility that have been considered. Are there other alternatives that Taggart and Miller should consider and if so why?

4) Do you think the preferred alternative identified by Taggart Miller of combining the recycling and disposal facilities on one Site makes sense? If not, why not?, and

5) What are your key concerns, if any, about the possible CRRRC facility?

In addition, attendees received a questionnaire asking if they would be interested in participating in future workshops or tours of existing Miller waste facilities. A total of 99 attendees provided a response; 54 indicated an interest in the workshops and 45 indicated an interest in tours.

Attendees also received a list of possible evaluation criteria and were asked to consider their relative importance and identify any criteria that might be missing.

The complete Open House #1 report is provided in **Volume 2 – Consultation Record**.

Groundwater Workshops

At Open House #1, held on November 25, 2010, all 600 attendees were given a registration form asking if they would like to participate in a workshop. In addition to the forms at the Open House, forms were also available on the study website at crrrc.ca. Emails were sent to all those who indicated an interest in attending. Follow up emails and individual phone calls were also undertaken to encourage attendance.

The workshops were held on April 9, 2011 to assist residents and interested individuals to learn more about groundwater issues as they relate to an integrated waste management facility at the North Russell Road site. The workshop was held in the Village of Russell at St. Mary's Anglican Church on Castor Street.

Two workshops were organized, one in the morning and one in the afternoon. The workshops were identical in presentation content and were organized to accommodate two groups of participants. Attendance at the morning session was 16; attendance at the afternoon session was 13.

The presentation was prepared and presented by staff from Golder Associates Ltd. Each attendee was given a hard copy of the presentation and an evaluation sheet.

Golder Associates Ltd. presented the workshop material and attendees were able to ask questions throughout the session. The morning session was from 9:00 a.m. until 12:30 p.m., and the afternoon session from 2:00 p.m. until 5:30 p.m. At the start of each session, attendees were asked to offer what they hoped to learn by attending the workshop. The presentation material, workshop evaluation sheet and comments received are provided in **Volume 2 – Consultation Record**.

Tours of Miller Diversion Facilities

45 of the survey responses from Open House #1 indicated interest in participating in tours of other Miller facilities located in the Greater Toronto Area. A tour was organized for April 30, 2011. All of the community members who indicated an interest in the tour were sent invitations to the April 30, 2011 event. On April 30, approximately 10 people participated in the tour. In addition to the 10 people who participated in the formal tour, several others from the community have toured Miller facilities in the Greater Toronto Area individually when in the area of these facilities.

On June 8, 2011 Taggart Miller placed advertisements in the Russell Township and area weekly papers La Nouvelle and The Villager to solicit interest in another tour. No calls or e-mails were received regarding interest in these tours. Taggart Miller continues to be available to provide tours to interested members of the community as and when required.

Meetings with MOE Technical Reviewers

Taggart Miller's consultants met with the MOE technical reviewers in Kingston, Ontario on two separate occasions: October 11, 2011 and July 11, 2012. Reviewers from EAAB in Toronto and District staff joined the meetings via teleconference. The purpose of these meetings was to provide background information on the proposed CRRRC and the existing environmental conditions

The MOE were able to ask questions about the proposed project and how the approvals process was being followed, and provided suggestions on how the TOR should be developed.

Release of Draft Key Documents for GRT and Public Comment

In January 2012, Taggart Miller prepared and provided for comment the following draft documents:

- A description of the waste diversion components proposed for the CRRRC project;
- Draft assessment criteria to be used to evaluate alternative approaches to haul route/site access location, site development and leachate treatment;
- Draft methodology to be followed in conducting the Environmental Assessment; and
- The proposed work plans for the North Russell Road Site for each of the environmental components to be studied during the Environmental Assessment.

The GRT members who received the draft key documents were as follows:

- Ministry of the Environment
- Ministry of Culture
- Ministry of Agriculture, Food & Rural Affairs
- Ministries of Citizenship and Immigration, Tourism and Culture, and Health Promotion
- Ministry of Natural Resources
- Ministry of Transportation
- Ontario Provincial Police
- South Nation Conservation Authority

The documents were posted on the EA website in January 2012 and an e-mail was sent to 266 members of the community directing them to the website on January 24, 2012. In addition, the draft key documents were mailed to 8 members of the community who are not confirmed to be on the e-mail list and/or who do not have internet service.

No comments on the draft documents were received from the Township of Russell or the local community. GRT comments on the draft documents were received from various sections of the Ministry of Environment, from the Ministry of Tourism, Culture and Sport – Culture Services Unit, and from the Ontario Ministry of Agriculture, Food and Rural Affairs.

Open House #2

Open House (OH) #2, Sessions 1 and 2, were held on June 20 and 25, 2012. The purpose of the Open Houses was to again provide an overview of the proposed CRRRC project and its components, to present the second alternative site- the Boundary Road site- to be considered for the CRRRC, and to describe the proposed EA methodology and an overview of the contents of the TOR. Taggart Miller organized two identical sessions of Open House #2; session 1 held in the Russell Arena and session 2 in the City of Ottawa at Rendez-vous des aînés francophones d'Ottawa. Both Open House sessions welcomed the public from 3:00 pm until 9:00 pm. An information centre format was used where members of the public were invited to review information panels and ask questions of the consulting team and company representatives. Three comment sheets were provided requesting ranking and feedback on proposed criteria for comparative evaluation of the two sites, interest in Miller facility tours and general feedback. Attendees could complete the forms at the Open House or send them back via regular mail or email. Attendance at session 1 was estimated at 190, and 226 at session 2.

At session 1, a total of 16 comment sheets were completed at the Open House, 7 tour questionnaires and 20 criteria sheets. At session 2, a total of 91 comment sheets were completed at the Open House, 56 tour questionnaires and 96 criteria sheets. A total of 7 attendees expressed interest in a tour of existing Miller facilities.

The complete Open House #2 report is provided in **Volume 2 – Consultation Record**.

9.1.1 Aboriginal Communities Consultation

It is recognized that Aboriginal communities have specific interests and rights in regards to consultation on projects that might potentially affect them. Consultation with Aboriginal communities may provide insight into the potential effects on Aboriginal communities including the potential effects on use of lands for traditional purposes. It is also recognized that Aboriginal communities may have specific and differing needs in regards to how they would like to be consulted. To address these interests, Taggart Miller will continue to inform Aboriginal communities about the proposed undertaking and invite their participation in the EA process.

A list of potentially affected Aboriginal communities was identified in consultation with the MOE, Ontario Ministry of Aboriginal Affairs and Northern Development Canada, and Indian and Northern Affairs Canada (AANDC) during the development of the TOR. The Aboriginal communities will be consulted on how they would like to be involved in the EA process.

The following Aboriginal communities have been contacted, with additional detail provided in **Volume 2 – Consultation Record**:

- Métis Nation of Ontario;
- Ottawa Métis Nation Council;
- Algonquins of Ontario Consultation Office;
- Algonquins of Pikwakanagan First Nation; and
- Mohawks of Akwesasne.

Potential communication tools include meetings or presentations at Open Houses in Aboriginal communities, smaller discussion groups with interested persons by phone and/or in-person on specific topics, Site tours, copies of information and email correspondence.

Each of the communities identified have been sent the Notice of Commencement; information explaining the EA process, including TOR development, and the proposed project; notice of the inclusion of the Boundary Road Site, and; notification of the upcoming Open Houses. Up until the notification of the second Site, only the Algonquins of Ontario Consultation Office have requested to be maintained on the consultation list and to receive copies of archaeological assessments as soon as they are available. No other response had been received.

9.2 Summary of Key Stakeholder Feedback during Development of the TOR

As noted previously the consultation program provided numerous opportunities for the public and interested persons to provide input and comment during the EA. Detailed information on the input received is provided in **Volume 2 – Consultation Record**, together with the way in which Taggart Miller has incorporated the input into the preparation of the TOR. Following is a summary of input received, as well as the most common comments, issues and concerns raised by the public:

Open House #1

At Open House #1, the public were asked to rank the environmental components and the associated draft sub-components as shown below in terms of their relative importance (although all are important, certain components may be considered more important than others). The results of the environmental component ranking are provided in Table 9-1 below.

Table 9-1: Results of Open House #1 Environmental Component Ranking of Importance

Environmental Component	Sub-components	Ranking		
		Very Important	Important	Less Important
1) Atmospheric Environment	Air quality	**145**	**1**	**0**
	Odour	**142**	**6**	**0**
	Noise	**123**	**17**	**3**
2) Geology & Hydrogeology	Groundwater quality and groundwater flow	**146**	**0**	**0**
3) Surface Water Resources	Surface water quantity and surface water quality	**135**	**10**	**1**

Environmental Component	Sub-components	Ranking		
		Very Important	Important	Less Important
4) Biology	Terrestrial ecosystems and aquatic ecosystems	**115**	**21**	**4**
5) Cultural & Archaeology Heritage Resources	Cultural landscape, built heritage and archaeological resources	**66**	**57**	**15**
6) Transportation	Effects from truck transportation along access roads	**125**	**18**	**4**
7) Land Use	Effects on current and planned future land uses	**111**	**23**	**7**
8) Agriculture	Effects on agricultural land and agricultural operations	**122**	**18**	**6**
9) Socio-economic	Effects on cost of service to customers	**54**	**33**	**48**
	Employment and economics	**45**	**38**	**54**
	Visual aesthetics	**76**	**50**	**15**
10) Aboriginal	Potential effects on aboriginal communities	**44**	**31**	**49**
11) Site Design & Operations	Site design and operational characteristics	**76**	**36**	**24**

At Open House #1, Taggart Miller also asked the public if there were additional environment components or considerations that should be included in the EA. The headings of the constructive comments which were received are listed below, from most common to least common. The term “common issue” has been used when 10 or more comments were received, “less common” when 5 to 9 comments received, and “occasional” when less than 5 comments received.

- **Geology, Hydrogeology & Geotechnical** – A common issue raised on the Open House #1 environmental component ranking sheets related to protection of groundwater resources in the Site-vicinity or beyond the Site-vicinity. Under the same heading were issues regarding bedrock faults in or around the North Russell Road Site, the potential movement of faults and the potential widening of fractures as a result of historical blasting at the North Russell Road Site.

- **Biology** – A common issue raised on the Open House #1 environmental component ranking sheets related to protection of the natural environment, including the protection of the water in the quarry at the North Russell Road Site.

- **Property Value Protection** – A less common issue raised on the Open House #1 ranking sheets related to property value protection and the desire to have the details that would normally be related to a formal plan.

- **Land Use & Socio-economic** – A less common issue raised on Open House #1 ranking sheets related to protection of the community and its social identity. Under the same heading, issues regarding the zoning of the North Russell Road Site were identified, and issues related to negative effects on nearby agricultural operations.
- **Location** – An issue occasionally raised on Open House #1 ranking sheets was the North Russell Road Site location. Of the comments received on the ranking sheets, the community members identified that the Site was unsuitable and many suggested that another more suitable Site should be found.
- **Traffic** – An issue occasionally raised on Open House #1 ranking sheets related to traffic associated with the CRRRC project.
- **Long Term Safety and Responsibility** – An issue occasionally raised on Open House #1 ranking sheets related to who would be responsible for the Site in the future and who would ensure the Site's safety in the future.
- **Atmosphere** – An issue occasionally raised on Open House #1 ranking sheets related to protection of air quality, odours, noise, and occasionally blasting.
- **Human Health** – An issue occasionally raised on Open House #1 ranking sheets related to protection of human health.
- **Agriculture** – An issue occasionally raised on Open House #1 ranking sheets related to the existing agricultural land located at the North Russell Road Site.

At Open House #1, in response to the question "What are your key concerns, if any, about the possible CRRRC facility?", the headings of key concerns identified by the public are summarized below, from most common to least common. The Geology, Hydrogeology & Geotechnical heading was two times more common than the next most common heading of Atmosphere. A description of the key concerns identified, if not already described above, is provided with the list below. In this list, the term "common issue" has been used when 50 or more responses were received, "less common" when 15 to 50 responses received, and "occasional" when less than 15 responses provided.

- **Geology, Hydrogeology & Geotechnical** – A common issue.
- **Atmospheric** – A common issue.
- **Traffic** – A common issue.
- **Property values** – A less common issue.
- **Land Use/Socio-economic** – A less common issue.
- **Biology** – A less common issue.
- **Location** – A less common issue.
- **Road maintenance** – An issue occasionally raised on Open House #1 general comment sheets related to excess wear and tear on the roads as a result of traffic from the proposed site. In addition, the financial responsibility for road maintenance was questioned.

- **Agriculture** – An occasional issue.
- **Human Health** – An occasional issue.
- **Surface Water** – An issue occasionally raised on Open House #1 general comment sheets related to the protection of surface water resources, including aquatic habitat.
- **Design and Operations** – An issue occasionally raised on Open House #1 general comment sheets related to the design of engineered systems including liners and leachate collection systems. Specifically, issues about longevity were identified.
- **Long Term Safety and Responsibility** – An occasional issue.
- **Loss of Tax Revenue** – An issue occasionally raised on Open House #1 general comment sheets related to the loss in tax revenue since the North Russell Road site would not be used for residential development and/or based on concerns would stifle development in the Township.
- **Toxic Waste / Hazardous Waste** – An issue occasionally raised on Open House #1 general comment sheets relate to the receipt of toxic and/or hazardous waste.
- **Vermin** – An issue occasionally raised on Open House #1 general comment sheets related to the potential for the proposed site to attract vermin.
- **Archaeology/Cultural Heritage** – An issue occasionally raised on Open House #1 general comment sheets related to the potential destruction of archaeological or cultural heritage significance.
- **Communication/Consultation** – An issue occasionally raised on Open House #1 general comment sheets related to how and what type of consultation events had occurred, how and what type of consultation events would occur, location of events and how much notice was required for events.
- **The Question of the Need for this Project** – An issue occasionally raised on Open House #1 general comment sheets related to the need for diversion facilities and more importantly landfills in eastern Ontario.
- **Fire** – An issue occasionally raised on Open House #1 general comment sheets related to the possibility of landfill fires.

Open House #2

At the Open House #2 sessions, the public were asked to rank the environmental components proposed for comparative evaluation of the alternative Sites in terms of their relative importance (although all are important, certain components may be considered more important than others). The results of the environmental component ranking are provided in Table 9-2 below:

Table 9-2: Results of Open House #2,
Session 2 Alternative Site Evaluation Component Ranking of Importance

#	Component	Very Important	Important	Less Important
1)	Atmospheric Environment	18	0	0
2)	Geology & Hydrogeology	19	0	0
3)	Surface Water Resources	16	2	0
4)	Biology (terrestrial and aquatic)	13	1	1
5)	Land Use & Socio-economic	16	0	1
6)	Cultural & Archaeology Heritage Resources	13	3	1
7)	Agriculture	14	3	0
8)	Site Design & Operation	12	3	2
9)	Traffic	14	2	2

At Open House #2, Taggart Miller asked if there were any additional environment components or considerations. The headings of the constructive comments which were received at Open House #2, Session 2 are listed below, from most common to least common. The term “common issue” has been used when 7 or more responses were received, “less common” when 4 to 6 responses received, and “occasional” when less than 4 responses were received.

- **Location** – A common issue, related to the suitability of the Boundary Road Site.
- **Geology, Hydrogeology & Geotechnical** – A common issue.
- **Agriculture** – A less common issue.
- **Atmospheric** – A less common issue.
- **Land Use & Socio-economic** – A less common issue.
- **Biology** – An occasional issue.
- **Property values** – An occasional issue.
- **Traffic** – An occasional issue.
- **Surface Water** – An occasional issue.
- **Communication/Consultation** – An occasional issue.
- **Vermin** – An occasional issue.

Comments Received Outside Consultation Events

Comments and questions were received from interested persons by Taggart Miller outside of consultation events through a variety of means, including by mail and e-mail correspondence. The following is a general summary of the most commonly received comments provided in the order of most common to least common. A description of the comment identified, if not already done so above, is provided with this list. The term "common issue" has been used when 10 or more comments were received, "less common" when 5 to 10 responses received, and "occasional" when less than 5 were received.

- **Geology, Hydrogeology & Geotechnical** – A common issue.
- **Traffic** – A common issue.
- **Location** – A common issue; community members identified that the North Russell Road Site was unsuitable and many suggested that another more suitable Site should be found.
- **Atmosphere** – A common issue.
- **Communication/Consultation** – A common issue.
- **Property Value Protection** – A common issue.
- **Land Use & Socio-economic** – A common issue.
- **Design and Operation** – A common issue.
- **The question of the need for this project** – A common issue.
- **Biology** – A common issue.
- **Agriculture** – A less common issue.
- **Surface Water** - A less common issue.
- **Human Health** – A less common issue.
- **Landfill Fires** – An occasional issue.

Shale Resource – An issue occasionally raised during the development of the TOR related to the protection of the shale aggregate resource at the North Russell Road Site.

9.2.1 Feedback from Aboriginal Communities

At the time of the notice of the second alternative Site, all Aboriginal communities contacted requested to remain informed about this proposed project and the process.

9.3 Proposed Consultation Program for EA

Following approval of the TOR and during preparation of the EA, a consultation program will be continued for the public, Aboriginal communities, government agencies and other interested parties in the EA process. Input will be solicited through a number of consultation activities as proposed below. In addition to the consultation activities described below, consultation specific to Aboriginal communities will also be carried out. These additional activities are described in Section 9.3. The results of the consultation program conducted by Taggart Miller during preparation of the EA will be presented in the EA Study Report.

In early 2011 the Township of Russell established an Environmental Advisory Committee Sub-committee (EAC-SC), whose mandate is to interact with Taggart Miller, to review and comment on the environmental aspects of the proposed CRRRC project and on documents prepared by Taggart Miller, to provide recommendations to Township Council for their consideration, and to liaise with key stakeholders in the EA process. If the North Russell Road Site is identified as preferred, Taggart Miller will continue to interact with the EAC-SC. Input will also be sought from local political representatives.

If the Boundary Road Site is identified as the preferred site for the CRRRC, Taggart Miller will continue to interact with local community associations, such as the Carlsbad Springs Community Association and Vars Community Association. Input will also be sought from political representatives from the area.

The proposed consultation activities for the EA are as follows:

- All public consultation sessions undertaken will be hosted in both English and French, and additional workshops on technical issues, where an interest from the public is expressed, will be conducted in English and French;
- **Open House #3** will present, to both communities where the two sites being considered are located, a more detailed description of the proposed CRRRC diversion and landfill components, the results of the comparative evaluation of the alternative sites and the rationale for identification of the preferred Site for the CRRRC project;
- **Open House #4** will present the results of the studies to define the existing environmental conditions to that point in the study and the alternative Site development concepts to be considered on the preferred Site;
- **Open House #5** will present the assessment of environmental effects associated with the preferred Site development concept together with proposed mitigation measures, monitoring and contingency measures; the results of the alternative haul routes/Site access assessment, the results of the leachate treatment assessment, the results of the cumulative impact assessment, an outline of the proposed EA/EPA documentation package, and an overview of the proposed schedule for submissions and the Ministry decision making process. Participants at this Open House will be informed of the plans regarding distribution of the draft EA for review;
- **Open House #6** will be held during the GRT and public review period for the draft EA. An overview of the draft EA will be provided and the venue will provide an opportunity for public feedback.
- **Meetings** with smaller groups such as the Township of Russell EAC-SC, and the Carlsbad Springs and Vars Community Association executives will be held as necessary or appropriate to enable discussions of issues in greater detail than is possible in the Open House format. The meetings may consist of an informal presentation and discussion of results and questions/answers, or simply meetings to discuss particular topics, such as community benefits programs or initiatives;
- **Special Workshops or Technical Sessions** will be held to discuss specific topics for an invited group in more detail. These sessions will include workshops on technical matters such as groundwater, noise, atmosphere, etc. At this point, it is contemplated that one or more workshops will be held on groundwater.

The need for additional workshops on other technical matters will be based on interest expressed by the public; and

- **Project Website** (www.crrrc.ca) to inform the public on the EA process and public consultation activities and solicit comments from the public. Taggart Miller will provide draft materials at key EA milestones on the project website.
- **Circulation of Draft EA** for public comment prior to finalization and submission to the MOE. The draft main EA document (excluding the technical appendices) will be made available in both French and English, as will the final main EA document. There will be a seven week review period provided for the draft EA.

9.3.1 Aboriginal Communities

Following approval of the TOR, Taggart Miller will contact the identified Aboriginal communities and invite discussions on the work plans and EA process to ensure that Aboriginal community concerns and input are received and incorporated. These concerns and inputs would be identified in the EA, and any measures required to be developed and implemented to mitigate these issues would be incorporated into the proposed undertaking and described in the EASR.

10.0 ENVIRONMENTAL ASSESSMENT SCHEDULE

EA timelines are dependent on the Minister's decision on the TOR. A decision on the approval of the TOR is anticipated by late 2012. Taggart Miller will endeavour to complete the draft EA in 2013.

As noted previously, the EA and the information necessary for support of subsequent EPA/OWRA applications are being submitted as a single package. It is assumed that the EA and supporting technical documents will be reviewed as a single package by the regulatory agencies, public, Aboriginal communities and other stakeholders. Following review, if it is necessary to supplement the EA documentation previously submitted; the supplementary information would take the form of addenda.

The issuance of EA approval is the first step in the approvals project for this project. Following receipt of EA approval and depending on comments received during the EA and/or EA conditions of approval, the EPA/OWRA applications will be submitted. It may be necessary to supplement the EPA/OWRA documentation previously submitted; the modifications would take the form of addenda or, only if required, resubmission of modified reports.

11.0 OTHER APPROVALS

A number of approvals will be required in addition to the EA approval required under the Ontario Environmental Assessment Act. Approvals will also be required under the Environmental Protection Act and Ontario Water Resources Act. As noted above, the documentation for EA approval and the documentation to support EPA/OWRA applications are being submitted jointly in one submission. The EPA/OWRA applications will be formally submitted after EA approval.

Other approvals will or may be required under the statutory requirements described below. The other approvals required, and the details of those approvals will depend on which of the North Russell Road site or Boundary Road site is identified as the preferred site for the proposed CRRRC. Other approval requirements, including information related to those approvals, will be provided in greater detail in the EA.

Planning Act, Official Plan, and Zoning By-Law Amendments – The implementation of the CRRRC on either Site will require approvals under the *Planning Act* for construction and operation of the proposed diversion and other waste management facilities. *Planning Act* approvals would be sought after EA approval is received for the project; it is anticipated that this application would share many of the same studies used to support the EA/EPA applications.

Aggregate Resources Act (ARA) – If the North Russell Road site is the preferred site for the project, it is anticipated that an approval under the *ARA* will be required to amend the currently approved rehabilitation plan for the existing licensed quarry on the property, in order that the rehabilitation is compatible with the proposed CRRRC site development plan. This application for license amendment would be made after the required planning approvals are in place.

Conservation Authority Approvals – Both Sites are located within the jurisdiction of the South Nation Conservation Authority, which is responsible for issuing permits for any construction in or alteration of water courses under *The Conservation Authorities Act* O.Reg. 170/06. It is anticipated at this time that approval from South Nation Conservation may be required to implement the site development plan due to the required drainage alterations.

Drainage Act – Both Sites contain municipal drains. It may be desirable to optimize the site development to alter and/or shift the location of a municipal drain, which would require approval under the provincial *Drainage Act*.

Federal approvals – It is not currently anticipated that any federal approvals will be required, however the process will allow for any such approvals that are required.

12.0 COMMITMENTS AND MONITORING STRATEGY

12.1 Commitments

The environmental assessment (and more specifically, the EA Study Report) will include a comprehensive list of commitments made by Taggart Miller during the EA process (including these TOR):

a) Although the approval of waste management projects in Ontario requires the proponent to demonstrate that the project can be designed, operated and monitored in accordance with Ontario regulations such that potential off-Site impacts are controlled to acceptable levels and standards, compensation plans have become common for both privately owned and publically owned waste management facilities. Although there are various compensation measures that can be considered, Property Value Protection (PVP) has been a component of many such plans.

   For the proposed CRRRC project, Taggart Miller is proposing to provide PVP to property owners within a certain distance from the property and to engage the community to develop the details of the plan during the EA process. The basic premise is that if the owner of a property wishes to sell, they are entitled to receive fair value for their property as if the waste management facility was not present. If there is a reduction in property value from its otherwise fair market value, the difference will be made up by Taggart Miller. In this way, the value of the property is protected.

   There may also be other components of an overall community benefits plan to be determined through discussion with the local community during the EA process;

b) Taggart Miller commit to provide facilities and capacity for recovery of resources and diversion of materials from disposal for wastes that are generated by the IC&I and C&D sectors upon opening of the CRRRC. Both the diversion and disposal components will be implemented at a scale appropriate for the level of business that might reasonably be expected during the initial period of site operation. The facilities will be scalable and their capacity will be increased over time in order to respond efficiently to changing market conditions and to any new government regulations mandating increased IC&I diversion;

c) Taggart Miller will carry out a cumulative effects assessment as a component of the EA; and

d) The draft EA will be made available for public review and comment before the final EA is submitted. A 30 day comment period is contemplated.

12.2 Compliance and Effects Monitoring

Mitigation measures are designed to avoid or reduce potential adverse effects from the undertaking. Taggart-Miller commits to developing a conceptual monitoring framework during the preparation of the EA. The monitoring framework will consider all phases of the proposed undertaking. The monitoring will include:

- Compliance monitoring; and
- Effects monitoring.

It is anticipated that the detailed effects monitoring requirements for the project will ultimately be determined through the conditions of EPA/OWRA approval. Compliance monitoring is an assessment of whether an undertaking has been constructed, implemented and/or operated in accordance with the commitments made during the preparation of the EA and the conditions of the EAA. Compliance monitoring and contingency measures will be designed to detect and immediately respond to potential problems and unanticipated effects. Effects monitoring will involve activities designed to determine and verify the anticipated effects of the undertaking.

APPENDIX A

Criteria for Comparative Evaluation of Alternative Sites

January 2013

Appendix A
Criteria for Comparative Evaluation of Alternative Sites

TAGGART
GROUP OF COMPANIES

THE MILLER GROUP

1.0 INTRODUCTION

This appendix to the TOR describes the criteria that are proposed to be used in the Environmental Assessment (EA) to comparatively evaluate the two alternative Sites that are proposed for the CRRRC - the North Russell Road Site and the Boundary Road Site. Each criterion includes a statement of rationale, indicators proposed for measurement of each criterion, and data sources. The outcome of this step will be the identification of the preferred Site for the CRRRC.

Proposed Evaluation Criteria to Compare Alternative Sites for the Proposed CRRRC and Identify Preferred Site

Components	Assessment Criteria	Rationale	Indicators	Data Sources
		Environmental Components		
Atmosphere	Which site is preferred regarding potential effects due to air quality and noise?	Operation of diversion and residual waste disposal facilities can produce air emissions that may degrade off-Site air quality. Similarly, they can result in increased noise levels and odour emissions.	▪ Number, type and location of off-Site receptors in Site-vicinity (within 500 m of site boundary)	▪ Aerial photographic mapping and field reconnaissance ▪ Consultation with Russell Township (as required) ▪ Consultation with the City of Ottawa (as required)
Geology, Hydrogeology & Geotechnical	Which site is preferred for protection of groundwater?	Diversion and disposal facilities have the potential to impact off-Site groundwater quality and/or quantity (availability).	▪ Geological setting; ▪ Type and thickness of any natural on-Site attenuation layer ▪ Presence and quality of groundwater resources on-Site and in Site-vicinity ▪ Interpreted direction of vertical groundwater flow on-Site and in Site-vicinity, i.e., area of groundwater recharge, transitional flow, or groundwater discharge	▪ Published geological, hydrogeological and geotechnical maps and reports including applicable source water protection plans and related studies/reports ▪ Municipal Official Plans, specifically any groundwater protection zones, recharge areas, etc. ▪ MOE water well records and determination of water well users in the area (using topographic maps, aerial photos and field reconnaissance) ▪ Findings of on-Site testing completed for this project or otherwise available to confirm/compare information
Surface Water	Which site is preferred for protection of surface water quality?	Diversion and disposal facilities have the potential to impact off-Site surface water quality.	▪ Number of existing ▪ Surface water outlet points ▪ Distance to nearest continuously flowing water course ▪ Characteristics of downstream surface water system and usage	▪ Topographic maps ▪ Air photos ▪ Interviews and discussions with municipalities, MNR, conservation authorities ▪ Published water quality and flow information ▪ Site reconnaissance ▪ Surface water flow and water quality monitoring stations

Components	Assessment Criteria	Rationale	Indicators	Data Sources
Biology	Which site is preferred for protection of terrestrial and aquatic biological systems?	Waste management projects have the potential to impact on-Site biological resources. Note that most on-Site biological systems are expected to be removed by the Site development.	▪ Amount of, quality of and impact on biological systems on-Site, including protected biological systems. Specifically including the total impact on: – class 1-3 wetlands – life science ANSIs – wooded areas – species at risk and endangered species and associated habitat – waterbodies and water courses	▪ Site reconnaissance and preliminary field surveys ▪ Published data sources including: Ontario Ministry of Natural Resources (MNR) Natural Heritage Information Centre; MNR fisheries data; Conservation Authority information and mapping; past natural feature surveys and regulatory requirements; Atlas of the Breeding Birds of Ontario; Atlas of the Mammals of Ontario; Ontario Herpetofaunal Summary Atlas; Bird Studies Canada and other similar organizations; Royal Ontario Museum SAR mapping; Species at Risk and Endangered Species Acts; the Committee on the Status of Endangered Wildlife in Canada; Municipal Official Plans; Ontario Base Maps; Natural Resource Values Information System mapping and Land Information Ontario; and aerial photography.

Components	Assessment Criteria	Rationale	Indicators	Data Sources
Socio-Economic Components				
Land Use & Socio-economic	Which site is more compatible with current and proposed planned future land uses in the Site-vicinity?	Waste management projects are often perceived to be more compatible with certain types of neighbouring land uses.	▪ Current land use within 1000 m of Site ▪ Certain and probable planned future land use within 1000 m of Site	▪ Aerial photographic and topographic mapping and field reconnaissance ▪ Published data on public recreational facilities/ activities ▪ Provincial Policy Statement, 2005 and ongoing review ▪ Eastern Ontario Smart Growth Panel Recommendations ▪ Discussions with municipality and institutions ▪ Municipal Official Plans and Zoning
	Which site is preferred for the protection of mineral aggregate resources?	Diversion and disposal facilities have the potential to impact future extraction and utilization of mineral aggregate resources underlying the site and in the surrounding area.	▪ Known and probable type and quality of mineral aggregate resources on site and within 500 metres	▪ Published reports, i.e., MNR, OGS, MNDM ARIPs; Existing quarry aggregate license; Municipal Official Plans and zoning; Findings of on-Site investigations completed for this project or otherwise available.
Cultural & Heritage Resources	Which site is preferred for the protection of archaeological and heritage resources, and cultural heritage landscapes?	Cultural and heritage resources can be altered by the redevelopment of diversion and disposal facilities.	▪ Number and significance of known archaeological and heritage features, and cultural heritage landscapes on-Site ▪ Area of on-Site lands with moderate to high potential for undiscovered archaeological sites	▪ Published data sources (including literature; historic maps, land registry data, assessment rolls and census records; Local Architectural Conservation Advisory Committee and/or municipal heritage building/district listings) ▪ Review of the Ministry of Tourism, Culture and Sport's updated database ▪ Site reconnaissance ▪ Stage 1 archaeological and cultural/heritage assessments ▪ Aboriginal communities and organizations (if responsive) ▪ Consultation with other government agencies as appropriate ▪ Applicable provincial guidance documents.

Components	Assessment Criteria	Rationale	Indicators	Data Sources
Agriculture	Which site is preferred regarding potential for effects on agriculture?	Waste management projects can adversely effect on-Site agricultural operations and use and are often perceived to have the potential to adversely impact off-Site agricultural operations and use.	▪ Percentage of on-Site lands with soil capability classes 1 to 3 ▪ Amount, type(s) and quality of on-Site improvements for agricultural purposes, (i.e., structures, tile drainage). ▪ Percentage of on-Site land being used for agricultural purposes ▪ Type(s) and extent of agricultural operations on-Site and within 500 m of Site boundary, i.e., organic, cash crop, livestock	▪ Provincial Policy Statement, 2005 and ongoing review ▪ Municipal Official Plans ▪ Aerial photographic and topographic mapping ▪ Available soils mapping, municipal drain mapping, available ownership information based on municipal assessment information and including farm tax credit information ▪ Field reconnaissance ▪ Canada Land Inventory (CLI) mapping ▪ Statistics Canada Agriculture Profiles ▪ Consult with the Ontario Federation of Agriculture, OMAFA, the Christian Farmer Union or other farming organizations
Technical Component				
Design & Operations	Which site is preferred regarding the anticipated amount of engineering required to assure MOE groundwater quality criteria are met at the property boundary?	Sites that require less engineering to assure protection of off-Site groundwater quality are typically preferred from a public and regulatory perspective.	▪ Degree of engineered containment expected to be required for on-Site systems	▪ Ont. Reg. 232/98 ▪ Published hydrogeological and geotechnical maps and reports; ▪ Findings of on-Site testing completed for this project or otherwise available to confirm/compare information ▪ Preliminary determination of on-Site engineered leachate management system requirements ▪ Review of previous knowledge or experience for designs in similar geological settings in Ontario

Components	Assessment Criteria	Rationale	Indicators	Data Sources
Traffic	Which site is preferred regarding potential effects from Site-related truck traffic?	Truck traffic associated with waste diversion and residual waste disposal facilities may adversely affect residents, businesses, institutions and movement of farm vehicles along the haul route(s).	▪ Proximity of Site to Highway interchange ▪ Characteristics of road network between Highway interchange and Site ▪ Land use from Highway interchange to Site along the main haul route(s)	▪ Available road and intersection characteristics, and traffic count information on potential haul routes ▪ Historical traffic and collisions, if available ▪ Aerial photographic mapping and field reconnaissance ▪ Location and nature of potential receptors ▪ Consult with Russell Township and the City of Ottawa, as appropriate

APPENDIX B

Alternative Haul Route and
Leachate Treatment Assessment Criteria

January 2013

Appendix B
Alternative Haul Route and Leachate Treatment Assessment Criteria

1.0 INTRODUCTION

This appendix to the TOR describes the assessment criteria that are proposed to be used in the EA of the proposed CRRRC for assessment of alternative haul routes (if the North Russell Road Site is selected as preferred) and for assessment of leachate treatment alternatives. Each criterion includes a statement of rationale, indicators proposed for measurement of each criterion, and data sources.

- Appendix B-1 presents the criteria proposed for the assessment in Task 4 of the EA methodology- Assessment of Alternative Haul Routes and Identify Preferred Haul Route; and
- Appendix B-2 presents the criteria proposed for the assessment in Task 5 of the EA methodology- Evaluate Leachate Management Options and Identify Preferred Alternative.

APPENDIX B-1 PROPOSED ASSESSMENT CRITERIA FOR ALTERNATIVE HAUL ROUTES

Assessment Criteria	Rationale	Indicators	Data Sources
Effects from truck traffic along haul routes	Truck traffic associated with new waste diversion and disposal facilities may adversely affect residents, business, institutions and movement of farm vehicles along the haul routes.	▪ Number of residences and businesses along the haul route ▪ Travel distance from Highway interchange to Site access location(s) ▪ Required roadway and intersection upgrades along the haul route	▪ Available road and intersection characteristics, and traffic count information on potential haul routes ▪ Historical traffic and collisions, if available ▪ Aerial photographic mapping and field reconnaissance ▪ Traffic impact study.

APPENDIX B-2 PROPOSED ASSESSMENT CRITERIA FOR EVALUATION OF LEACHATE MANAGEMENT OPTIONS

Environmental Component	Assessment Criteria	Rationale	Indicators	Data Sources
Atmosphere	Odour	Leachate management and treatment options can produce air emissions, which may degrade off-Site air quality. Similarly, they can result in increased noise levels and odour emissions.	▪ Predicted odour emissions	▪ Estimated leachate characteristics ▪ Total and available capacity of potential municipal treatment facilities, treatment facility capability and discharge criteria ▪ Results of baseline studies, including ▪ characteristics of potential receiving waters ▪ Identification of required treatment facility modifications and/or on-Site pre-treatment; ▪ Results of quantitative or qualitative predictive assessments for the environmental components ▪ Prediction of treatment facility performance ▪ Capital and operating cost estimates
	Air quality		▪ Predicted air emissions	
	Noise		▪ Predicted noise levels	
Geology & Hydrogeology	Groundwater quality	Leachate management and treatment options have the potential to impact off-Site groundwater quality.	▪ Predicted effects on off-Site groundwater quality	
Surface Water	Surface water quality	Leachate management and treatment options have the potential to impact off-Site surface water quality and quantity.	▪ Predicted effects on off-Site surface water quality	
	Surface water quantity		▪ Predicted effects on off-Site surface water quantity	
Biology	Aquatic biological resources	Leachate management and treatment options have the potential to impact terrestrial and aquatic resources	▪ Predicted effects on aquatic habitat ▪ Predicted effects on aquatic species	
	Terrestrial biological resources		▪ Predicted effects on vegetation communities ▪ Predicted effects on wildlife habitat ▪ Predicted effects on vegetation and wildlife, including rare, threatened or endangered species	

Environmental Component	Assessment Criteria	Rationale	Indicators	Data Sources
Land Use	Current and planned future land use	Leachate management and treatment options have the potential to impact off-Site current and planned future land uses, including sensitive land uses	▪ Location and type(s) of current and known planned future land uses within 1,000 metres of the Site	
Traffic	Leachate haulage	Leachate management and treatment options have the potential to impact traffic due to haulage of leachate.	▪ Amount and type of traffic associated with leachate haulage ▪ Type(s) and usage of routes along which leachate will be transported	
Technical Effectiveness		The technical effectiveness depends on the quantity and associated chemical loading associated with the leachate and characteristics of the watercourse that will receive the treated effluent, and the expected ability of the treatment system to provide the required treatment of the leachate.	▪ Amount of incremental increase in quantity and chemical loading on treatment facility by accepting leachate ▪ Predicted effect of treated effluent on receiving watercourse flow and quality	
Regulatory Approvability		The approvability depends on the degree to which the technology has been approved for use in the past and its performance, and its expected ability to achieve regulatory requirements.	▪ Historical approval of technology and performance record	

Environmental Component	Assessment Criteria	Rationale	Indicators	Data Sources
Capital and Operating Costs		The capital costs depend largely on the amount of modifications/upgrade required to the off-Site treatment facility, and/or the need for on-site pre-treatment, as well as the leachate conveyance method, i.e., haulage by tanker or pipeline. The operational costs to treat leachate would be incremental and depend on the increased treatment associated with leachate loading and any additional treatment processes.	▪ Estimated capital costs for modifications and upgrades ▪ Estimated operational costs ▪ Effects on overall treatment facility performance ▪ Revenue impacts to municipality by providing leachate treatment service	

APPENDIX C

EA/EPA Work Plans

C-2 Boundary Road Site Work Plans

APPENDIX C-2.1

Atmospheric Work Plan

Table of Contents

1.0 INTRODUCTION

This document presents the proposed work plan for the Atmospheric component of the environmental assessment (EA) of the Boundary Road Site for the proposed Capital Region Resource Recovery Centre (CRRRC). The work plan is part of the Terms of Reference (TOR) for the EA submitted for approval to the Minister of the Environment. The TOR sets out the proponent's proposed approach for addressing the Ontario *Environmental Assessment Act* (EAA) requirements when preparing the EA. In addition to EA requirements, the proponent has chosen to submit a combined EAA and *Environmental Protection Act* (EPA) and *Ontario Water Resources Act* (OWRA) documentation package. Therefore, additional detailed studies required for subsequent EPA/OWRA approval are included in this work plan.

2.0 ASSESSMENT FRAMEWORK

2.1 Project Team Organization

The project tasks will be organized to be completed by the following teams:

- The EA Management Team;
- The Design and Operations (D&O) Team consists of landfill design technical staff and CAD technicians; and
- The EA Team consists of discipline leads for each of nine different environmental components.

2.2 Study Areas

Data for the site-specific component of the EA will be collected and analyzed for three generic study areas. The generic study areas are as follows:

- Site – The lands secured by Taggart Miller Environmental Services (Taggart Miller) for the proposed CRRRC;
- Site-vicinity – The lands in the vicinity of the Site (generally within 500 m of the Site boundaries, and modified as appropriate for specific technical disciplines as will be determined during the EA). It is anticipated that the Site-vicinity will need to be expanded for the Atmospheric component; and
- Haul Routes – The main haul/access route(s) to the Site.

As noted, the generic study areas described above may be adjusted as required during the EA to suit the requirements of the Atmospheric component.

3.0 COMPARATIVE EVALUATION OF ALTERNATIVE SITES AND IDENTIFICATION OF PREFERRED SITE

Two properties that have been secured by Taggart Miller have been identified as suitable locations for the proposed CRRRC (the Alternative Sites). The first step in the EA process will be the identification of the preferred Site for the proposed diversion facilities and landfill that comprise the CRRRC.

3.1 Assessment Criteria and Indicators

The Atmospheric component will compare the Alternative Sites using the following criterion:

- Which site is preferred regarding potential effects due to air quality and noise?

The rationale, indicators and data sources for the Alternative Sites criterion listed above are provided in the Appendix A of the proposed TOR.

3.2 Approach and Work Plan

The Atmospheric discipline team will complete a comparison of information about each of the two Alternative Sites available from published information and from preliminary investigations/assessments on or in the vicinity of each of the Sites. The following tasks will be undertaken to obtain and review the published information and the preliminary investigations/assessments for the Boundary Road Site:

- Review aerial photographic mapping and conduct field reconnaissance to identify location and nature of potential off-Site receptors; and
- Consult with City of Ottawa about neighbouring land use (as required).

Based on this information and the above criterion, the Atmospheric discipline team will identify which of the Alternative Sites is preferred for this component.

If the Boundary Road Site is selected as the preferred Site, then the remainder of this work plan will be completed. If the North Russell Road Site is selected as the preferred Site, then no further action under this work plan will be completed, and the North Russell Road Site Atmospheric work plan will be used.

4.0 EA AND EPA ASSESSMENT OF THE PREFERRED SITE FOR THE CRRRC

The remaining steps of the EA/EPA/OWRA assessment are proposed to take place in three phases. The proposed phases consist of the following tasks:

Phase 1 – EA

- Task 1 – Complete Assessment of Existing Environment;
- Task 2 – Identify Preferred Site Development Concept;
- Task 3 – Assess Environmental Effects of Preferred Site Development Concept;
- Task 4 – Assessment of Alternative Haul Routes and Identify Preferred Route;
- Task 5 – Evaluate Leachate Management Options and Identify Preferred Option; and
- Task 6 – Cumulative Impact Assessment.

Phase 2 – EPA/OWRA

- Task 7 – Complete EPA/OWRA Level Activities for Proposed CRRRC.

Phase 3 – Documentation and Submission

- Task 8 – Finalize and Submit EAA/EPA/OWRA Documentation and Applications.

For the Atmospheric Work Plan, activities will be carried out as part of Tasks 1, 2, 3, 4, 5, 6, 7 and 8 as described below.

4.1 Task 1: Complete Assessment of Existing Environment

The atmospheric environmental component comprises two subcomponents for the purposes of the EA: air quality (which includes air quality and odour) and noise. The following tasks will be undertaken to further characterize existing environmental conditions:

- Review conceptual components of the proposed CRRRC project;
- Compile and interpret information from existing data sources, including information available from Environment Canada and the Ontario Ministry of the Environment (MOE) air quality monitoring data from local stations;
- Based on consultation with the MOE, the review of existing information and the project description, identify information gaps and data needs;
- Conduct Site reconnaissance to confirm Site information compiled from existing documentation and finalize location and nature of potential off-site receptors;
- Compile and document climate normals for the Site, and document the existing climatic conditions;
- Conduct noise measurement surveys to determine baseline noise levels at potential sensitive points of reception around the Site and / or along the possible haul route(s);
- Define baseline conditions for the Alternative Sites; and
- Determine "linkages" with other components and data generation/transfer requirements (e.g., link with Biology and Land Use and Socio-economic component).

4.2 Task 2: Identify Preferred Site Development Concept

This task will involve preparing reasonable Site development concepts for the proposed CRRRC and selecting the preferred Site development concept. It will be completed by the D&O Team and the EA Team. The Atmospheric component will provide input as required based on available information on atmospheric conditions as related to conceptual design development of the on-site diversion and residual disposal facilities.

4.3 Task 3: Assess Environmental Effects of Preferred Site Development Concept

The Province of Ontario has regulations and standards for air quality and noise, which set limits protective of the surrounding environment and the use and enjoyment of property. A facility such as the CRRRC will not be approved or permitted to operate unless it is demonstrated to the MOE that it can be designed and operated to meet the provincial air quality and noise standards. Prior to commencing the studies the Atmospheric discipline team will:

- Consult with the MOE and other members of the Government Review Team (GRT) to decide on landfill gas (LFG) generation modelling approach for this proposed project and air dispersion/noise modelling approach and protocols to be used in the assessment;
- Use existing Golder information and published information and/or conduct noise measurement at other sites with similar equipment to determine the expected noise emissions from the Site operations; and
- Gather published odour data at sites with similar activities.

The following studies will be completed to predict the air quality and noise effects.

4.3.1 Air Quality

Upon collection of data required for the assessment of air quality and odour, the following study will be completed:

- Assessment of predicted air quality and odour emissions from the preferred Site development concept. Air emissions from the preferred Site development concept (including LFG collection and energy production, on-Site haul roads, excavation operations, waste processing equipment, composting, etc.) will be estimated. This will be followed by the execution of an atmospheric dispersion model. The results of this study will be predicted maximum air quality and odour effects. This study will focus on property line and sensitive receptors that were identified during the Site reconnaissance. The results of the dispersion modelling will be compared to existing regulatory limits to determine the impact of the preferred Site development concept. In addition, the dispersion modelling results will be provided to other disciplines for further assessment. The air quality assessment will be conducted using MOE approved methodology. Odour impacts will be determined using published odour data and following the guidance in the MOE Technical Bulletin *Methods for Modeling Assessments of Contaminants with 10-minute average standards for odours and guidelines under O.Reg. 419/05.*

In support of the air quality and odour study described above, the following will be completed:

- The development of an AERMOD atmospheric dispersion model for the Site, which will be used to predict effects of the proposed operations. Based on the complexity (or simplicity) of local conditions, changes to the selected atmospheric dispersion model may be made. Changes to the dispersion model will be done in consultation with the MOE; and

- The appropriate meteorological dataset will be compiled, including prevailing winds, based on available datasets. The sources of the data will be reviewed with the MOE and if available the City's consultant prior to finalization of the modelling dataset.

4.3.2 Noise

Upon collection of data required for the assessment of noise emissions, the following study will be completed:

- A study which focuses on the subject of the EA (i.e., the waste management facility) and assesses emissions. Emissions from equipment (including LFG collection system, on-Site haul roads, excavation operations, etc.) will be based on data from Golder's database of similar noise sources, published information and/or measurements at sites with similar noise sources. This will be followed by the execution of a noise prediction model. The results of this study will be predicted worst-case hour operation associated with the preferred Site development concept. This study will focus on off-Site sensitive points of reception.

In support of the noise study described above, the following will be completed:

- The development of an ISO 9613 prediction model for the Site, which will be used to predict effects of the proposed operations; and

- Provide acoustic specifications for mitigation measures inherent in the project design and those necessary to ensure compliance with MOE noise guidelines.

4.4 Task 4: Assessment of Alternative Haul Routes and Identify Preferred Route

This part of the task will primarily be completed by the Traffic discipline lead and the EA Management Team. Following the identification of the preferred haul route/Site access location(s), any material constraints to its implementation from an atmospheric perspective will be assessed.

4.5 Task 5: Evaluate Leachate Management Options and Identify Preferred Option

This evaluation will be completed by the D&O and Surface Water discipline teams, with some input data from the Geology, Hydrogeology & Geotechnical discipline team. The Surface Water discipline team will provide effluent discharge criteria and the D&O discipline team will define the alternatives and evaluate the options.

Once the preferred option is identified, the Atmospheric discipline team will consider potential air quality (including odour) and noise effects associated with the preferred option to complete the impact assessment of the overall proposed CRRRC facility.

4.6 Task 6: Cumulative Impact Assessment

The EA Team will work to identify the predicted effects of other existing or certain and probable projects in the area of the Site. The Atmospheric discipline team will consider other identified atmospheric effects together from those projects with those predicted during the environmental effects assessment to determine if there are any unacceptable predicted cumulative effects.

4.7 Task 7: Complete EPA/OWRA Level Activities for Proposed CRRRC

Following completion of the Phase 1 - EA studies, which will result in the identification of the preferred undertaking and the assessment of its predicted effects on the environment, the proposed undertaking will undergo any additional analysis as required for submission under the EPA and OWRA. The EPA/OWRA supporting documentation, along with the EA documents, will be submitted as a single package (contained in several individual volumes) to the MOE. It is anticipated that this combined submission will meet the requirements of all of the MOE approval processes for the proposed undertaking (overall Site development, residuals disposal component, diversion components and ancillary operational features), with the understanding that the formal EPA/OWRA applications can only be submitted once the EA is approved. Depending on the EA conditions of approval or comments received on the EA, it may be necessary to supplement the EPA/OWRA documentation previously submitted; this would be done in the form of addenda or, only if required due to major changes, resubmission of modified reports.

4.7.1 Air Quality and Odour Assessment

The air quality and odour assessment will be carried out as part of the EA studies, and reported in a technical document in support of the Environmental Assessment report. For EPA approval of the preferred alternative, this assessment will be reported in a technical document in accordance with the MOE requirements for an Emission Summary and Dispersion Modelling (ESDM) report. The ESDM report will be used to support the application for an EPA Approval (Air and Noise). Prior to conducting the work, consultation with MOE will have been carried out to agree on the dispersion modelling approach and input parameters. Preparation of the ESDM report requires a compilation of all proposed sources of emissions, preparing emission estimates from these sources and comparison with MOE Standards for maximum allowable air quality concentrations at off-Site receptors. Additional final modelling may be required for the final preferred Site development concept; if this additional modelling suggests that the standards may not be achieved, modifications to the sources and/or additional mitigation measures will be required. Operational plans to control air emissions, i.e., dust and odours, will be provided, together with an appropriate monitoring program and applicable conceptual contingency plans, in an appendix to the D&O report, and summarized within the text of the D&O report.

4.7.2 Noise Assessment

The noise assessment conducted for on-Site sources for the preferred Site development concept in the EA studies will have included any proposed noise mitigation measures to meet the noise level limit for landfill operations for the preferred alternative in accordance with the MOE Noise Guideline for Landfills, October 1998.

For EPA approval, it will be necessary to prepare an Acoustic Assessment Report (AAR), in accordance with NPC-233 "Information to be Submitted for Approval of Stationary Sources of Sound", October, 1995 and NPC-205 “Sound Level Limits for Stationary Sources in Class 1 & 2 Areas (Urban)”, October 1995, or NPC-232 “Sound Level Limits for Stationary Sources in Class 3 Areas (Rural)”, October, 1995, using the analysis developed for the EA assessment of environmental effects for the preferred Site development concept. The details of this quantitative noise assessment will be provided in an appendix to the D&O report, and summarized within the text of the report. An appropriate noise monitoring program and applicable conceptual contingency plans will also be prepared. The AAR will be used in support of an application for an EPA Approval (Air and Noise).

4.8 Task 8: Finalize and Submit EAA/EPA/OWRA Documentation & Applications

In support of the completion of this task, the Atmospheric discipline team will carry out the following tasks:

- Document the assessments listed above, data sources and assessment results in an Atmospheric Supporting Document to the EASR, an ESDM report and AAR that will form an appendix to the D&O report;
- Participate in meetings with the government review agencies including upfront consultations with the MOE during the EA to obtain pre-approval of tasks in the work plan as required; and
- Provide technical support during the review of the EA by the regulatory agencies and the public.

APPENDIX C-2.2

Geology, Hydrogeology & Geotechnical Work Plan

Table of Contents

TABLES

FIGURES

1.0 INTRODUCTION

This document presents the proposed work plan for the Geology, Hydrogeology & Geotechnical components of the environmental assessment (EA) of the Boundary Road Site for the proposed Capital Region Resource Recovery Centre (CRRRC). The work plan is part of the Terms of Reference (TOR) for the EA submitted for approval to the Minister of the Environment. The TOR sets out the proponent's proposed approach for addressing the Ontario *Environmental Assessment Act* (EAA) requirements when preparing the EA. In addition to EA requirements, the proponent has chosen to submit a combined EAA and *Environmental Protection Act* (EPA) and *Ontario Water Resources Act* (OWRA) document package. Therefore, additional detailed studies required for subsequent EPA/OWRA approval are included in this work plan.

2.0 ASSESSMENT FRAMEWORK

2.1 Project Team Organization

The project tasks will be organized to be completed by the following teams:

- The EA Management Team;
- The Design and Operations (D&O) Team consists of landfill design technical staff and CAD technicians; and
- The EA Team consists of discipline leads for each of nine different environmental components.

2.2 Study Areas

Data for the site-specific component of the EA will be collected and analyzed for three generic study areas presented in the TOR. The generic study areas are as follows:

- Site – The lands secured by Taggart Miller Environmental Services (Taggart Miller) for the proposed CRRRC;
- Site-vicinity – The lands in the vicinity of the Site (generally within 500 m of the Site boundaries, and modified as appropriate for specific technical disciplines as will be determined during the EA); and
- Haul Routes – The main haul/access route(s) to the Site.

As noted, the generic study areas described above may be adjusted as required during the EA to suit the requirements of the Geology, Hydrogeology & Geotechnical components as described below.

3.0 COMPARATIVE EVALUATION OF ALTERNATIVE SITES AND IDENTIFICATION OF PREFERRED SITE

Two properties that have been secured by Taggart Miller have been identified as suitable locations for the proposed CRRRC (the Alternative Sites). The first step in the EA process will be the identification of the preferred Site for the proposed diversion facilities and landfill that comprise the CRRRC.

3.1 Assessment Criteria and Indicators

The Geology, Hydrogeology & Geotechnical components will compare the Alternative Sites using the following criterion:

- Which site is preferred for protection of groundwater?

The rationale, indicators and data sources for the Alternative Sites criterion listed above are provided in Appendix A of the proposed TOR.

3.2 Approach and Work Plan

The Geology, Hydrogeology & Geotechnical discipline team will complete a comparison of information about each of the two Alternative Sites available from published information and from preliminary investigations/assessments on or in the vicinity of each of the Sites. The following tasks will be undertaken to obtain and review the published information and complete the preliminary investigations/assessments for the Boundary Road Site:

- Compile and interpret information from defined background sources, including published geotechnical, geological and hydrogeological maps and reports, water well data, regional groundwater and wellhead protection studies, regional and local topographic and drainage mapping, Environment Canada climatic normals and the findings and interpretations of previous subsurface investigations in the vicinity of the Site;
- Review Municipal Official Plans, specifically for any groundwater protection zones, recharge areas, etc.
- Discuss local water supply with groundwater users in the vicinity of the Site, and collect groundwater samples from select water supply wells on or in the area of the Site to characterize background groundwater quality for typical organic and inorganic landfill leachate parameters; and
- A portion of the more detailed field work outlined in Section 4.1, Task 1 of this work plan will be completed to provide site-specific information for comparison of the Alternative Sites.

Based on this information and the above criterion, the Geology, Hydrogeology & Geotechnical discipline team will identify which of the Alternative Sites is preferred for this component.

If the Boundary Road Site is selected as the preferred Site, then the remainder of this work plan will be completed. If the North Russell Road Site is selected as the preferred Site, then no further action under this work plan will be completed, and the North Russell Road Site Geology, Hydrogeology & Geotechnical work plan will be used.

4.0 EA AND EPA ASSESSMENT OF THE PREFERRED SITE FOR THE CRRRC

The remaining steps of the EA/EPA/OWRA assessment are proposed to take place in three phases. The proposed phases consist of the following tasks:

<u>Phase 1 – EA:</u>

- Task 1 – Complete Assessment of Existing Environment;
- Task 2 – Identify Preferred Site Development Concept;
- Task 3 – Assess Environmental Effects of Preferred Site Development Concept;
- Task 4 – Assessment of Alternative Haul Routes and Identify Preferred Route;
- Task 5 – Evaluate Leachate Management Options and Identify Preferred Option; and

- Task 6 – Cumulative Impact Assessment.

Phase 2 – EPA/OWRA:

- Task 7 – Complete EPA/OWRA Level Activities for Proposed CRRRC.

Phase 3 – Documentation and Submission:

- Task 8 – Finalize and Submit EAA/EPA/OWRA Documentation and Applications.

For the Geology, Hydrogeology & Geotechnical Work Plan, activities will be carried out as part of Tasks 1, 2, 3, 5, 6, 7 and 8 as described below.

4.1 Task 1: Complete Assessment of Existing Environment

The proposed Geology, Hydrogeology & Geotechnical Work Plan described herein was developed to gather information required to understand the Boundary Road Site to a level of detail suitable for the purpose of supporting a submission for combined EAA and EPA/OWRA approval for on-Site diversion and on-Site residual disposal components.

The Geology, Hydrogeology & Geotechnical components include the subcomponents groundwater quality, groundwater flow and soil geotechnical properties. The following tasks will be undertaken to characterize existing subsurface conditions.

- Review conceptual components of the proposed CRRRC project;
- Acquire and review published and unpublished research on the occurrence of Quaternary deformation features within about a 200 km radius of the Site;
- Consult with local Canadian earthquake experts to understand seismicity in this area and how seismic effects are approached and accommodated in local engineering and design practice;
- Analyze the topography within a 5 km radius of the Site using high resolution digital elevation models (DEM) and LiDAR imagery (if available) to identify and interpret surface topographic features that might relate to surface faulting of the bedrock;
- Document the location and nature of any bedrock faults observed in natural exposures and drillholes within a 5 km radius of the proposed Site including their level of calcite cementation and any evidence for near surface stress relief features. Considering the relatively thick soil cover in much of this area, it is expected that natural exposures will be limited, and the drillholes would likely be those drilled as part of the hydrogeological investigation of the Site;
- Complete a reconnaissance level survey to document the location and nature of evidence of deformation/displacement or paleoliquifaction in natural and artificial exposures of Quaternary sediments within about a 20 km radius of the Site, including glacial and post-glacial deposits. If such evidence is found, then further studies may be required to establish whether these features have a glacial or tectonic origin;
- Utilize information obtained from literature and field reconnaissance to assess the potential risk for fault movement on and in the area of the Site;

- On the basis of the background data, prepare a conceptual model of geological and hydrogeological conditions beneath and in the area of the Site (e.g., subsurface geologic units, local aquifers and recharge areas);
- Conduct subsurface investigations to characterize the overburden and bedrock geology at the Site, and to assess the hydrogeological and geotechnical properties of the materials (program described below);
- Characterize the hydraulic conductivity of the overburden deposits and upper bedrock (i.e., using rising or falling head tests in monitoring wells);
- Determine seasonal variation in groundwater levels and flow orientations using multi-level well nests;
- Collect groundwater samples from representative on-Site wells to characterize background groundwater quality for typical organic and inorganic landfill leachate parameters. In addition, selected groundwater samples from on-Site monitoring wells will be analyzed for ^{3}He and ^{3}H to assist in estimating the age of the groundwater;
- Determine soil characteristics and distribution of soil thickness across the Site, including shear-wave velocity profiles to assess seismic design requirements;
- Develop the final conceptual model of geological, hydrogeological and geotechnical conditions in the area of the Site, including groundwater and surface water interaction; and
- Determine “linkages” with other components and data generation/transfer requirements.

Based on the current understanding of the Site, a proposed geology, hydrogeology and geotechnical field program has been developed. The investigation consists of 24 test locations, spaced on a grid with approximately 300 to 400 metres separation. The 24 test locations have been identified as ‘A’ through ‘X’ and are shown on Figure C-2.2-1. The components of the field program are describe below, and details on the objectives of the drilling program along with the proposed drilling techniques, borehole depths, testing, etc. are presented in Table C-2.2-1.

The proposed field program includes the following components:

- At seven (7) of the 24 testing locations, boreholes will be augered through the overburden units and cored into the upper portion of the underlying bedrock. Depending on the number of subsurface units encountered at each borehole location, additional boreholes may be completed at the testing location to allow for the installation of monitoring wells in the geologic unit encountered (i.e., surficial sand, weathered or unweathered silty clay, basal till and bedrock). Up to three monitors may be installed in the silty clay to assess the pressure profile and vertical hydraulic gradient within this unit. If the basal till unit is encountered, split barrel sampling would be completed for the full depth of the till unit to obtain samples for grain size analysis;
- At the remaining 17 testing locations, shallow boreholes will be completed to assess the distribution and thickness of the surficial sand unit. Depending on the presence/absence and thickness of the surficial sand unit encountered, a groundwater monitor will be installed at selected locations to provide additional information on the water table and shallow groundwater flow system at the Site;

- If a surficial sand unit is encountered at any of the 24 testing locations, split-barrel sampling and Standard Penetration Testing would be completed for the full depth of the sand unit to confirm its compactness (as related to the potential for seismic liquefaction) and to obtain samples for grain size distribution testing;
- Where weathered silty clay (weathered crust) is encountered at any of the 24 testing locations, split-barrel sampling would be completed to visually confirm the thickness of the upper zone of the clay deposit;
- At all 24 testing locations, Cone Penetration Tests (CPT) (an instrumented probe for geotechnical characterization) will be advanced to fully penetrate the silty clay. The CPT will obtain information on the strength characteristics of the silty clay, as well as identify the presence, frequency and thickness of any sandy layering or inclusions;
- If the Cone Penetration Tests indicate the presence of sandy layering or inclusions within the silty clay deposit, continuous soil sampling using a direct-push drill would be completed at five locations to permit visual observation of the complete soil profile;
- Nilcon *in situ* vane testing would be completed at five locations to investigate the shear strength profile of the full thickness of the silty clay;
- Shelby tube samples would be collected from representative intervals within the silty clay for consolidation and/or triaxial testing; and
- As part of the subsurface investigation, representative overburden samples will be collected to determine the fraction of organic carbon (an input parameter for contaminant transport modelling).

In addition to the program summarized in Table C-2.2-1, to assist with the seismic evaluation and potential for bedrock faults, the maximum horizontal stress orientation in the bedrock would be determined in two of the boreholes at different depths using a USBM gauge and the overcoring technique. The specific two boreholes and depth intervals for this testing would be selected to get coverage of the Site.

Following completion of the field drilling and testing program, the in-situ rising or falling head test data would be analyzed to develop hydraulic conductivity estimates for the soil and bedrock on and in the vicinity of the Site. If boreholes encounter a surficial sand layer or basal till layer, grain size analyses of soil sample(s) from this layer(s) would be conducted such that its hydraulic conductivity could also be estimated empirically.

The locations and critical elevations for all proposed boreholes/monitoring wells would be surveyed to Geodetic datum.

Following the completion of the in-situ rising or falling head tests, a groundwater level monitoring program would be implemented. At a minimum, the groundwater levels would be measured in all existing monitoring wells on a monthly basis. Selected groundwater monitoring wells would be outfitted with dataloggers which would measure groundwater levels on a daily basis. Daily and monthly groundwater measurements would be gathered. These groundwater level measurements would be used to assess the daily and seasonal variations in groundwater levels, and would permit an assessment of the groundwater level changes in relationship to precipitation events. The groundwater level data would be used to characterize the horizontal and vertical groundwater flow regime at the Site.

Following completion of the geotechnical field investigation program, geotechnical laboratory testing would be carried out on selected soil samples. That testing would include index/classification testing (e.g., water content, Atterberg limit / plasticity, and grain size distribution) as well as more sophisticated testing relating to the strength and compressibility of the underlying soils, with a focus on the clay deposit. The testing would likely include laboratory oedometer consolidation testing to evaluate the consolidation characteristics of the deposit, and may also include triaxial testing to evaluate the shear strength of the deposit.

Upon completion of the field program and data analysis associated with the Geology, Hydrogeology & Geotechnical work plan (and allowing a period of time for the collection of sufficient representative groundwater level data), the data would be utilized to develop the final conceptual model of the geological and hydrogeological conditions in the area of the Site.

4.2 Task 2: Identify Preferred Site Development Concept

This task will involve developing Site development concepts for the proposed CRRRC and selecting the preferred Site development concept. It will be completed by the D&O Team and the EA Team. The Geology, Hydrogeology & Geotechnical components will provide input as required based on the initial investigation findings and analysis of the subsurface conditions (i.e., stability and settlement) as related to the conceptual design of the residual disposal cell component, and design considerations for diversion facilities and ancillary features.

4.3 Task 3: Assess Environmental Effects of Preferred Site Development Concept

Considering in-design mitigation measures, predictive modelling of alternative residual disposal facility performance (contaminant modelling and if necessary flow modelling) and contaminating lifespan as per Ontario Regulation (O. Reg.) 232/98 using selected key parameters of concern will be conducted. Based on the type and location of the alternative diversion facilities, the potential for impact on groundwater quality on and off-Site from these facilities will also be assessed. The landfill footprint size of the preferred Site development concept will be evaluated and the potential for change to recharging groundwater conditions and potential effects on off-Site groundwater resources and water supply will be estimated.

In terms of seismicity, it is anticipated based on all of the background information that the earthquake shaking hazard will be addressed by the application of existing probabilistic seismic hazard models that provide estimates of the severity of earthquake shaking at various return periods for a reference ground condition. The effects of site-specific amplification through the shear-wave velocity profile will be incorporated into the ground shaking estimates. The additional information on deformation and faulting collected as described above will be used to assess whether any modifications or enhancements to available regional probabilistic models are required. Based on these earthquake ground motions, appropriate measures will be developed as part of the site development concept analysis and designs. The analysis will include the stability of the landfill and liner system components under both static and seismic loading conditions.

4.4 Task 5: Evaluate Leachate Management Options and Identify Preferred Option

This task will be completed by the D&O and Surface Water discipline teams. The Surface Water discipline team will provide effluent discharge criteria and the D&O Team will define the alternatives and evaluate the options. The Geology and Hydrogeology discipline team will contribute to this task by estimating the leachate generation rate to be handled by the leachate treatment and disposal options and the contaminating lifespan with respect to leachate treatment. Any geotechnical or hydrogeological factors to be considered in this evaluation will be identified.

4.5 Task 6: Cumulative Impact Assessment

The EA Team will work to identify the predicted effects of other existing or certain and probable projects in the area of the Site. The Geology and Hydrogeology discipline team will consider other identified groundwater effects together from those projects with those predicted during the environmental effects assessment to determine if there are any unacceptable predicted cumulative effects.

4.6 Task 7: Complete EPA/OWRA Level Activities for Proposed CRRRC

Following completion of the Phase 1 - EA studies, which will result in the identification of the preferred undertaking and the assessment of its predicted effects on the environment, the proposed undertaking will undergo any additional analysis as required for submission under the EPA and OWRA. The EPA/OWRA supporting documentation, along with the EA documents, will be submitted as a single package (contained in several individual volumes) to the MOE. It is anticipated that this combined submission will meet the requirements of all of the MOE approval processes for the proposed undertaking (overall Site development, residuals disposal component, diversion components and ancillary operational features), with the understanding that the formal EPA/OWRA applications can only be submitted once the EA is approved. Depending on the EA conditions of approval or comments received on the EA, it may be necessary to supplement the EPA/OWRA documentation previously submitted; this would be done in the form of addenda or, only if required due to major changes, resubmission of modified reports.

The completed applications for EPA approval for the overall Site development, residuals disposal component and ancillary operational features must be accompanied by the Geology, Hydrogeology & Geotechnical Study Report. The Geology, Hydrogeology & Geotechnical Study Report will be prepared as part of the EA study, and also serve as one of the supporting documents for EPA approval. Its purpose is to describe the existing geological, hydrogeological, hydrological and geotechnical conditions, and the detailed prediction of impacts associated with the preferred Site development concept. It will include an assessment of the service lives of the engineered components of the disposal component of the CRRRC as compared to its predicted contaminating lifespan and will also include a detailed monitoring program, trigger mechanism and conceptual contingency plans.

4.7 Task 8: Finalize and Submit EAA/EPA/OWRA Documentation & Applications

In support of the completion of this task, the Geology, Hydrogeology & Geotechnical discipline team will carry out the following tasks:

- Document the assessments listed above, data sources and assessment results in a Geology, Hydrogeology & Geotechnical supporting document that will form an appendix to the EA submission;
- Participate in meetings with the government review agencies including upfront consultations with the MOE during the EA to obtain pre-approval of tasks in the work plan as required; and
- Provide technical support during the review of the EA by the regulatory agencies and the public.

Borehole Identifier (see Figure C-2.2-1)	Rationale for Borehole	Proposed Drilling Technique	Proposed Borehole Depth Below Ground Surface (metres)	Geotechnical Testing	Number of Monitoring Wells to be Installed in Borehole	In-situ Rising or Falling Head Tests in Monitoring Wells	Data Logger Installations
A	Investigate the thickness of the overburden units and hydrogeological characteristic of the overburden and upper bedrock; assess geotechnical properties of materials encountered; assist in defining groundwater flow directions in overburden and upper bedrock; assess vertical gradient in silty clay; assess layering in silty clay$^{(1)}$	Power auger through overburden followed by rotary drill with HQ core recovery direct-push$^{(1)}$	To be drilled approximately 5 metres into bedrock (approx. 35 m to 40 m) To be completed to base of silty clay (or as deep as possible with available equipment)	CPT to fully penetrate silty clay Nilcon vane Shelby tube split-barrel sampling$^{(2)}$ Standard Penetration Testing$^{(2)}$	Up to 6 (1 monitor in surficial sand, up to 3 monitors in silty clay, 1 monitor in basal till and 1 monitor in upper bedrock)	Yes	Yes
B	Investigate the thickness of the surficial sand and weathered crust; assess geotechnical properties of materials encountered; assist in defining shallow groundwater flow directions in overburden (if surficial sand unit is present)	Power auger	To be drilled to base of surficial sand (approx. 2 to 4 m) Fully penetrate silty clay	split-barrel sampling$^{(2)}$ Standard Penetration Tests$^{(2)}$ Cone Penetration Tests	Up to 1	Yes (if monitor installed)	No
C	Investigate the thickness of the surficial sand and weathered crust; assess geotechnical properties of materials encountered; assist in defining shallow groundwater flow directions in overburden (if surficial sand unit is present)	Power auger	To be drilled to base of surficial sand (approx. 2 to 4 m) Fully penetrate silty clay	split-barrel sampling$^{(2)}$ Standard Penetration Tests$^{(2)}$ Cone Penetration Tests	Up to 1	Yes (if monitor installed)	No
D	Investigate the thickness of the surficial sand and weathered crust; assess geotechnical properties of materials encountered; assist in defining shallow groundwater flow directions in overburden (if surficial sand unit is present)	Power auger	To be drilled to base of surficial sand (approx. 2 to 4 m) Fully penetrate silty clay	split-barrel sampling$^{(2)}$ Standard Penetration Tests$^{(2)}$ Cone Penetration Tests	Up to 1	Yes (if monitor installed)	No
E	Investigate the thickness of the overburden units and hydrogeological characteristic of the overburden and upper bedrock; assess geotechnical properties of materials encountered; assist in defining groundwater flow directions in overburden and upper bedrock; assess vertical gradient in silty clay; assess layering in silty clay$^{(1)}$	Power auger through overburden followed by rotary drill with HQ core recovery direct-push$^{(1)}$	To be drilled approximately 5 metres into bedrock (approx. 35 m to 40 m) To be completed to base of silty clay (or as deep as possible with available equipment)	CPT to fully penetrate silty clay Nilcon vane Shelby tube split-barrel sampling$^{(2)}$ Standard Penetration Testing$^{(2)}$	Up to 6 (1 monitor in surficial sand, up to 3 monitors in silty clay, 1 monitor in basal till and 1 monitor in upper bedrock)	Yes	Yes
F	Investigate the thickness of the surficial sand and weathered crust; assess geotechnical properties of materials encountered; assist in defining shallow groundwater flow directions in overburden (if surficial sand unit is present)	Power auger	To be drilled to base of surficial sand (approx. 2 to 4 m) Fully penetrate silty clay	split-barrel sampling$^{(2)}$ Standard Penetration Tests$^{(2)}$ Cone Penetration Tests	Up to 1	Yes (if monitor installed)	No
G	Investigate the thickness of the surficial sand and weathered crust; assess geotechnical properties of materials encountered; assist in defining shallow groundwater flow directions in overburden (if surficial sand unit is present)	Power auger	To be drilled to base of surficial sand (approx. 2 to 4 m) Fully penetrate silty clay	split-barrel sampling$^{(2)}$ Standard Penetration Tests$^{(2)}$ Cone Penetration Tests	Up to 1	Yes (if monitor installed)	No
H	Investigate the thickness of the surficial sand and weathered crust; assess geotechnical properties of materials encountered; assist in defining shallow groundwater flow directions in overburden (if surficial sand unit is present)	Power auger	To be drilled to base of surficial sand (approx. 2 to 4 m) Fully penetrate silty clay	split-barrel sampling$^{(2)}$ Standard Penetration Tests$^{(2)}$ Cone Penetration Tests	Up to 1	Yes (if monitor installed)	No

Borehole Identifier (see Figure C-2.2-1)	Rationale for Borehole	Proposed Drilling Technique	Proposed Borehole Depth Below Ground Surface (metres)	Geotechnical Testing	Number of Monitoring Wells to be Installed in Borehole	In-situ Rising or Falling Head Tests in Monitoring Wells	Data Logger Installations
I	Investigate the thickness of the overburden units and hydrogeological characteristic of the overburden and upper bedrock; assess geotechnical properties of materials encountered; assist in defining groundwater flow directions in overburden and upper bedrock; assess vertical gradient in silty clay; assess layering in silty clay⁽¹⁾	Power auger through overburden followed by rotary drill with NQ core recovery direct-push⁽¹⁾	To be drilled approximately 3 metres into bedrock (approx. 35 m to 40 m) To be completed to base of silty clay (or as deep as possible with available equipment)	CPT to fully penetrate silty clay Nilcon vane Shelby tube split-barrel sampling⁽²⁾ Standard Penetration Testing⁽²⁾	Up to 6 (1 monitor in surficial sand, up to 3 monitors in silty clay, 1 monitor in basal till and 1 monitor in upper bedrock)	Yes	Yes
J	Investigate the thickness of the surficial sand and weathered crust; assess geotechnical properties of materials encountered; assist in defining shallow groundwater flow directions in overburden (if surficial sand unit is present)	Power auger	To be drilled to base of surficial sand (approx. 2 to 4 m) Fully penetrate silty clay	split-barrel sampling⁽²⁾ Standard Penetration Tests⁽²⁾ Cone Penetration Tests	Up to 1	Yes (if monitor installed)	No
K	Investigate the thickness of the surficial sand and weathered crust; assess geotechnical properties of materials encountered; assist in defining shallow groundwater flow directions in overburden (if surficial sand unit is present)	Power auger	To be drilled to base of surficial sand (approx. 2 to 4 m) Fully penetrate silty clay	split-barrel sampling⁽²⁾ Standard Penetration Tests⁽²⁾ Cone Penetration Tests	Up to 1	Yes (if monitor installed)	No
L	Investigate the thickness of the surficial sand and weathered crust; assess geotechnical properties of materials encountered; assist in defining shallow groundwater flow directions in overburden (if surficial sand unit is present)	Power auger	To be drilled to base of surficial sand (approx. 2 to 4 m) Fully penetrate silty clay	split-barrel sampling⁽²⁾ Standard Penetration Tests⁽²⁾ Cone Penetration Tests	Up to 1	Yes (if monitor installed)	No
M	Investigate the thickness of the surficial sand and weathered crust; assess geotechnical properties of materials encountered; assist in defining shallow groundwater flow directions in overburden (if surficial sand unit is present)	Power auger	To be drilled to base of surficial sand (approx. 2 to 4 m) Fully penetrate silty clay	split-barrel sampling⁽²⁾ Standard Penetration Tests⁽²⁾ Cone Penetration Tests	Up to 1	Yes (if monitor installed)	No
N	Investigate the thickness of the overburden units and hydrogeological characteristic of the overburden and upper bedrock; assess geotechnical properties of materials encountered; assist in defining groundwater flow directions in overburden and upper bedrock	Power auger through overburden followed by rotary drill with NQ core recovery	To be drilled approximately 3 metres into bedrock (approx. 35 m to 40 m)	CPT to fully penetrate silty clay split-barrel sampling⁽²⁾ Standard Penetration Testing⁽²⁾	Up to 4 (1 monitor in surficial sand, 1 monitor in silty clay, 1 monitor in basal till and 1 monitor in bedrock)	Yes	No
O	Investigate the thickness of the surficial sand and weathered crust; assess geotechnical properties of materials encountered; assist in defining shallow groundwater flow directions in overburden (if surficial sand unit is present)	Power auger	To be drilled to base of surficial sand (approx. 2 to 4 m) Fully penetrate silty clay	split-barrel sampling⁽²⁾ Standard Penetration Tests⁽²⁾ Cone Penetration Tests	Up to 1	Yes (if monitor installed)	No
P	Investigate the thickness of the surficial sand and weathered crust; assess geotechnical properties of materials encountered; assist in defining shallow groundwater flow directions in overburden (if surficial sand unit is present)	Power auger	To be drilled to base of surficial sand (approx. 2 to 4 m) Fully penetrate silty clay	split-barrel sampling⁽²⁾ Standard Penetration Tests⁽²⁾ Cone Penetration Tests	Up to 1	Yes (if monitor installed)	No

Borehole Identifier (see Figure C-2.2-1)	Rationale for Borehole	Proposed Drilling Technique	Proposed Borehole Depth Below Ground Surface (metres)	Geotechnical Testing	Number of Monitoring Wells to be Installed in Borehole	In-situ Rising or Falling Head Tests in Monitoring Wells	Data Logger Installations
Q	Investigate the thickness of the overburden units and hydrogeological characteristic of the overburden and upper bedrock; assess geotechnical properties of materials encountered; assist in defining groundwater flow directions in overburden and upper bedrock; assess vertical gradient in silty clay; assess layering in silty clay(1)	Power auger through overburden followed by rotary drill with NQ core recovery direct-push(1)	To be drilled approximately 3 metres into bedrock (approx. 35 m to 40 m) To be completed to base of silty clay (or as deep as possible with available equipment)	CPT to fully penetrate silty clay Nilcon vane Shelby tube split-barrel sampling(2) Standard Penetration Testing(2)	Up to 6 (1 monitor in surficial sand, up to 3 monitors in silty clay, 1 monitor in basal till and 1 monitor in upper bedrock)	Yes	Yes
R	Investigate the thickness of the surficial sand and weathered crust; assess geotechnical properties of materials encountered; assist in defining shallow groundwater flow directions in overburden (if surficial sand unit is present)	Power auger	To be drilled to base of surficial sand (approx. 2 to 4 m) Fully penetrate silty clay	split-barrel sampling(2) Standard Penetration Tests(2) Cone Penetration Tests	Up to 1	Yes (if monitor installed)	No
S	Investigate the thickness of the surficial sand and weathered crust; assess geotechnical properties of materials encountered; assist in defining shallow groundwater flow directions in overburden (if surficial sand unit is present)	Power auger	To be drilled to base of surficial sand (approx. 2 to 4 m) Fully penetrate silty clay	split-barrel sampling(2) Standard Penetration Tests(2) Cone Penetration Tests	Up to 1	Yes (if monitor installed)	No
T	Investigate the thickness of the surficial sand and weathered crust; assess geotechnical properties of materials encountered; assist in defining shallow groundwater flow directions in overburden (if surficial sand unit is present)	Power auger	To be drilled to base of surficial sand (approx. 2 to 4 m) Fully penetrate silty clay	split-barrel sampling(2) Standard Penetration Tests(2) Cone Penetration Tests	Up to 1	Yes (if monitor installed)	No
U	Investigate the thickness of the surficial sand and weathered crust; assess geotechnical properties of materials encountered; assist in defining shallow groundwater flow directions in overburden (if surficial sand unit is present)	Power auger	To be drilled to base of surficial sand (approx. 2 to 4 m) Fully penetrate silty clay	split-barrel sampling(2) Standard Penetration Tests(2) Cone Penetration Tests	Up to 1	Yes (if monitor installed)	No
V	Investigate the thickness of the overburden units and hydrogeological characteristic of the overburden and upper bedrock; assess geotechnical properties of materials encountered; assist in defining groundwater flow directions in overburden and upper bedrock	Power auger through overburden followed by rotary drill with NQ core recovery	To be drilled approximately 3 metres into bedrock (approx. 35 m to 40 m)	CPT to fully penetrate silty clay split-barrel sampling(2) Standard Penetration Testing(2)	Up to 4 (1 monitor in surficial sand, 1 monitor in silty clay, 1 monitor in basal till and 1 monitor in bedrock)	Yes	No
W	Investigate the thickness of the surficial sand and weathered crust; assess geotechnical properties of materials encountered; assist in defining shallow groundwater flow directions in overburden (if surficial sand unit is present)	Power auger	To be drilled to base of surficial sand (approx. 2 to 4 m) Fully penetrate silty clay	split-barrel sampling(2) Standard Penetration Tests(2) Cone Penetration Tests	Up to 1	Yes (if monitor installed)	No
X	Investigate the thickness of the surficial sand and weathered crust; assess geotechnical properties of materials encountered; assist in defining shallow groundwater flow directions in overburden (if surficial sand unit is present)	Power auger	To be drilled to base of surficial sand (approx. 2 to 4 m) Fully penetrate silty clay	split-barrel sampling(2) Standard Penetration Tests(2) Cone Penetration Tests	Up to 1	Yes (if monitor installed)	No

Borehole Identifier (see Figure C-2.2-1)	Rationale for Borehole	Proposed Drilling Technique	Proposed Borehole Depth Below Ground Surface (metres)	Geotechnical Testing	Number of Monitoring Wells to be Installed in Borehole	In-situ Rising or Falling Head Tests in Monitoring Wells	Data Logger Installations
Y	Investigate the thickness of the overburden units and hydrogeological characteristic of the overburden and upper bedrock; assess geotechnical properties of materials encountered; assist in defining groundwater flow directions in overburden and upper bedrock; assess vertical gradient in silty clay; assess layering in silty clay(1)	Power auger through overburden followed by rotary drill with HQ core recovery direct-push(1)	To be drilled approximately 5 metres into bedrock (approx. 35 m to 40 m) To be completed to base of silty clay (or as deep as possible with available equipment)	CPT to fully penetrate silty clay Nilcon vane Shelby tube split-barrel sampling(2) Standard Penetration Testing(2)	Up to 6 (1 monitor in surficial sand, up to 3 monitors in silty clay, 1 monitor in basal till and 1 monitor in upper bedrock)	Yes	Yes

Notes:

(1) – If the results of the Cone Penetrations Tests indicate the presence of extensive layering within the silty clay unit, continuous soil sampling using a direct-push drill rig would be completed at five locations. If direct-push sampling is required, the actual locations may differ from those proposed above, and will depend on conditions encountered in the field during drilling.

(2) – Split-barrel sampling would be completed if either the surficial sand or weathered crust are encountered, and Standard Penetration Testing would only be completed if the surficial sand layer is encountered.

LEGEND

PROPOSED BOREHOLE

● NILCON VANE PROFILE, SHELBY TUBES, DIRECT-PUSH SAMPLING (IF REQUIRED), MULTI LEVEL MONITORING WELL NEST

● MULTI-LEVEL MONITORING WELL NEST

● SURFICIAL SAND MONITOR

NOTE

-CPT THROUGH SILTY CLAY AT ALL LOCATIONS
-SPLIT-BARREL SAMPLING AND SPT AT ALL LOCATIONS HAVING SURFICIAL SAND

REFERENCE

BACKGROUND IMAGERY - BING MAPS AERIAL (C) 2010 MICROSOFT CORPORATION AND ITS DATA SUPPLIERS
AERIAL PHOTOGRAPHS PURCHASED FROM THE CITY OF OTTAWA
BASE DATA - CANVEC PROVIDED BY HER MAJESTY THE QUEEN IN RIGHT OF CANADA, DEPARTMENT OF NATURAL RESOURCES, 2010
PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 18

PROJECT
TERMS OF REFERENCE FOR
ENVIRONMENTAL ASSESSMENT OF THE CAPITAL
REGION RESOURCE RECOVERY CENTRE

TITLE
PROPOSED BOREHOLE LOCATION FOR GEOLOGY,
HYDROGEOLOGY AND GEOTECHNICAL WORK PLAN
BOUNDARY ROAD SITE

Golder Associates
Ottawa, Ontario

PROJECT No. 09-1125-1008			SCALE AS SHOWN	REV. 0.0
DESIGN	JPAO	07 Nov. 2012	FIGURE C-2.2-1	
GIS	BR/PM	13 Nov. 2012		
CHECK	PLE	13 Nov. 2012		
REVIEW	PAS	13 Nov. 2012		

Path: N:\Active\GIS\Clients\HansonBrick\GIS\Projects\0911251008\ArcGIS\Phase_9000 TOR\0911251008-1000-C-2.2-1.mxd

TAGGART
GROUP OF COMPANIES

APPENDIX C-2.3

Surface Water Work Plan

Table of Contents

1.0 INTRODUCTION

This document presents the proposed work plan for the Surface Water component of the environmental assessment (EA) of the Boundary Road Site for the proposed Capital Region Resource Recovery Centre (CRRRC). The work plan is part of the Terms of Reference (TOR) for the EA submitted for approval to the Minister of the Environment. The TOR sets out the proponent's proposed approach for addressing the Ontario *Environmental Assessment Act* (EAA) requirements when preparing the EA. In addition to EA requirements, the proponent has chosen to submit a combined EAA and *Environmental Protection Act* (EPA) and *Ontario Water Resources Act* (OWRA) documentation package. Therefore, additional detailed studies required for subsequent EPA/OWRA approval are included in this work plan.

2.0 ASSESSMENT FRAMEWORK

2.1 Project Team Organization

The project tasks will be organized to be completed by the following teams:

- The EA Management Team;
- The Design and Operations (D&O) Team consists of landfill design technical staff and CAD technicians; and
- The EA Team consists of discipline leads for each of nine different environmental components.

2.2 Study Areas

Data for the site-specific component of the EA site will be collected and analyzed for three generic study areas presented in the TOR. The generic study areas are as follows:

- Site – The lands secured by Taggart Miller Environmental Services (Taggart Miller) for the proposed CRRRC;
- Site-vicinity – The lands in the vicinity of the Site (generally within 500 m of the Site boundaries, and modified as appropriate for specific technical disciplines as will be determined during the EA); and
- Haul Routes – The main haul/access route(s) to the Site.

As noted, the generic study areas described above may be adjusted as required during the EA to suit the requirements of the Surface Water component.

3.0 COMPARATIVE EVALUATION OF ALTERNATIVE SITES AND IDENTIFICATION OF PREFERRED SITE

Two properties that have been secured by Taggart Miller have been identified as suitable locations for the proposed CRRRC (the Alternative Sites). The first step in the EA process will be the identification of the preferred Site for the proposed diversion facilities and landfill that comprise the CRRRC.

3.1 Assessment Criteria and Indicators

The Surface Water component will compare the Alternative Sites using the following criterion:

- Which site is preferred for protection of surface water quality?

The rationale, indicators and data sources for the Alternative Sites criterion listed above are provided in Appendix A of the proposed TOR.

3.2 Approach and Work Plan

The Surface Water discipline team will complete a comparison of information about each of the two Alternative Sites available from published information and from preliminary investigations/assessments on or in the vicinity of each of the Sites. The following tasks will be undertaken to obtain and review the published information and complete the preliminary investigations/assessments for the Boundary Road Site:

- Compile and interpret information from defined background sources including:
    - Topographic mapping and aerial photography to define drainage networks and drainage watersheds/sub-watersheds, Site discharge locations; and
    - Published sources (Ministry of the Environment (MOE), Environment Canada, conservation authority) to characterize water quality and stream flow.
- Conduct Site reconnaissance to confirm and refine the information from available sources;
- Discuss information as necessary with municipal staff, MOE, and the conservation authority; and
- Surface water flow and water quality monitoring stations.

Based on this information and the above criterion, the Surface Water discipline team will identify which of the Alternative Sites is preferred for this component.

If the Boundary Road Site is selected as the preferred Site, then the remainder of this work plan will be completed. If the North Russell Road Site is selected as the preferred Site, then no further action under this work plan will be completed, and the North Russell Road Site Surface Water work plan will be used.

4.0 EA AND EPA ASSESSMENT OF THE PREFERRED SITE FOR THE CRRRC

The remaining steps of the EA/EPA/OWRA assessment are proposed to take place in three phases. The proposed phases consist of the following tasks:

Phase 1 – EA

- Task 1 – Complete Assessment of Existing Environment;
- Task 2 – Identify Preferred Site Development Concept;
- Task 3 – Assess Environmental Effects of Preferred Site Development Concept;
- Task 4 – Assessment of Alternative Haul Routes and Identify Preferred Route;
- Task 5 – Evaluate Leachate Management Options and Identify Preferred Option; and
- Task 6 – Cumulative Impact Assessment.

Phase 2 – EPA/OWRA

- Task 7 – Complete EPA Level Activities for Preferred CRRRC.

Phase 3 – Documentation and Submission

- Task 8 – Finalize and Submit EAA/EPA/OWRA Documentation and Applications.

For the Surface Water work plan, activities will be carried out as part of Tasks 1, 2, 3, 5, 6, 7 and 8 as described below.

4.1 Task 1: Complete Assessment of Existing Environment

The following tasks will be undertaken to further characterize existing environmental conditions:

- Review conceptual components of the proposed CRRRC project;
- Test surface water quality at selected locations for a suite of chemical and metal parameters as well as field measurements for pH, turbidity, conductivity and dissolved oxygen;
- Summarize existing surface water flow and quality representative of conditions upstream and downstream of the proposed diversion and residual waste disposal facility site development concepts; and
- Using an event based hydrologic model, calculate surface water runoff peak flow rates in the area of the proposed diversion facilities and residual waste disposal facility under existing pre-development conditions, using 2, 5, 25 and 100 year design storms as set out in Ontario Regulation (O. Reg.) 232/98.

4.2 Task 2: Identify Preferred Site Development Concept

This task will involve developing Site development concepts for the proposed CRRRC and selecting the preferred Site development concept. It will be completed by the D&O Team and the EA Team. The Surface Water discipline team will provide input on conceptual stormwater management requirements and outlet locations based on available information for consideration in the Site design.

4.3 Task 3: Assess Environmental Effects of Preferred Site Development Concept

The preferred Site development concept will be assessed to evaluate potential effects to surface water quantity and quality. The MOE has stringent requirements with respect to protection of surface water. Predicted effects to surface water will be linked with the Biology component for the assessment of potential effects to fish habitat.

The following list of activities will be carried out as part of the prediction of environmental effects:

- Based on the preferred Site development concept, predict and assess future surface water runoff and peak flows and quality conditions for a range of storm events (e.g., 2, 5, 25 and 100 year);
- Compare these predictions to the existing pre-development conditions; determine changes and potential adverse effects on downstream water courses. Determine if mitigation measures are required, and if so develop conceptual mitigation, (e.g., engineered stormwater management measures/facilities); and
- Document the factual information and analysis in a Surface Water Supporting Document that will form an appendix to the EA/EPA submission and the basis of the OWRA submission for approval of the stormwater management facilities.

4.4 Task 5: Evaluate Leachate Management Options and Identify Preferred Option

At present it is not decided how or where the leachate generated at the Site will be treated. Task 5 will be to evaluate off-Site leachate treatment alternatives compared to on-Site treatment. Approval of treatment systems requires strict conformance with treatment system discharge criteria with very detailed contingencies in the event a non-conformance event occurs.

The Surface Water discipline team will not provide input to the evaluation of leachate management options, but will assist in selecting the approach to on-Site treatment. The Surface Water discipline team will establish effluent discharge requirements for alternatives involving on-Site treatment for discharge to the natural environment (i.e., on-Site treatment for discharge to the local surface water environment). The measures required to manage the discharge of combined treated leachate and stormwater runoff, from both a quantity and quality perspective, to meet provincial requirements will be developed. Depending on the preferred alternative there may be an OWRA approval required for leachate treatment and disposal, and a leachate management report will be prepared as an appendix to the D&O report, and in support of any application for OWRA approval.

4.5 Task 6: Cumulative Impact Assessment

The EA Team will work to identify the predicted effects of other existing or certain and probable proposed projects in the area of the Site. The Surface Water discipline team will consider other identified surface water effects together from those projects with those predicted during the environmental effects assessment to determine if there are any unacceptable predicted cumulative effects.

4.6 Task 7: Complete EPA/OWRA Level Activities for Proposed CRRRC

Following completion of the Phase 1 - EA studies, which will result in the identification of the preferred undertaking and the assessment of its predicted effects on the environment, the proposed undertaking will undergo any additional analysis as required for submission under the EPA and OWRA. The EPA/OWRA supporting documentation, along with the EA documents, will be submitted as a single package (contained in several individual volumes) to the MOE. It is anticipated that this combined submission will meet the requirements of all of the MOE approval processes for the proposed undertaking (overall Site development, residuals disposal component, diversion components and ancillary operational features), with the understanding that the formal EPA/OWRA applications can only be submitted once the EA is approved. Depending on the EA conditions of approval or comments received on the EA, it may be necessary to supplement the EPA/OWRA documentation previously submitted; this would be done in the form of addenda or, only if required due to major changes, resubmission of modified reports.

In addition to the conceptual design options for the leachate management system, a stormwater management system design for the facility will require OWRA approval. The EA studies will present the overall approach to stormwater management for the Site and the required size of stormwater management systems based on modelling results and conceptual level designs. The stormwater management system design will be refined based on the phasing and final grading plans for the overall Site development. Design drawings and details, suitable for OWRA approval, will be prepared. Consultation with the conservation authority will be required to obtain their input and any permitting approvals associated with construction of the stormwater management ponds and other drainage works.

Site drainage will be designed in accordance with the Landfill Standards[1]. Surface water discharges from the Site will be controlled to at or below existing pre-development conditions to minimize potential for downstream flooding and erosion. Stormwater quality features will be designed to treat the 4 hour – 25 mm storm event. The final alignment, sizing and conveyance capacity of drainage ditches will also be assessed. External ditches will be designed to convey 1 in 100 year event flows while on-Site features will be designed to convey 1 in 25 year flows with an overland flow route for larger flows. A sediment and erosion control plan will be created to identify measures to be implemented during construction and installation and during the facility operation. If on-Site treatment of leachate with discharge to the natural environment is identified as the preferred alternative, or off-Site options are not available, management of treated effluent discharge will be combined with that required for Site drainage.

A monitoring program appropriate for the preferred alternative and leachate treatment system, trigger mechanisms and conceptual contingency plans approaches will be prepared.

4.7 Task 8: Finalize and Submit EAA/EPA/OWRA Documentation & Applications

In support of the completion of this task, the Surface Water discipline team will carry out the following tasks:

- Document the assessments listed above, data sources and assessment results in a Surface Water Supporting Document that will form an appendix to the EA submission;
- Document the design information required in support of the OWRA application and approval in a Stormwater Management report, that will form an appendix to the D&O report;
- Participate in meetings with the government review agencies including upfront consultations with the MOE during the EA to obtain pre-approval of tasks in the work plan as required;
- Provide technical support during the review of the EA by the regulatory agencies and the public.

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[1] Ministry of the Environment (MOE). 2010. *Landfill Standards: A Guideline on the Regulatory and Approval Requirements for New or Expanding Landfilling Sites.* June 2010. PIBS 7792e.

TAGGART
GROUP OF COMPANIES

APPENDIX C-2.4

Biology Work Plan

Table of Contents

1.0 INTRODUCTION

This document presents the proposed work plan for the Biology component of the environmental assessment (EA) of the Boundary Road Site for the proposed Capital Region Resource Recovery Centre (CRRRC). The work plan is part of the Terms of Reference (TOR) of the EA submitted for approval to the Minister of the Environment. The TOR sets out the proponent's proposed approach for addressing the Ontario *Environmental Assessment Act* (EAA) requirements when preparing the EA. In addition to EA requirements, the proponent has chosen to submit a combined EAA and *Environmental Protection Act* (EPA) and *Ontario Water Resources Act* (OWRA) documentation package. Therefore, additional detailed studies required for subsequent EPA/OWRA approval are included in this work plan.

2.0 ASSESSMENT FRAMEWORK

2.1 Project Team Organization

The project tasks will be organized to be completed by the following teams:

- The EA Management Team;
- The Design and Operations (D&O) Team consists of landfill design technical staff and CAD technicians; and
- The EA Team consists of discipline leads for each of nine different environmental components.

2.2 Study Areas

Data for the site-specific component of the EA will be collected and analyzed for three generic study areas presented in the TOR. The generic study areas are as follows:

- Site – The lands secured by Taggart Miller Environmental Services (Taggart Miller) for the proposed CRRRC;
- Site-vicinity – The lands in the vicinity of the Site (generally within 500 m of the Site boundaries, and modified as appropriate for specific technical disciplines as will be determined during the EA); and
- Haul Routes – The main haul/access route(s) to the Site.

As noted, the generic study areas described above may be adjusted as required during the EA to suit the requirements of the Biology component.

3.0 COMPARATIVE EVALUATION OF ALTERNATIVE SITES AND IDENTIFICATION OF PREFERRED SITE

Two properties that have been secured by Taggart Miller have been identified as suitable locations for the proposed CRRRC (the Alternative Sites). The first step in the EA process will be the identification of the preferred Site for the proposed diversion facilities and landfill that comprise the CRRRC.

3.1 Assessment Criteria and Indicators

The Biology component will compare the Alternative Sites using the following criterion:

- Which site is preferred for protection of terrestrial and aquatic biological systems?

The rationale, indicators and data sources for the Alternative Sites criterion listed above are provided in Appendix A of the proposed TOR.

3.2 Approach and Work Plan

The Biology discipline team will complete a comparison of information about each of the two Alternative Sites available from published information and from preliminary investigations/assessments on or in the vicinity of each of the Sites.

A targeted desktop data review will be conducted of natural environment information available for the Boundary Road Site and adjacent lands, identifying any designated natural areas or significant natural heritage features on or adjacent to the Site.

Readily available literature, data and agency materials will be identified and obtained to assist in describing the natural features in the area. Past natural feature surveys and regulatory requirements for the Site and Site-vicinity will be reviewed. Background data review for this project will include a number of information sources. For the Boundary Road Site these sources include:

- Ontario Ministry of Natural Resources (MNR) Natural Heritage Information Centre (NHIC) geographic, species and natural areas information queries. Follow-up with MNR will be completed to verify information, as needed;
- MNR fisheries data for surface water features located within the Site-vicinity, if appropriate;
- Information and mapping available through the Conservation Authority for the Site and surrounding area, if applicable and available;
- The Atlas of the Breeding Birds of Ontario[1];
- Atlas of the Mammals of Ontario[2];
- Ontario Herpetofaunal Summary Atlas[3];
- Bird Studies Canada and other scientific organizations relevant and available databases;
- Royal Ontario Museum SAR mapping;
- Species lists, range maps, and other SAR information related to the *Species At Risk Act* and *Endangered Species Act*;
- The Committee on the Status of Endangered Wildlife in Canada species lists and status reports;
- Natural heritage schedules and associated text and mapping contained in the City of Ottawa Official Plans;
- Natural heritage related map layers from Ontario Base Map series, Natural Resource Values Information System (NRVIS) mapping and Land Information Ontario (LIO);

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[1] Cadman, M.D., D.A. Sutherland, G.G. Beck, D. Lepage and A.R. Couturier. 2007. Atlas of the Breeding Birds of Ontario. Bird Studies Canada, Environment Canada, Ontario Field Ornithologists, Ontario Ministry of Natural Resources, Ontario Nature. 728 pp**.**

[2] Dobbyn, J. 1994. Atlas of the Mammals of Ontario Federation of Naturalists. Don Mills, Ontario.

[3] Ministry of Natural Resources (MNR). 2011. Ontario Herpetofaunal Summary Atlas. Website accessed on May 27, 2011 at http://nhic.mnr.gov.on.ca/herps/ohs.html.

- Existing aerial photography; and
- Site visit to verify and assess information from published sources. Depending on timing, a portion of the more detailed surveys outlined in Section 4.1, Task 1 of this work plan may be completed.

Based on this information and the above criterion, the Biology discipline team will identify which of the Alternative Sites is preferred for this component.

If the Boundary Road Site is selected as the preferred Site, then the remainder of this work plan will be completed. If the North Russell Road Site is selected as the preferred Site, then no further action under this work plan will be completed, and the North Russell Road Site Biology work plan will be used.

4.0 EA AND EPA ASSESSMENT OF THE PREFERRED SITE FOR THE CRRRC

The site-specific components of the EA/EPA/OWRA assessment are proposed to take place in three phases. The proposed phases consist of the following tasks:

Phase 1 – EA

- Task 1 – Complete Assessment of Existing Environment;
- Task 2 – Identify Preferred Site Development Concept;
- Task 3 – Assess Environmental Effects of Preferred Site Development Concept;
- Task 4 – Assessment of Alternative Haul Routes and Identify Preferred Route;
- Task 5 – Evaluate Leachate Management Options and Identify Preferred Option; and
- Task 6 – Cumulative Impact Assessment.

Phase 2 – EPA/OWRA

- Task 7 – Complete EPA Level Activities for Proposed CRRRC.

Phase 3 – Documentation and Submission

- Task 9 – Finalize and Submit EAA/EPA/OWRA Documentation and Applications.

For the Biology work plan, activities will be carried out as part of Tasks 1, 2, 3, 6, 7 and 8 as described below.

4.1 Task 1: Complete Assessment of Existing Environment

Based on available information and preliminary field surveys, the plant communities on this Site are primarily those that are typical of an agricultural immature forest landscape of this sort and are common in the Ottawa area. Natural environment condition studies during the environmental assessment will include more detailed surveys and will be used to update and supplement the preliminary work completed. A portion of this work will be completed to support the initial comparison of the two Alternative Sites. The study results will be written up and provided in a report supporting the EA. Consultation with natural environment clubs about the species that may be present on the Site and adjacent lands will be conducted. MNR will be consulted prior to conducting the field program, to ensure species at risk, rare wildlife species, or rare plant communities are appropriately addressed (including butternut trees, American ginseng, turtles, fish and birds) and that the most recent survey protocols are followed. If any of these are found to be present or likely to be affected by the proposed project, the appropriate measures will have to be taken in order to obtain approvals for the project to proceed.

A biological sampling program will be undertaken to characterize existing terrestrial and aquatic environmental baseline conditions, including the temporal and spatial distribution of natural heritage features on the Site. Examples of natural heritage features with potential to occur on-Site include plant communities and wetland communities, wildlife, Species at Risk (SAR), significant portions of the habitat of endangered and threatened species, species of conservation concern, and designated natural areas (including but not limited to Areas of Natural and Scientific Interest (ANSI), significant woodlands, significant valley lands and provincially significant wetlands). Certain aspects of this work have already been carried out. This work will be supplemented and updated by proposed work. The biological sampling program will be separated into terrestrial and aquatic components as described in the following sections.

4.1.1 Terrestrial Environmental Field Data Collection and Characterization

The overall objective of this program will be to characterize existing terrestrial environmental baseline conditions in the area of the proposed diversion and residual waste disposal facility and Site-vicinity. Where feasible, the following surveys will be conducted in terrestrial and poorly drained areas on-Site.

Ecological Land Classification, Wetland, and Vegetation Surveys

Following protocols published by MNR[4], a detailed Ecological Land Classification (ELC) of the Site will be conducted by provincially certified staff. A plant inventory and rare plant survey will be carried out. The general abundance of each species present on the Site will be estimated. In addition, habitats where plant SAR could occur will be investigated and any rare, threatened, or endangered plants (e.g., butternut) will be identified. The location(s) of identified species with special conservation status will be mapped using hand-held Global Positioning System (GPS) units. Three ELC/plant surveys will be conducted between late spring and late summer to cover the blooming season of various species (e.g., spring for forest flowering plants such as *Trillium* spp. and *Viola* spp. (violet species), mid summer for *Juncus* spp. (rush species) and *Carex* spp (sedge species), late summer for *Aster* spp. and *Solidago* spp. (goldenrod species)). Results from the ELC surveys will be used to determine whether additional taxa-specific surveys, including SAR searches, will be required.

Avian Surveys

Several different avian survey methods may be utilized to sample bird species that may be found on-site:

- Breeding Raptor Surveys - One breeding raptor survey is planned in spring. An area search will be used to search for breeding adults, nests or other breeding evidence. Observations of raptors will also be made during Breeding Bird Surveys and other survey types. Depending on the species identified as potentially occurring on-site during the desktop review, species-specific playback may be utilized to detect those species that are known to respond (e.g., red-shouldered hawk *Buteo lineatus*);
- Owl Surveys - One breeding owl survey is planned in spring in conjunction with nocturnal amphibian surveys. Surveys may include silent listening as well as playback for species such as the eastern screech

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[4] Lee, H.T., Bakowsky, W.D., Riley, J., Bowles, J., Puddister, M., Uhlig, P., and McMurray, F.S. 1998. Ecological land classification of southern Ontario: First approximation and its application. Ontario Ministry of Natural Resources, Southcentral Science Section, Science Development and Transfer Branch. SCSS Field Guide FG-02.

owl (*Megascops asio*). All species of owls and other nocturnal wildlife that are encountered will be identified during these surveys. Incidental observations of wildlife will be noted during other on-Site surveys;

- Breeding Bird Surveys - Two Breeding Bird Surveys (BBS) will be conducted at the Site, planned for between May and July. The surveys will consist of point count stations distributed throughout all natural habitats at the Site (including SAR habitat). BBSs will begin one-half hour before sunrise and will generally be completed by 10:00 a.m. The surveys will be conducted when weather conditions (i.e., precipitation and wind) are within the parameters required by monitoring programs such as the Canadian Wildlife Service (CWS) Breeding Bird Survey. Each survey station will be visited for ten minutes and all species heard or seen will be identified. Other data collected will include but not be limited to distance of birds from observer, notable behaviours, sex and age (where possible); and
- Eastern Whip-poor-will, Common Nighthawk and Chimney Swift Surveys - These species are crepuscular and nocturnal by nature and require their own survey protocol. Therefore, nocturnal point count surveys at several stations are planned during May or June, when these species are most vocal. An effort will be made to conduct this survey within one week of the full moon, when the eastern whip-poor-will is most active. All other nocturnal wildlife observed will be identified during this survey.

Mammal Surveys/Deer Yard Usage

The MNR tracks significant deer yarding areas in Ontario. As part of the background review, a data request will be made for this information.

Two mammal surveys will be conducted at the Site, planned between April and October. Track counts are often the most feasible method for surveying large mammals. In addition to track/sign/scat surveys, as well as incidental observations, infrared cameras will be deployed to identify mammal activity at the Site. Data will be downloaded from these cameras during visits to the Site.

Amphibian Surveys

Two or three nocturnal amphibian (frogs and toads) surveys will be conducted, planned between late April and July, 2013, following standardized protocols that are consistent with the Marsh Monitoring Program. The surveys will occur at stations within and adjacent to wetlands and waterbodies within the Site. The surveys will be completed by listening for calling frogs and toads starting a half hour after local sunset. At each station, three minute surveys will be completed and amphibians will be identified by their unique vocalization. Abundance will be estimated based upon the intensity of the calling activity.

Reptile Surveys

During spring 2013, an area search will be conducted to search for emerging or basking snakes, including SAR. Areas of high potential for use as hibernacula or basking sites, such as rock piles and building foundations, will be searched.

Turtle basking counts will be conducted, planned for May and June, 2013, including SAR. Turtle nesting surveys will be conducted during the appropriate nesting season of each species with a potential to occur on-Site. Surveys will take place at the edge of wetlands, ponds, or other waterbodies, or adjacent potential nesting areas. Basking survey stations will be approached quietly and carefully, using existing vegetation as a blind. High power binoculars (10 x magnification) and/or spotting scopes will be used to conduct the surveys. Turtle nesting surveys will include modified area searches following procedures recommended by MNR SAR biologists.

Turtles and snakes will also be sought during other spring and summer visits. Potential hiding areas, such as logs and debris, will be searched as well.

Butterfly and Dragonfly Surveys

Two butterfly and dragonfly surveys will be conducted during summer months. In addition, opportunistic sampling will occur during all other surveys.

Area searches in suitable habitat and incidental observations of butterflies and dragonflies will be conducted. Close focus binoculars and butterfly nets will be used to identify species, where necessary. In addition, habitat for rare and/or listed species (e.g., Monarch) will be identified during ELC surveys.

Other Species (including SAR)

Based on the initial data review, a list of SAR species that potentially occur on the Site will be compiled. Most SAR will be covered by the previously mentioned surveys (e.g., BBS surveys for Cerulean Warbler, Basking Counts and Area Search for Blanding's Turtle, Butterfly surveys for Monarch, Vegetation Surveys for Butternut, Fish Community Surveys).

If data suggest that particular SAR species have been missed by the surveys that are planned, then additional species-specific surveys will be conducted, based upon consultation with the MNR.

4.1.2 Terrestrial Results Data Summary

A report will be prepared to provide a current assessment of terrestrial resources to assist with the development of the EA. It will include complete description of key natural heritage features within the Site and Site-vicinity.

4.1.3 Aquatic Environment Field Data Collection and Characterization

The overall objective of this program is to characterize existing aquatic environmental baseline conditions and address any data gaps for the area.

Preparation and submittal of an application for a fish collection permit will be conducted prior to the summer survey.

Spring Survey

A reconnaissance of Site watercourses and off-Site connectivity of these water courses will be undertaken to select aquatic sampling stations. Stations will be selected based on similarity of habitat to permit the comparison of fish and benthic communities among stations. Locations of sampling stations will also depend on road access, land access and logistical constraints.

Representative photos of stream and other open water body habitat will be taken from the upstream and downstream locations at each station, where applicable.

Standard *in situ* water quality parameters (temperature, dissolved oxygen, pH and conductivity) will be collected in all watercourses on and adjacent to the Site during the spring survey. Detailed habitat mapping and incidental wildlife observations will be recorded on standardized datasheets. No in-water biological sampling will occur during this survey due to the MNR spawning exclusion period (March 15 to June 30).

Summer Survey

During the summer a fish survey will be conducted by a two-person crew. Survey stations identified in the spring survey will be sampled (i.e., shocked) for a minimum of 150 m or 40 times the wetted width to ensure reliable estimates of species occurrences and that rare habitats are encountered. All captured fish will be identified to species, measured, weighted and examined for sex and maturity characteristics.

Fish habitat mapping will be conducted during this survey and supplemented with *in-situ* water quality readings and photos of watercourses on and adjacent to the Site. Descriptions and mapping of aquatic habitats will include measurements of wetted channel width, depth, flow, velocity, substrate composition, and in-stream cover. Typically, a 150 m (minimum) section of representative habitat will be mapped within a stream section to show the distribution and relative abundance of distinct habitat types (e.g., cascades, riffles, runs, pools). Basic water quality data (*in-situ* measurements of pH, conductivity, water temperature, dissolved oxygen concentration, and turbidity) will be collected to supplement fish habitat characterization.

Fall Survey

During the fall, a two-person crew will sample fish and macroinvertebrates at the established stations.

During the fall survey, benthic macroinvertebrate sampling will be conducted using a 0.72 m^2 fixed-area sample from a standard habitat unit according to methods describe in the Ontario Benthos Biomonitoring Network: Protocol Manual (2007). A 500 µm mesh D-framed dipnet will be jabbed into the substrate to a depth of 5 cm, and swept forward until the net is filled with disturbed materials. A minimum of three jabs will be pooled to create one sample. The number of jab and sweep samples pooled per replicate will be recorded, as well as depth. All benthic samples will be submitted to Zaranko Environmental Assessment Services ("ZEAS") for sorting and identification of the organisms.

If, during the spring survey, an alternative benthic sampling technique is deemed necessary, the work plan will identify this adjustment and describe the chosen technique.

Sediment samples will be collected using a standard Ekman grab (6x6) at each station. Samples will be sent to a private analytical laboratory for metals analyses including particle size to aid in Site description, and analysis of benthic community.

4.1.4 Aquatic Results Data Summary

A report will be prepared to include complete descriptions of fish, habitat and macroinvertebrate assemblages per each watercourse section. Assemblages will be described using standard metrics measuring functional and structural attributes of the community, for example, fish abundance, macroinvertebrate density and diversity, and relative abundance of EPT taxa (Ephemeroptera, Plecoptera, and Trichoptera).

To aid with the interpretation of biological summaries, data on the physical-chemical environment, watercourse size and surrounding land use will also be provided per sampling location. The EA will include descriptions of habitat of fish species (e.g., locations, availability, important spawning areas) and this information will be incorporated with the Surface Water components to describe the potential effects of the proposed Site development activities on the natural environment.

4.2 Task 2: Identify Preferred Site Development Concept

This task will involve developing Site development concepts for the proposed CRRRC, and will be completed by the D&O discipline team. Selection of the preferred Site development concept will be competed by the EA discipline team. The Biology component will advise the D&O team, based on available information, if there are natural features or habitat to be preserved to minimize potential effects.

4.3 Task 3: Assess Environmental Effects of Preferred Site Development Concept

Based on the conceptual Site design and considering in-design mitigation measures, potential impacts of the proposed diversion facilities and residual waste disposal component of the preferred Site development concept will be assessed. Where project-environment interactions are identified, the Biology discipline team will work closely with the D&O discipline team to understand the development plan for the Site and the associated impacts to the terrestrial and aquatic environment. Quantitative assessment methods will be employed where the Site plan is detailed enough to allow numerical calculation of changes to the Site over time. For example, this may apply to the changing water balance for the Site, which would drive any potential changes to water quality. Qualitative analysis, based on the experience and professional opinion of the biologists, will be applied to evaluate impacts to the natural environment for ecosystem components that are not as easily quantified.

4.4 Task 6: Cumulative Impact Assessment

The EA Team will work to identify the predicted effects of other existing or certain and probable projects in the area of the Site. The Biology discipline team will consider other identified terrestrial or aquatic effects together from those projects with those predicted during the environmental effects assessment to determine if there are any unacceptable predicted cumulative effects.

4.5 Task 7: Complete EPA/OWRA Level Activities for Proposed CRRRC

Following completion of the Phase 1 - EA studies, which will result in the identification of the preferred undertaking and the assessment of its predicted effects on the environment, the proposed undertaking will undergo any additional analysis as required for submission under the EPA and OWRA. The EPA/OWRA supporting documentation, along with the EA documents, will be submitted as a single package (contained in several individual volumes) to the MOE. It is anticipated that this combined submission will meet the requirements of all of the MOE approval processes for the proposed undertaking (overall Site development, residuals disposal component, diversion components and ancillary operational features), with the understanding that the formal EPA/OWRA applications can only be submitted once the EA is approved. Depending on the EA conditions of approval or comments received on the EA, it may be necessary to supplement the EPA/OWRA documentation previously submitted; this would be done in the form of addenda or, only if required due to major changes, resubmission of modified reports.

A monitoring program appropriate for the preferred Site development concept, and conceptual contingency plan approaches will be prepared and summarized in the EPA application documents where appropriate. This program will be integrated with the proposed surface water monitoring program. Conceptual contingency measure approaches will be developed to deal with conditions that approach unacceptable exceedances of the parameters that are monitored.

4.6 Task 8: Finalize and Submit EAA/EPA/OWRA Documentation & Applications

In support of the completion of this task, the Biology discipline team will carry out the following tasks:

- Document the assessment results in a Biology Supporting Document that will form an appendix to the EA submission;
- Participate in meetings with the government review agencies including upfront consultations with the MOE during the EA to obtain pre-approval of tasks in the work plan, as required; and
- Provide technical support during the review of the EA by the regulatory agencies and public.

APPENDIX C-2.5

Land Use & Socio-economic Work Plan

Table of Contents

1.0 INTRODUCTION

This document presents the proposed work plan for the Land Use & Socio-economic component of the environmental assessment (EA) of the Boundary Road Site for the proposed Capital Region Resource Recovery Centre (CRRRC). The work plan is part of the Terms of Reference (TOR) of the EA submitted for approval to the Minister of the Environment. The TOR sets out the proponent's proposed approach for addressing the Ontario *Environmental Assessment Act* (EAA) requirements when preparing the EA. In addition to EA requirements, the proponent has chosen to submit a combined EAA and *Environmental Protection Act* (EPA) and *Ontario Water Resources Act* (OWRA) documentation package. The application process for approvals required under the *Planning Act* will come after EA approval is received from the MOE.

2.0 ASSESSMENT FRAMEWORK

2.1 Project Team Organization

The project tasks will be organized to be completed by the following teams:

- The EA Management Team;
- The Design and Operations (D&O) Team consists of landfill design technical staff and CAD technicians; and
- The EA Team consists of discipline leads for each of nine different environmental components.

2.2 Study Areas

Data for the site-specific component of the EA will be collected and analyzed for three generic study areas presented in the TOR. The generic study areas are as follows:

- Site – The lands secured by Taggart Miller Environmental Services (Taggart Miller) for the proposed CRRRC;
- Site-vicinity – The lands in the vicinity of the Site (generally within 500 m of the Site boundaries, and modified as appropriate for specific technical disciplines as will be determined during the EA); and
- Haul Routes – The main haul/access route(s) to the Site.

As noted, the generic study areas described above may be adjusted as required during the EA to suit the requirements of the Land Use & Socio-economic component. For socio-economic data, the Site-vicinity will need to be the smallest relevant census division for which demographic data exists to describe potentially-affected communities. To provide a more robust review of the Alternative Sites the Site-vicinity for land use aspects may be increased to 1km.

3.0 COMPARATIVE EVALUATION OF ALTERNATIVE SITES AND IDENTIFICATION OF PREFERRED SITE

Two properties that have been secured by Taggart Miller have been identified as suitable locations for the proposed CRRRC (the Alternative Sites). The first step in the EA process will be the identification of the preferred Site for the proposed diversion facilities and landfill that comprise the CRRRC.

3.1 Assessment Criteria and Indicators

The Land Use & Socio-economic component will compare the Alternative Sites using the following criteria:

- Which site is more compatible with current and proposed planned future land uses in Site-vicinity?
- Which site is preferred for the protection of mineral aggregate resources?

The rationale, indicators and data sources for the Alternative Sites criteria listed above are provided in Appendix A of the proposed TOR.

3.2 Approach and Work Plan

The Land Use & Socio-economic discipline team will complete a comparison of information about each of the two Alternative Sites available from published information and from preliminary investigations/assessments on or in the vicinity of each of the Sites. The following tasks will be undertaken to obtain and review the published information and the preliminary investigations/assessments for the Boundary Road Site:

- Compile and interpret information from defined background sources including:
    - MOE Guideline D-4 - Land use On or Near Landfills and Dumps;
    - The Provincial Policy Statement;
    - Published data of public recreational facilities / activities;
    - The Eastern Ontario Smart Growth Panel Recommendations (2004);
    - Official Plan for the City of Ottawa;
    - City of Ottawa Master Plans;
    - Published reports, i.e., MNR, OGS, MNDM ARIPs; Existing quarry aggregate license; Municipal Official Plans and zoning; Findings of on-Site investigations completed for this project or otherwise available;
    - Zoning By-law for the City of Ottawa;
    - NCC – Plan for Canada’s Capital, 1999;
    - NCC – Greenbelt Master Plan, 1996;
    - Topographic mapping; and
    - Aerial photographic mapping.
- Consult with the Ministry of Municipal Affairs and Housing to determine status of the Provincial Policy Statement review and share this information with other components as required;
- Reconnaissance to confirm data from information sources including documenting the number, type and proximity of sensitive land uses, including current dwellings and institutional uses and the land uses existing on the date of the assessment; and

- Meet with municipal officials to determine any limitations on growth associated with Land Use Policy and infrastructure or other factors, and planned development and land use, including any applications for approval currently submitted.

Based on this information, a description of the land use and planning designations for the Site and surrounding area will be prepared. Using the above criterion, the Land Use & Socio-economic discipline team will identify which of the Alternative Sites is preferred for this component.

If the Boundary Road Site is selected as the preferred Site, then the remainder of this work plan will be completed. If the North Russell Road Site is selected as the preferred Site, then no further action under this work plan will be completed, and the North Russell Road Site Land Use & Socio-economic work plan will be used.

4.0 EA AND EPA ASSESSMENT OF THE PREFERRED SITE FOR THE CRRRC

The remaining steps of the EA/EPA/OWRA assessment are proposed to take place in three phases. The proposed phases consist of the following tasks:

Phase 1 – EA

- Task 1 – Complete Assessment of Existing Environment;
- Task 2 – Identify Preferred Site Development Concept;
- Task 3 – Assess Environmental Effects of Preferred Site Development Concept;
- Task 4 – Assessment of Alternative Haul Routes and Identify Preferred Route;
- Task 5 – Evaluate Leachate Management Options and Identify Preferred Option; and
- Task 6 – Cumulative Impact Assessment.

Phase 2 – EPA/OWRA

- Task 7 – Complete EPA/OWRA Level Activities for Proposed CRRRC.

Phase 3 – Documentation and Submission

- Task 8 – Finalize and Submit EAA/EPA/OWRA Documentation and Applications.

For the Land Use & Socio-economic work plan, activities will be carried out as part of Tasks 1, 2, 3, 4, 5, 6 and 8 as described below.

4.1 Task 1: Complete Assessment of Existing Environment

The following tasks will be undertaken to further characterize existing land use and socio-economic conditions:

- Field reconnaissance to define the existing visual conditions of the Site from off-Site viewpoints, and document through written and photographic record;
- Review conceptual components of the proposed CRRRC project;

- Review Site grading plan and aerial mapping;
- Review City of Ottawa Waste Management Strategy;
- Review Canadian Society of Landscape Architects reference library;
- Determine the viewpoints (directions, distances) from which the proposed Site development concepts will be visible and take photographs from those viewpoints;
- Request and review data on anticipated opportunities for employment and local procurement of goods and services for the construction and operation of the proposed CRRRC; and
- In order to establish the general context, compile information from Statistics Canada census data, and municipal and regional economic development data, studies and reports on socio-economic conditions in the study area, including:
    - Population and demographics;
    - Labour force distribution;
    - Key employment sectors and employers;
    - Employment, unemployment and participation rates;
    - Average household and personal incomes; and
    - Economic development trends and plans.

4.2 Task 2: Identify Preferred Site Development Concept

This task will involve developing Site development concepts for the proposed CRRRC and selecting the preferred Site development concept. It will be completed by the D&O Team and the EA Team. The Land Use & Socio-economic component will provide input as required based on available information on conditions as related to the conceptual design development of the on-Site diversion and residual disposal facilities.

4.3 Task 3: Assess Environmental Effects of Preferred Site Development Concept

Land Use

The potential off-Site effects from the preferred Site development concept will for the most part be completed under other environmental components. For consideration of land use:

- Based on the proposed Site operational practices and/or the results of predictive assessments of potential nuisance effects as carried out under the Atmospheric (air quality, noise, odour) and D&O components, and visual considerations, the potential effects on existing land use in the area of the Site will be assessed;
- Based on the proposed Site operational practices and/or the results of predictive assessments of potential nuisance effects as carried out under the Atmospheric (air quality, noise, odour) and D&O components, and visual considerations, the potential effects on future planned land use in the area of the Site will be assessed; and
- Identify if additional mitigation measures are required from an off-Site land use perspective.

Employment and Economics

The following data will be developed / collected to assess and compare the socio-economic effects of each alternative:

- Estimated person hours of employment for the construction and operation of each alternative;
- An estimate of the tax revenue generated by the undertaking for the municipality;
- Estimated business impacts (positive or negative) on nearby commercial activities; and
- Estimated value of goods and services required for construction and operation of the CRRRC.

Visual

An assessment of the visual effects of the proposed CRRRC on the study area will be undertaken. The visual effects assessment will be based on the selection of at least six representative viewpoints, including the view from Highway 417. Viewpoints for visual simulations are typically selected to be representative views of the proposed undertaking, and at receptor locations where a person might view the CRRRC and be potentially affected by the proposed undertaking. Landforms in this study include the residual disposal facility design, the buildings, equipment or stockpiles, as well as any berms that may be put into place to mitigate the visual effects of the CRRRC on receptors in the vicinity. The study area includes the project Site within the property boundaries as well as any public or private properties and roads in the Site-vicinity that may contain visual receptors. This can also be described as the zone of visual influence or area within which the proposed development may have an effect on visual amenities. The assessment will result in the production of at least six visual simulation figures or photomontages that illustrate how the proposed CRRRC will appear from the selected viewpoints. This work will lead to the development of a conceptual landscape plan as discussed in the D&O work plan.

Photographs of the Boundary Road Site proposed CRRRC will be taken from at least six viewpoint locations. The photographs will be taken with approximately 50% overlap in order to create panoramic images for each viewpoint. The ground coordinates directly below the camera will be collected with a survey grade Global Positioning System (GPS) unit. The distance will be measured from the ground to the camera lens with a tape measure and added to the camera elevation value. Additional GPS coordinates will be collected for reference features such as telephone poles or fence posts that can also be seen in the photographs. These reference points will later be used to superimpose the visualization images onto the photographs.

A 3D model of the proposed CRRRC will be built from the AutoCAD digital terrain model provided by The Base Mapping Co. Ltd. using 3D visualisation software called Visual Nature Studio (VNS). Telephone poles and fence posts will be added at the reference point coordinates downloaded from the Trimble R8 GPS unit. Cameras will be placed in the model at the same GPS coordinate location and elevation as that of the digital SLR camera used in the field. Images will be rendered in VNS at each viewpoint using the same focal length, heading and horizontal field of view as that of the digital photographs. Panoramic images will then be created from the VNS images for each viewpoint by following the same procedure used to create the panoramic photographs. The reference points collected in the field will be used to align and superimpose the VNS images onto the photographs in Adobe Photoshop. The landfill and any other visible CRRRC facility will be extracted from the VNS image and various selection methods will be used to pull layers of vegetation or buildings into the foreground. Lines will be drawn at the top of the landfill design and berms and labelled in order to differentiate one from the other. The resulting photomontage images will be presented as figures for the EA report.

4.4 Task 4: Assessment of Haul Routes and Identify Preferred Route

The alternative haul routes and access locations to the Site will be assessed and the preferred haul route and access location(s) selected. This part of the task will primarily be completed by the Traffic discipline team and the EA Management Team. Following the identification of the preferred haul route/site access location, any material constraints to its implementation will be assessed.

4.5 Task 5: Evaluate Leachate Management Options and Identify Preferred Option

This task will be completed by the D&O and Surface Water discipline teams. The Surface Water discipline team will provide effluent discharge criteria and the D&O Team will define the alternatives and evaluate the options. The Land Use & Socio-economic discipline team will provide input as required on the municipal and/or land use approvals associated with the various alternatives for leachate treatment and management.

4.6 Task 6: Cumulative Impact Assessment

The EA Team will work to identify the predicted effects of other existing or certain and probable proposed projects in the area of the Site. Based on the results of predictive assessments carried out under other disciplines, the Land Use & Socio-economic discipline team will consider other identified land use, socio-economic and visual effects together with those predicted during the environmental effects assessment to identify if there are any unacceptable predicted cumulative effects.

4.7 Task 8: Finalize and Submit EAA/EPA/OWRA Documentation and Applications

In support of the completion of this task, the Land Use & Socio-economic discipline team will carry out the following tasks:

- Document the assessments listed above, data sources and assessment results in a Land Use and Socio-economic Supporting Document that will form an appendix to the EA submission;
- Participate in meetings with the government review agencies including upfront consultations with the MOE during the EA to obtain pre-approval of tasks in the work plan as required; and
- Provide support during the review of the EA by the regulatory agencies and the public.

APPENDIX C-2.6

Cultural & Heritage Resources Work Plan

TAGGART
GROUP OF COMPANIES

Table of Contents

1.0 INTRODUCTION

This document presents the proposed work plan for the Cultural & Heritage Resources component of the environmental assessment (EA) of the Boundary Road Site for the proposed Capital Region Resource Recovery Centre (CRRRC). The work plan is part of the Terms of Reference (TOR) of the EA submitted for approval to the Minister of the Environment. The TOR sets out the proponent's proposed approach for addressing the Ontario *Environmental Assessment Act* (EAA) requirements when preparing the EA. In addition to EA requirements, the proponent has chosen to submit a combined EAA and *Environmental Protection Act* (EPA) and *Ontario Water Resources Act* (OWRA) documentation package.

2.0 ASSESSMENT FRAMEWORK

2.1 Project Team Organization

The project tasks will be organized to be completed by the following teams:

- The EA Management Team;
- The Design and Operations (D&O) Team consists of landfill design technical staff and CAD technicians; and
- The EA Team consists of discipline leads for each of nine different environmental components.

2.2 Study Areas

Data for the site-specific component of the EA will be collected and analyzed for three generic study areas presented in the TOR. The generic study areas are as follows:

- Site – The lands secured by Taggart Miller Environmental Services (Taggart Miller) for the proposed CRRRC;
- Site-vicinity – The lands in the vicinity of the Site (generally within 500 m of the Site boundaries, and modified as appropriate for specific technical disciplines as will be determined during the EA); and
- Haul Routes – The main haul/access route(s) to the Site.

As noted, the generic study areas described above may be adjusted as required during the EA to suit the requirements of the Cultural & Heritage Resources component.

3.0 COMPARATIVE EVALUATION OF ALTERNATIVE SITES AND IDENTIFICATION OF PREFERRED SITE

Two properties that have been secured by Taggart Miller have been identified as suitable locations for the proposed CRRRC (the Alternative Sites). The first step in the EA process will be the identification of the preferred Site for the proposed diversion facilities and landfill that comprise the CRRRC.

3.1 Assessment Criteria and Indicators

The Cultural & Heritage Resources EA component will compare the Alternative Sites using the following criterion:

- Which site is preferred for the protection of archaeological and heritage resources, and cultural heritage landscapes?

The rationale, indicators and data sources for the Alternative Sites criterion listed above are provided in Appendix A of the proposed TOR.

3.2 Approach and Work Plan

The Cultural & Heritage Resources discipline team will complete a comparison of information about each of the two Alternative Sites available from published information and from preliminary investigations/assessments on or in the vicinity of each of the Sites. The following tasks will be undertaken to obtain and review the published information and the preliminary investigations/assessments for the Boundary Road Site:

- Compile and interpret information, including an assessment of archaeological potential of the Site and Site-vicinity, as part of a Stage 1 archaeological assessment from defined background sources, including:
    - Review of available relevant environmental, historic and archaeological literature pertaining to the Site and Site-vicinity;
    - Review of primary documentation pertaining to the history of the property including historic maps, land registry data, assessment rolls and census records;
    - Consultation with other government agencies as appropriate;
    - Review of the Ministry of Tourism Culture and Sport's updated database for known archaeological sites on the Site and within the Site-vicinity; and
    - Site reconnaissance to confirm the information from available sources and plan field work programs.
- Consult with Aboriginal communities and organizations (if responsive);
- Complete a Cultural Heritage Overview Report for the Site and Site-vicinity, including:
    - Applicable provincial guidance documents;
    - Background Research on the Site-vicinity, including a review of the site history undertaken in conjunction with the Stage 1 archaeological assessment;
    - Identification of Cultural Heritage Resources from known inventories, registers, and from the identification of pre-1972 structures (as per MTO and Ministry of Tourism, Culture, and Sport requirements);
    - Consideration of Potential Impact;
    - Recommendations for further Work; and
    - Site reconnaissance to field check the property and confirm whether there are built heritage and/or cultural landscapes of value for the Site or Site-vicinity.

The objective of a Cultural Heritage Overview Report focuses on the identification of potential cultural heritage issues or readily apparent impacts. Like a Cultural Heritage Impact Statement (CHIS), a Heritage Overview Report is based on an understanding of a project, the cultural heritage resources that may be affected by that project, and best practices to mitigate any recognized impacts. A Cultural Heritage Overview Report is often prepared to provide initial guidance on the project to help narrow potential options; it is often supplemented by a Cultural Heritage Impact Statement once more details are known about a specific project.

Based on this information and the above criterion, the Culture and Heritage Resources discipline team will identify which of the Alternative Sites is preferred for this component.

If the Boundary Road Site is selected as the preferred Site, then the remainder of this work plan will be completed. If the North Russell Road Site is selected as the preferred Site, then no further action under this work plan will be completed, and the North Russell Road Site Cultural & Heritage Resources work plan will be used.

4.0 EA AND EPA ASSESSMENT OF THE PREFERRED SITE FOR THE CRRRC

The remaining steps of the EA/EPA/OWRA assessment are proposed to take place in three phases. The proposed phases consist of the following tasks:

Phase 1 – EA

- Task 1 – Complete Assessment of Existing Environment;
- Task 2 – Identify Preferred Site Development Concept;
- Task 3 – Assess Environmental Effects of Preferred Site Development Concept;
- Task 4 – Assessment of Alternative Haul Routes and Identify Preferred Route;
- Task 5 – Evaluate Leachate Management Options and Identify Preferred Option; and
- Task 6 – Cumulative Impact Assessment.

Phase 2 – EPA/OWRA

- Task 7 – Complete EPA Level Activities for Proposed CRRRC.

Phase 3 – Documentation and Submission

- Task 8 – Finalize and Submit EAA/EPA/OWRA Documentation and Applications.

For the Cultural & Heritage Resources work plan, activities will be carried out as part of Tasks 1, 2, 3, 6, and 8 as described below.

4.1 Task 1: Complete Assessment of Existing Environment

The Cultural & Heritage Resources environmental component includes archaeological resources, built heritage, and cultural landscape. The following tasks will be undertaken to further characterize existing environmental conditions:

- Review conceptual components of the proposed CRRRC project;
- Complete a Stage 2 archaeological and cultural heritage assessment of areas that may be disturbed by the proposed diversion facilities, residual disposal facility and associated facilities;
- The Stage 2 assessment is expected to consist of both a pedestrian survey of cultivated fields and test pitting of those areas that could not be ploughed, with the objective of identifying artifacts and/or features of archaeological interest;

- If necessary, due to the presence and significance of resources identified, complete Stage 3 and 4 assessments;
- If necessary, undertake an evaluation of properties based on Regulation 9/06 of the *Ontario Heritage Act*; and
- If necessary, prepare a Cultural Heritage Impact Statement in accordance with City of Ottawa requirements. These will be supplemented by the requirements of the Ministry of Tourism, Culture, and Sport where appropriate.

4.2 Task 2: Identify Preferred Site Development Concept

This task will involve developing reasonable Site development concepts for the proposed CRRRC and selecting the preferred Site development concept. It will be completed by the D&O Team and the EA Team. The Cultural & Heritage Resources discipline team will provide input based on available information on conditions as related to conceptual design development of the on-Site diversion and residual disposal facilities.

4.3 Task 3: Assess Environmental Effects of Preferred Site Development Concept

Considering in-design mitigation measures, potential impacts of the proposed waste diversion and residual disposal facilities will be assessed. Where project-environment interactions are identified, effects on the Cultural & Heritage Resources will be predicted within the Site and Site-vicinity.

4.4 Task 6: Cumulative Impact Assessment

The EA Team will work to identify the predicted effects of other existing or certain and probable projects in the area of the Site. The Cultural & Heritage Resource discipline team will consider other identified effects together from those projects with those predicted during the environmental effects assessment to determine if there are any unacceptable predicted cumulative effects.

4.5 Task 8: Finalize and Submit EAA/EPA/OWRA Documentation & Applications

In support of the completion of this task, the Cultural & Heritage Resources discipline team will carry out the following tasks:

- Document the assessments listed above, data sources and assessment results in a Cultural & Heritage Resources Supporting Document that will form an appendix to the EA submission. This document will also be used as the basis to obtain clearances from the Ministry of Tourism, Culture and Sport;
- Participate in meetings with the government review agencies including upfront consultations with the MOE during the EA to obtain pre-approval of tasks in the work plan, as required; and
- Provide technical support during the review of the EA by the regulatory agencies and the public.

APPENDIX C-2.7

Agriculture Work Plan

Table of Contents

1.0 INTRODUCTION

This document presents the proposed work plan for the Agriculture component of the environmental assessment (EA) of the Boundary Road Site for the proposed Capital Region Resource Recovery Centre (CRRRC). The work plan is part of the Terms of Reference (TOR) of the EA submitted for approval to the Minister of the Environment. The TOR sets out the proponent's proposed approach for addressing the Ontario *Environmental Assessment Act* (EAA) requirements when preparing the EA. In addition to EA requirements, the proponent has chosen to submit a combined EAA and *Environmental Protection Act* (EPA) and *Ontario Water Resources Act* (OWRA) documentation package.

2.0 ASSESSMENT FRAMEWORK

2.1 Project Team Organization

The project tasks will be organized to be completed by the following teams:

- The EA Management Team;
- The Design and Operations (D&O) Team consists of landfill design technical staff and CAD technicians; and
- The EA Team consists of discipline leads for each of nine environmental components.

2.2 Study Areas

Data for the site-specific component of the EA will be collected and analyzed for three generic study areas presented in the TOR. The generic study areas are as follows:

- Site – The lands secured by Taggart Miller Environmental Services (Taggart Miller) for the proposed CRRRC;
- Site-vicinity – The lands in the vicinity of the Site (generally within 500 m of the Site boundaries, and modified as appropriate for specific technical disciplines as will be determined during the EA); and
- Haul Routes – The main haul/access route(s) to the Site.

As noted, the generic study areas described above may be adjusted as required during the EA to suit the requirements of the Agriculture component.

3.0 COMPARATIVE EVALUATION OF ALTERNATIVE SITES AND IDENTIFICATION OF PREFERRED SITE

Two properties that have been secured by Taggart Miller have been identified as suitable locations for the proposed CRRRC (the Alternative Sites). The first step in the EA process will be the identification of the preferred Site for the proposed diversion facilities and landfill that comprise the CRRRC.

3.1 Assessment Criteria and Indicators

The Agriculture component will compare the Alternative Sites using the following criterion:

- Which site is preferred regarding potential for affects on agriculture?

The rationale, indicators and data sources for the Alternative Sites criterion listed above are provided in Appendix A of the proposed TOR.

3.2 Approach and Work Plan

The Agriculture discipline team will complete a comparison of information about each of the two Alternative Sites available from published information and from preliminary investigations/assessments on or in the vicinity of each of the Sites. The following tasks will be undertaken to obtain and review the published information and the preliminary investigations/assessments for the Boundary Road Site:

- Review the Official Plans of the City of Ottawa which, in addition to providing overall land use policy for the Site and Site-vicinity, identify the lands deemed to be Prime Agricultural lands and establish policies for their protection. This will include a review of the OC-LEAR Report which is to be finalized in 2012 and will form part of the Official Plan update in 2014;
- Review the Provincial Policy Statement 2005;
- Review the zoning By-Law for the City of Ottawa which regulates land use on the Site and on adjacent lands;
- Review aerial photographic mapping, topographic mapping and complete field reconnaissance;
- Consult with the Ontario Federation of Agriculture, OMAFA, the Christian Farmer Union or other farming organizations;
- Review published information on agricultural land classification (eg. Canada Land Inventory mapping and Statistics Canada Agriculture Profiles) and agricultural or agricultural-related uses in the Site-vicinity; and
- Review available soils mapping, municipal drain mapping, available ownership information based on municipal assessment information and including farm tax credit information.

Based on this information and the above criterion, the Agriculture discipline team will identify which of the Alternative Sites is preferred for this component.

If the Boundary Road Site is selected as the preferred Site, then the remainder of this work plan will be completed. If the North Russell Road Site is selected as the preferred Site, then no further action under this work plan will be completed, and the North Russell Road Site Agriculture work plan will be used.

4.0 EA AND EPA ASSESSMENT OF THE PREFERRED SITE FOR THE CRRRC

The remaining steps of the EA/EPA/OWRA assessment are proposed to take place in three phases. The proposed phases consist of the following tasks:

Phase 1 – EA

- Task 1 – Complete Assessment of Existing Environment;
- Task 2 – Identify Preferred Site Development Concept;
- Task 3 – Assess Environmental Effects of Preferred Site Development Concept;
- Task 4 – Assessment of Alternative Haul Routes and Identify Preferred Route;
- Task 5 – Evaluate Leachate Management Options and Identify Preferred Option; and
- Task 6 – Cumulative Impact Assessment.

Phase 2 – EPA/OWRA

- Task 7 – Complete EPA Level Activities for Proposed CRRRC.

Phase 3 – Documentation and Submission

- Task 8 – Finalize and Submit EAA/EPA/OWRA Documentation and Applications.

For the Agriculture work plan, activities will be carried out as part of Tasks 1, 2, 3, 6 and 8 as described below.

4.1 Task 1: Complete Assessment of Existing Environment

The Agricultural component includes an evaluation of the effect of the project on the agricultural operations, both on-Site and in the Site-vicinity. The following tasks will be undertaken:

- Review conceptual components of the proposed CRRRC project;
- Complete reconnaissance and Site-specific field studies to confirm data from information sources and complete a Site-specific agricultural land classification and capability evaluation. The field studies will include an agricultural capability evaluation of the Site to confirm/refine the available soils mapping and Agricultural Capability Mapping. The reconnaissance survey will document the cropping patterns and agricultural operations on the Site and the adjacent lands. For purposes of the reconnaissance survey, all lands within 2 km of the Site will be included in the survey. This survey will include an assessment of all farm buildings with respect to current use and potential (original) use. The reconnaissance survey will be based upon uses and buildings visible from public roads. Other uses and structures not visible from public roads will rely upon aerial photos;
- Meet with farmers to obtain information they are willing to share about their agricultural operations within 1km; and
- Meet with municipal officials to determine planned agricultural operations, including any applications for approval currently submitted.

4.2 Task 2: Identify Site Development Concept

This task will involve developing Site development concepts for the proposed CRRRC and selecting the preferred Site development concept. It will be completed by the D&O Team and the EA Team. As part of development of concepts, any on-Site constraints related to agriculture and any necessary setbacks between existing agricultural activities in the Site-vicinity and possible Site operations will be identified. These setbacks will be incorporated by the D&O team into the preparation of Site development concepts.

4.3 Task 3: Assess Environmental Effects of Preferred Site Development Concept

Considering in-design mitigation measures, potential impacts of the preferred Site development concept will be assessed. The preferred Site development concept will be evaluated as described below.

4.3.1 On-Site Agricultural Use

The lands not required for the proposed project will be evaluated to determine their potential for agricultural use. This evaluation will include an assessment of the impacts of the proposed facilities on the agricultural use of those on-Site lands not required for the proposed project.

4.3.2 Off-Site Agricultural Use

The potential impact of the proposed project on the existing and potential agricultural use of off-Site lands will be assessed. The potential off-Site effects from the preferred Site development concept will for the most part be completed under other environmental components. Based on the proposed Site operational practices and/or the results of predictive assessments of potential nuisance effects as carried out under the Atmospheric (air quality, noise, odour) and D&O components, and groundwater and surface water considerations, the potential effects on existing and proposed off-site agricultural use will be assessed. Impacts to be considered will include compatibility, any limitations on cropping including constraints on type of crops and crop yields, any limitations on crop processing, and any limitations on livestock facilities including location and type of livestock.

4.4 Task 6: Cumulative Impact Assessment

The EA Team will work to identify the predicted effects of other existing or certain and probable projects in the area of the Site. The Agriculture discipline team will consider other identified agriculture effects together from those projects with those predicted during the environmental effects assessment to assess if there are any unacceptable predicted cumulative effects.

4.5 Task 8: Finalize and Submit EAA/EPA/OWRA Documentation & Applications

In support of the completion of this task, the Agriculture discipline team will carry out the following tasks:

- Document the assessments listed above, data sources and assessment results in an Agriculture Supporting Document that will form an appendix to the EA submission;
- Participate in meetings with the government review agencies including upfront consultations with the MOE during the EA to obtain pre-approval of tasks in the work plan as required; and
- Provide technical support during the review of the EA by the regulatory agencies and the public.

TAGGART
GROUP OF COMPANIES

APPENDIX C-2.8

Design and Operations Work Plan

Table of Contents

1.0 INTRODUCTION

This document presents the proposed work plan for the Site Design and Operations component of the environmental assessment (EA) of the Boundary Road Site for the proposed Capital Region Resource Recovery Centre (CRRRC). The work plan is part of the Terms of Reference (TOR) of the EA submitted for approval to the Minister of the Environment. The TOR sets out the proponent's proposed approach for addressing the Ontario *Environmental Assessment Act* (EAA) requirements when preparing the EA. In addition to EA requirements, the proponent has chosen to submit a combined EAA and *Environmental Protection Act* (EPA) and *Ontario Water Resources Act* (OWRA) documentation package. Therefore, additional detailed studies required for subsequent EPA/OWRA approval are included in this work plan.

2.0 ASSESSMENT FRAMEWORK

2.1 Project Team Organization

The project tasks will be organized to be completed by the following teams:

- The EA Management Team;
- The Design and Operations (D&O) Team consists of landfill design technical staff and CAD technicians; and
- The EA Team consists of discipline leads for each of nine different environmental components.

2.2 Study Areas

Data for the site-specific component of the EA will be collected and analyzed for three generic study areas presented in the TOR. The generic study areas are as follows:

- Site – The lands secured by Taggart Miller Environmental Services (Taggart Miller) for the proposed CRRRC;
- Site-vicinity – The lands in the vicinity of the Site (generally within 500 m of the Site boundaries, and modified as appropriate for specific technical disciplines as will be determined during the EA); and
- Haul Routes – The main haul/access route(s) to the Site.

As noted, the generic study areas described above may be adjusted as required during the EA to suit the requirements of the D&O component.

3.0 COMPARATIVE EVALUATION OF ALTERNATIVE SITES AND IDENTIFICATION OF PREFERRED SITE

Two properties that have been secured by Taggart Miller have been identified as suitable locations for the proposed CRRRC (the Alternative Sites). The first step in the EA process will be the identification of the preferred Site for the proposed diversion facilities and landfill that comprise the CRRRC.

3.1 Assessment Criteria and Indicators

The D&O Team will prepare Site development concepts for carrying out the undertaking at the preferred Site. In addition, the D&O Team will compare the Alternative Sites using the following criterion:

- Which site is preferred regarding the anticipated amount of engineering required to assure MOE groundwater quality criteria are met at the property boundary?

The rationale, indicators and data sources for the Alternative Sites criterion listed above are provided in Appendix A of the proposed TOR.

3.2 Approach and Work Plan

The D&O Team will complete a comparison of information about each of the two Alternative Sites available from published information and from preliminary investigations/assessments on or in the vicinity of each of the Sites. The following tasks will be undertaken to obtain and review the published information and the preliminary investigations/assessments for the Boundary Road Site:

- Review aerial photographic mapping;
- Review information compiled and interpreted by the Geology, Hydrogeology & Geotechnical discipline team which includes information from defined background sources, including published geological and hydrogeological maps and reports, water well data, regional groundwater and wellhead protection studies, regional and local topographic and drainage mapping, Environment Canada climatic normals and previous subsurface investigation findings and interpretation;
- Preliminary determination of on-Site engineered leachate management systems requirements;
- Review Regulation 232/98; and
- Based on the review and previous experience or knowledge of what has been required elsewhere in similar geological settings in Ontario, identify the anticipated engineered containment requirements.

Based on this information and the above criterion, the D&O Team will identify which of the Alternative Sites is preferred for this component.

If the Boundary Road Site is selected as the preferred Site, then the remainder of this work plan will be completed. If the North Russell Road Site is selected as the preferred Site, then no further action under this work plan will be completed, and the North Russell Road Site Design & Operation work plan will be used.

4.0 EA AND EPA ASSESSMENT OF THE PREFERRED SITE FOR THE CRRRC

The remaining steps of the EA/EPA/OWRA assessment are proposed to take place in three phases. The proposed site-specific EA phases consist of the following tasks:

Phase 1 – EA

- Task 1 – Complete Assessment of Existing Environment;
- Task 2 – Identify Preferred Site Development Concept;
- Task 3 – Assess Environmental Effects of Preferred Site Development Concept;
- Task 4 – Assessment of Alternative Haul Routes and Identify Preferred Route;
- Task 5 – Evaluate Leachate Management Options and Identify Preferred Option; and
- Task 6 – Cumulative Impact Assessment.

Phase 2 – EPA/OWRA

- Task 7 – Complete EPA Level Activities for Proposed CRRRC.

Phase 3 – Documentation and Submission

- Task 8 – Finalize and Submit EAA/EPA/OWRA Documentation and Applications.

For the D&O Work Plan, activities will be carried out as part of Tasks 2, 5, 7 and 8 as described below.

4.1 Task 2: Identify Preferred Site Development Concept

This task will involve preparing Site development concepts for the residual disposal facility and overall Site layout at the preferred Site and will be completed by the D&O Team. Preparation of the Site development concepts will consider the proximity to and types of neighbouring land uses, and will include the following:

- For the on-site diversion facilities, identify approximate area required for each component;
- Develop alternative residual waste disposal facility footprints and site grading and drainage approach to reasonably represent the characteristics of the possible range of concepts within the land envelope identified for the new residual waste disposal facility footprint using the component diversion and disposal capacity requirements. This includes base elevations, height, side slope geometry and top area contours;
- Calculate maximum elevation, total footprint area, total airspace, corresponding estimated residual waste tonnage capacity, and potential Site operational period;
- For the landfill footprint, calculate an estimate of leachate generation to size the leachate treatment component; also, estimate process wastewater quantity from the diversion facilities
- Integrate alternative footprints and diversion facilities with overall Site development concept (i.e., waste diversion components, Site roads, screening berms, buffer zones, leachate treatment and stormwater management facilities, entrance and administration facilities, etc.) and develop residual disposal facility Site sequencing/phasing plans considering various site constraints such as the municipal drain;
- In conjunction with the Surface Water discipline, consider realignment of the Simpson Municipal Drain to facilitate the layout and operations of the overall Site development concept;
- Determine quantity of excavated material to be managed and develop conceptual excess material management plan;
- Estimate any additional excavation and fill quantities and construction and operations materials requirements, and prepare overall materials balance for each development concept;
- Prepare conceptual design of leachate containment and management system (liner and leachate collection system), following the requirements of Ontario Regulation (O. Reg.) 232/98;
- Complete geotechnical assessment (geotechnical aspects of diversion and other structures, static and seismic stability and settlement analysis for landfill component) of development concepts;
- Prepare conceptual design of final cover system; and
- Prepare estimate of landfill gas generation and prepare conceptual design of landfill gas management system.

Selecting the preferred Site development concept will be completed by the EA Team in consultation with the public. The D&O Team will prepare a conceptual Site design report for the preferred design and circulate it to other EA component disciplines.

4.2 Task 5: Evaluate Leachate Management Options and Identify Preferred Option

This task will involve defining leachate treatment and disposal alternatives and evaluating each option accordingly to identify the preferred alternative. The criteria for this assessment are provided in Appendix B of the TOR and further discussion is provided in Section 8.3.5 of the TOR. This assessment will be completed by the D&O Team with input and information from the Geology, Hydrogeology & Geotechnical and Surface Water discipline teams.

4.3 Task 7: Complete EPA/OWRA Level Activities for Proposed CRRRC

Following completion of the Phase 1 - EA studies, which will result in the identification of the preferred Site development concept and the assessment of its predicted effects on the environment, the proposed undertaking will undergo any additional analysis as required for the submission under the EPA and OWRA. The EPA/OWRA supporting documentation, along with the EA documents, will be submitted as a single package (contained in several individual volumes) to the MOE. It is anticipated that this combined submission will meet the requirements of all of the MOE approval processes for the proposed undertaking (overall Site development, residuals disposal component, diversion components and ancillary operational features), with the understanding that the formal EPA/OWRA applications can only be submitted once the EA is approved. Depending on the EA conditions of approval or comments received on the EA, it may be necessary to supplement the EPA/OWRA documentation previously submitted; this would be done in the form of addenda or, only if required due to major changes, resubmission of modified reports.

The Phase 1 – EA studies will contain conceptual designs for the overall Site development and components, including the residuals disposal landfill. In this task, EPA level designs will be prepared for the proposed undertaking to address in more detail, as required, such topics as base grades, final contours, waste capacity, Site capacity and materials balance, Site access, entrance, on-Site roads, visual and noise screening, fencing, conceptual landscape plan, signage, landfill development phasing and schedule, soil management, operating conditions, staffing, procedures, waste placement, buffers, leachate containment and collection and management and landfill gas management. Proposed Site monitoring programs, trigger mechanisms and contingency measures will be provided. The requirements for these matters are described in Ontario Regulation 232/98.

The remaining document to be prepared is a Financial Assurance Report. This is required by Ontario Regulation 232/98 for private sector facilities including residual disposal sites. The report will present the assumptions and financial calculations to establish a financial reserve for Site closure and post-closure care and contingency measures. The approach to calculating the amount of financial assurance will be that set out in the Regulation 232/98 and MOE Guideline F-15.

4.4 Task 8: Finalize and Submit EAA/EPA/OWRA Documentation & Applications

In support of the completion of this task, the D&O Team will carry out the following tasks:

- Document the information described above in a Site Design and Operations Supporting Document (D&O report) that will form an appendix to the EA submission. Specific technical studies that will be required to complete the D&O report include the following:
    - Stormwater Management;
    - Leachate Management;
    - Acoustic (Noise and Vibration) Assessment;
    - Air Quality and Odour Assessment; and
    - Site D&O.
- Participate in meetings with the government review agencies including upfront consultations with the MOE during the EA to obtain pre-approval of tasks in the work plan as required; and
- Provide technical support during the review of the EA by the regulatory agencies and the public.

TAGGART
GROUP OF COMPANIES

APPENDIX C-2.9

Traffic Work Plan

Table of Contents

FIGURES

1.0 INTRODUCTION

This document presents the proposed traffic work plan for the environmental assessment (EA) of the Boundary Road Site for the proposed Capital Region Resource Recovery Centre (CRRRC). The study plan is part of the Terms of Reference (TOR) of the EA submitted for approval to the Minister of the Environment. The TOR sets out the proponent's proposed approach for addressing the Ontario *Environmental Assessment Act* (EAA) requirements when preparing the EA. In addition to EA requirements, the proponent has chosen to submit a combined EAA and *Environmental Protection Act* (EPA) and *Ontario Water Resources Act* (OWRA) documentation package.

2.0 ASSESSMENT FRAMEWORK

2.1 Project Team Organization

The project tasks will be organized to be completed by the following teams:

- The EA Management Team;
- The Design and Operations (D&O) Team consists of landfill design technical staff and CAD technicians; and
- The EA Team consists of discipline leads for each of nine different environmental components.

2.2 Study Area

For the assessment of traffic related to alternative haul routes/site access locations for the Boundary Road Site, the study area focuses on the potential haul routes from Highway 417 to the Site along which the majority of Site-related traffic will travel. It is anticipated that almost all Site-related traffic for this Site would be from the north from Highway 417 via the Boundary Road interchange. A small percentage of traffic might also access this Site from the west via Mitch Owens Road. It is anticipated that the Site access would either be off Frontier Road or Boundary Road.

3.0 COMPARATIVE EVALUATION OF ALTERNATIVE SITES AND IDENTIFICATION OF PREFERRED SITE

Two properties that have been secured by Taggart Miller have been identified as suitable locations for the proposed CRRRC (the Alternative Sites). The first step in the EA process will be the identification of the preferred Site for the proposed diversion facilities and landfill that comprise the CRRRC.

3.1 Assessment Criteria and Indicators

The Traffic component will compare the Alternative Sites using the following criterion:

- Which site is preferred regarding potential effects from site-related truck traffic?

The rationale, indicators and data sources for the Alternative Sites criterion listed above are provided in Appendix A of the proposed TOR.

3.2 Approach and Work Plan

The Traffic discipline team will complete a comparison of information about each of the two Alternative Sites available from published information and from preliminary investigations/assessments on or in the vicinity of each of the Sites. The following tasks will be undertaken to obtain and review the published information and the preliminary investigations/assessments for the Boundary Road Site:

- Compile information from background sources and project-specific studies including:
  - Observation and review of existing traffic, road user networks, intersection operations, existing quality of roads, as well as other existing road safety measures;
  - Obtain traffic counts, if available, from various sources, i.e., municipalities, the County and Ministry of Transportation Ontario (MTO), and conduct supplementary traffic counts at key intersections within the study area;
  - Vehicular posted speed limits;
  - Roadway and intersection geometrics (including sight distance at the proposed Site access location(s); truck travel restrictions; roadway width; intersection geometry and lane configuration, etc.);
  - Traffic controls as well as regulatory signage and pavement markings;
  - Historical collision records, if available, to identify any areas of concern;
  - Aerial photographic mapping and field reconnaissance;
  - Consult with the City of Ottawa about existing and future land uses, as appropriate; and
  - Identify location and nature of potential receptors along main haul routes and adjacent to possible Site entrance locations.

Based on this information and the above criterion, the Traffic discipline team will identify which of the Alternative Sites is preferred for this component.

If the Boundary Road Site is selected as the preferred Site, then the remainder of this work plan will be completed. If the North Russell Road Site is selected as the preferred Site, then no further action under this work plan will be completed, and the North Russell Road Site Traffic work plan will be used.

4.0 DETAILED STUDY PLAN

The remaining steps of the EA/EPA/OWRA assessment are proposed to take place in three phases. The proposed phases consist of the following tasks:

Phase 1 – EA

- Task 1 – Complete Assessment of Existing Environment;
- Task 2 – Identify Preferred Site Development Concept;
- Task 3 – Assess Environmental Effects of Preferred Site Development Concept;
- Task 4 – Assessment of Alternative Haul Routes and Identify Preferred Route;
- Task 5 – Evaluate Leachate Management Options and Identify Preferred Option; and
- Task 6 – Cumulative Impact Assessment.

<u>Phase 2 – EPA/OWRA</u>

- Task 7 – Complete EPA Level Activities for Proposed CRRRC.

<u>Phase 3 – Documentation and Submission</u>

- Task 8 – Finalize and Submit EAA/EPA/OWRA Documentation and Applications.

For the Traffic Work Plan, activities will be carried out as part of Tasks 1 and 4 as described below.

4.1 Task 1: Complete Assessment of Existing Conditions

The following tasks will be undertaken to further characterize existing environmental conditions related to traffic:

- Refine the study area based on the expected project influence area. In the case of the road network, impacts on the road geometrics and operations will be assessed for an area that includes roads (independent of classification or jurisdiction) that directly link the Site to one interchange on provincial Highway 417);
- Identify municipal and provincial design criteria and standards relevant to the study; and
- Detailed study of existing traffic and roadway network, including the Highway 417 interchange(s).

4.2 Task 4: Assessment of Alternative Haul Routes and Identify Preferred Route

The Traffic discipline team will assess the haul route using the following criterion:

- Effects from truck traffic along haul route.

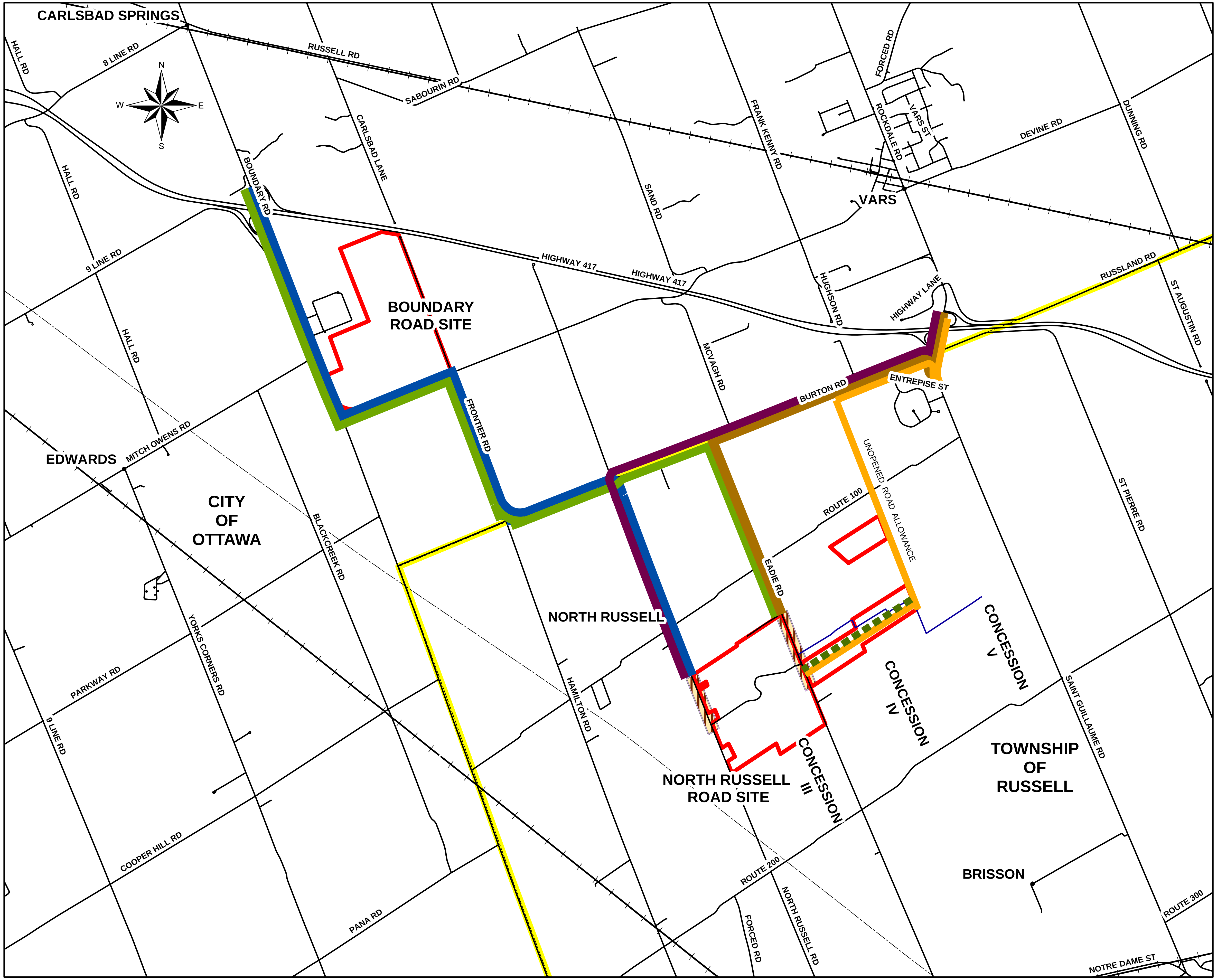
The rationale, indicators and data sources for the proposed haul route/Site access location assessment criterion are provided in Appendix B.

The haul route/access location will be assessed as follows:

- Using available information on the expected diversion to be achieved by the proposed diversion facilities, disposal requirements and proposed maximum annual tonnage to be accepted at the Site, predict the expected volume and distribution of Site generated trips (including geographical directions);
- Based on comparison with the detailed traffic study of existing conditions, identify: road improvements (e.g., addition of auxiliary lanes or extension in the length of existing auxiliary lanes) or required new construction; Site access geometry (e.g., width of access, turning lanes and paved shoulders); intersection improvements (e.g., modification to lane configuration and turning radius); introduction/upgrading of traffic controls; and roadway pavement structure upgrades;
- Calculate the predicted operation of key intersections and Site access (e.g., level of service, vehicular delay, vehicular queuing); and
- Using the indicators provided in Appendix B of the TOR, assess the effects of truck traffic along the haul route, including consideration of effects on agricultural land uses and farm related equipment and traffic on haul routes, and determine the preferred Site access location(s).

The evaluation of leachate management options (Task 5) will be subsequently completed by the D&O and Surface Water discipline teams. Activities related to leachate treatment and/or discharge will not interact with traffic, unless road haulage of leachate and/or discharge is part of the preferred alternative. In that case, the associated traffic will be modified accordingly and the haul route/access location assessment updated to include it.

The haul route/access location study report will document the data sources, assessment methods and conclusions as an appendix of the EA report.



LEGEND

— ROADWAY
┼ RAILWAY
-·- UTILITY LINE
🟨 CITY OF OTTAWA BOUNDARY
🟥 LIMITS OF OWNED OR OPTIONED PROPERTY
▥ POTENTIAL LOCATION OF SITE ACCESS

ALTERNATIVE HAUL ROUTE / ACCESS LOCATION

NORTH RUSSELL ROAD SITE

▬ 1) BOUNDARY ROAD EXIT TO NORTH RUSSELL ROAD ACCESS
▬ 2) BOUNDARY ROAD EXIT TO EADIE ROAD ACCESS
▬ 3) VARS EXIT TO NORTH RUSSELL ROAD ACCESS
▬ 4) VARS EXIT TO EADIE ROAD ACCESS
▬ 5) VARS EXIT TO UNOPENED ROAD ALLOWANCE
■ ■ ■ INTERNAL HAUL ROAD

REFERENCE

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PROJECT
TERMS OF REFERENCE FOR ENVIRONMENTAL ASSESSMENT OF THE
CAPITAL REGION RESOURCE RECOVERY CENTRE

TITLE
PROPOSED ALTERNATIVE
HAUL ROUTES / SITE ACCESS LOCATIONS

Golder Associates
Ottawa, Ontario

PROJECT No. 09-1125-1008
SCALE AS SHOWN
REV. 0

DESIGN	PLE	Aug. 2011
GIS	PJM/BR	11 Jul. 2012
CHECK	PLE	7 Sept. 2012
REVIEW	PAS	7 Sept. 2012

FIGURE
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