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.

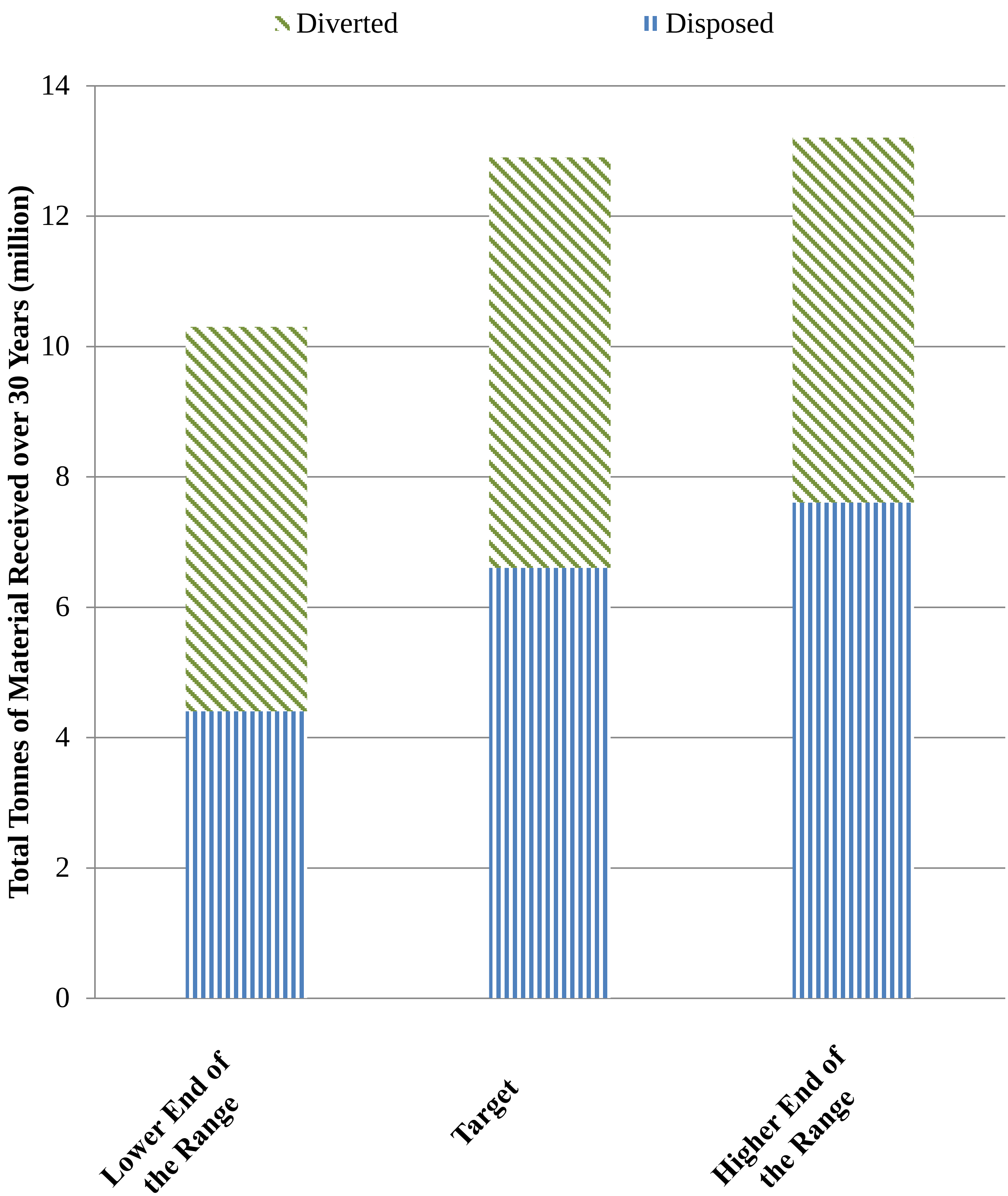
Figure 9.1-2 illustrates the diversion and disposal proportions for the tonnage received on an annual basis over the 30 year planning period using the assumptions set out above.

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

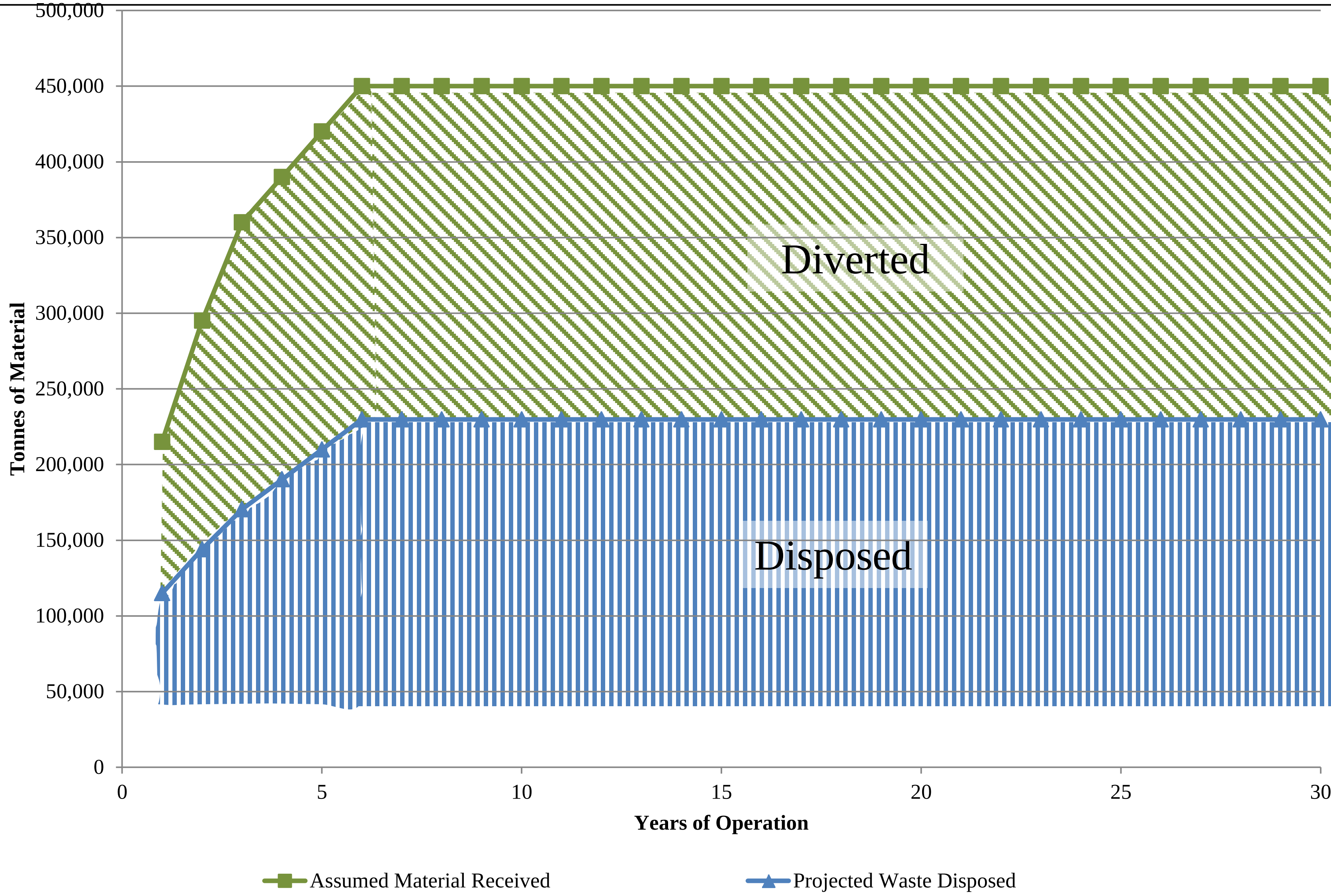
ENVIRONMENTAL ASSESSMENT OF THE CAPITAL REGION RESOURCE RECOVERY CENTRE

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

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

PROJECT

ENVIRONMENTAL ASSESSMENT OF THE CAPITAL REGION RESOURCE RECOVERY CENTRE

TITLE

Expected Tonnage Received Over Time

Golder Associates

PROJECT No. 12-1125-0045		
DESIGN	MIB	Nov. 2013
GIS	--	--
CHECK	PLE	Aug. 2014
REVIEW	PLE	Aug. 2014

SCALE AS SHOWN | REV.0

FIGURE 9.1-2

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.

<u>Site Access</u>: 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.

Petroleum Hydrocarbon Contaminated Soil Treatment: 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.

Surplus Soil Management: 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.

Landfill Component: 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.

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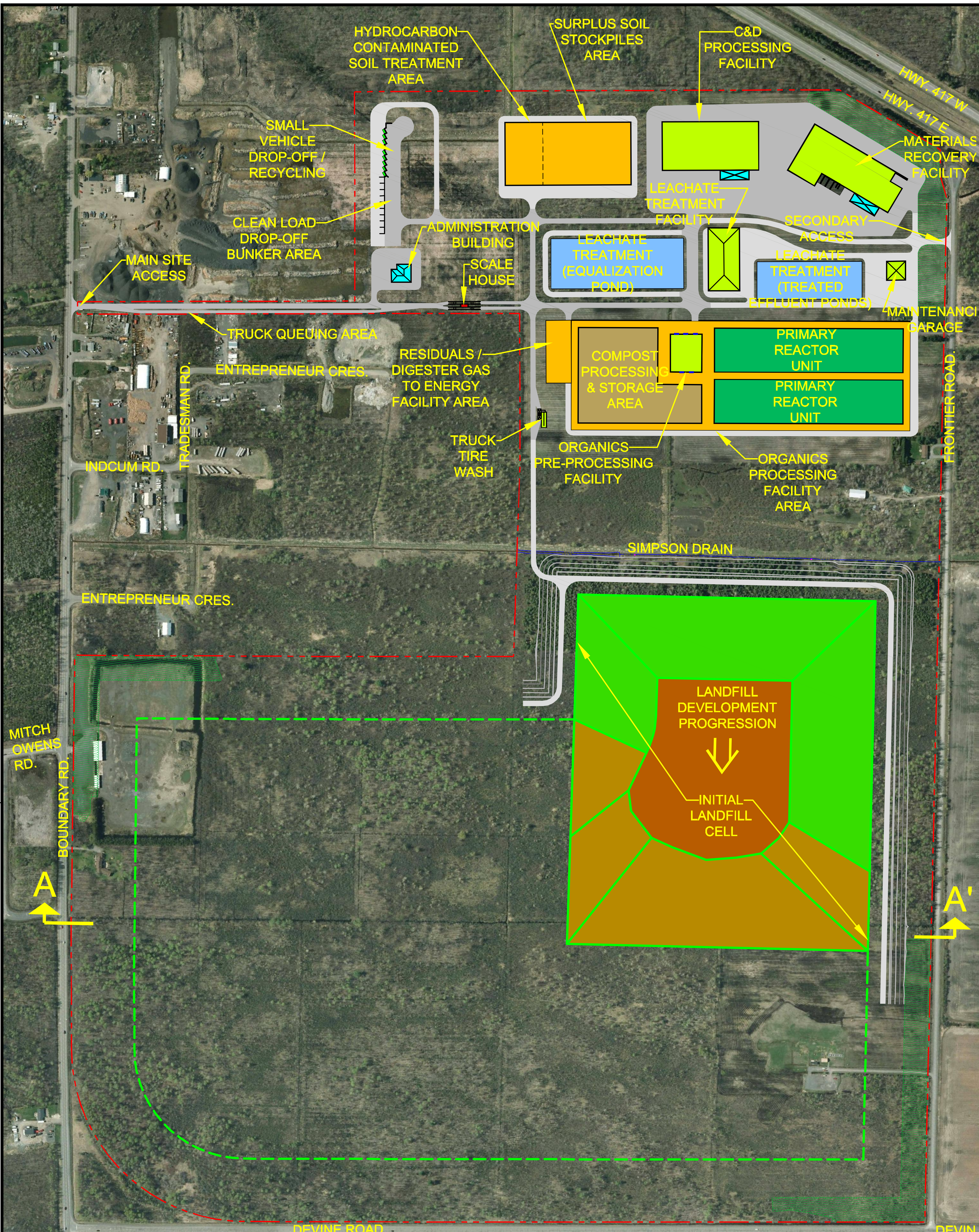


LEGEND

- 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

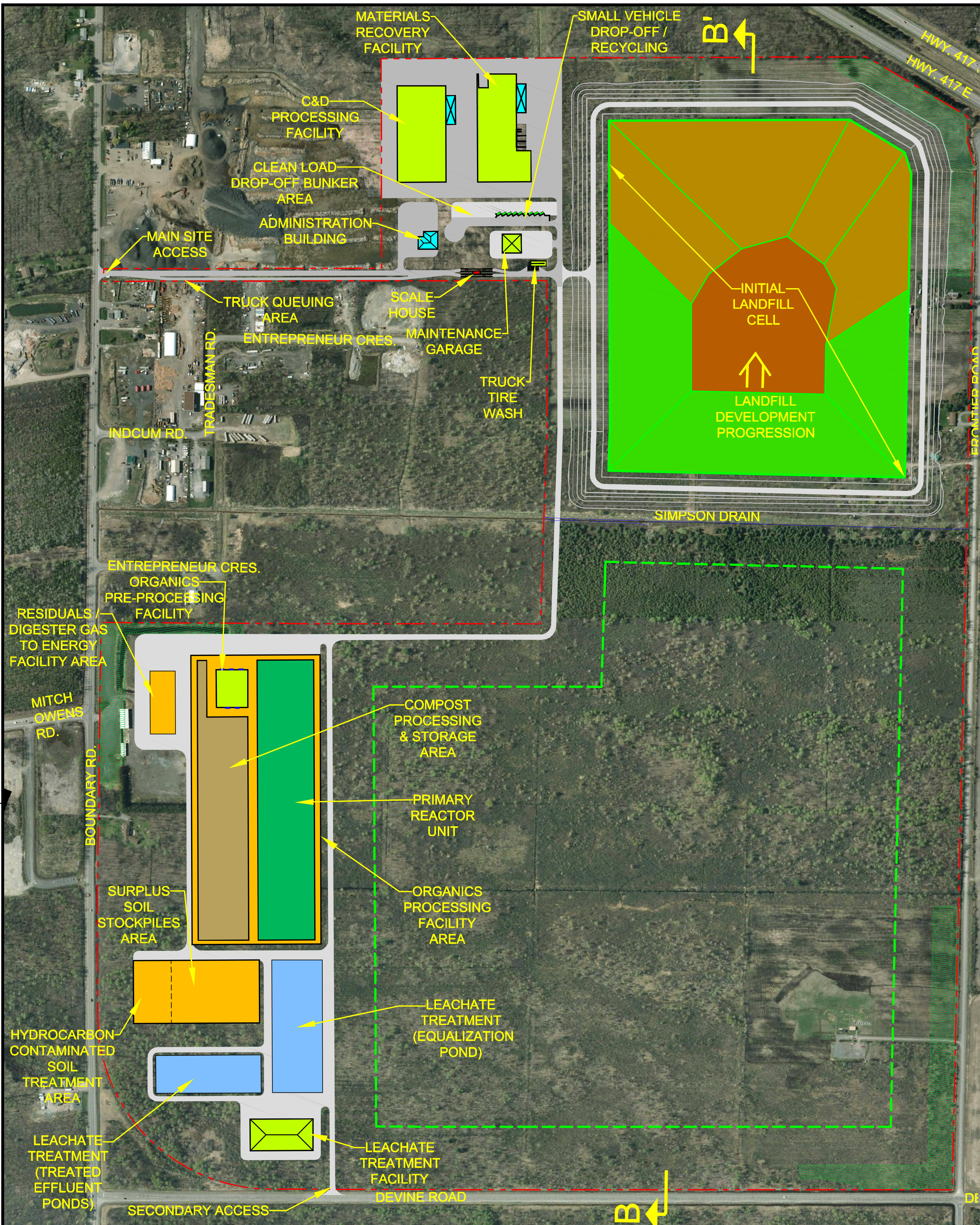
NOTE
THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT.

120 0 120 240
SCALE 1:6,000 METRES

Golder Associates
Ottawa, Ontario, Canada

SCALE	AS SHOWN	TITLE	ALTERNATIVE SITE DEVELOPMENT CONCEPT A
DATE	7 Nov. 2013		
DESIGN	M.L.F.		
CAD	M.L.F.		
FILE No. 1211250045-V1-EAr-9.3-1.dwg	CHECK P.L.E.	ENVIRONMENTAL ASSESSMENT OF THE CAPITAL REGION RESOURCE RECOVERY CENTRE	FIGURE 9.3-1
PROJECT No. 12-1125-0045 REV.	REVIEW P.A.S.		

PLOT DATE: June 26, 2014
FILENAME: N:\Active\Spatial_IM\Miller_Paving_Ltd\CRRRC\ACAD\Vol 1 (Report Figures)\EA report\1211250045-V1-EAr-9.3-2.dwg



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

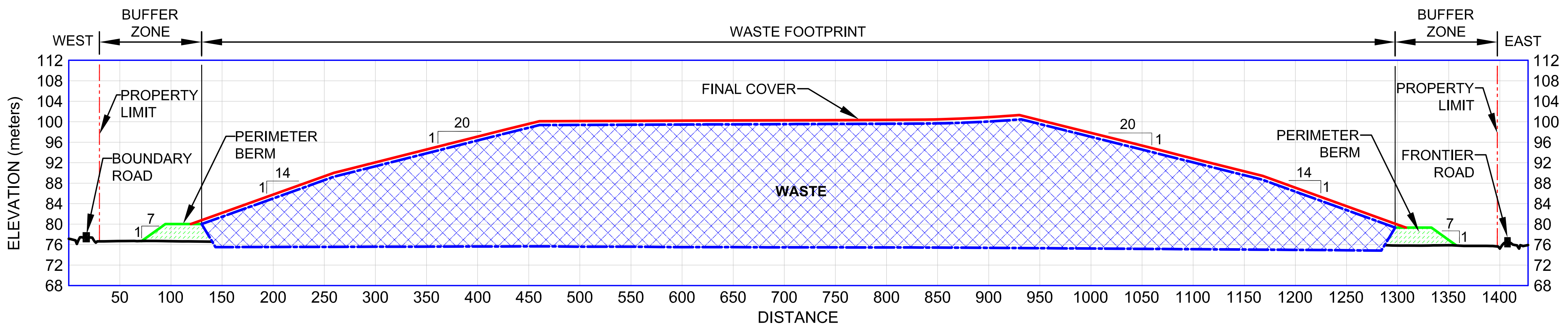
LEGEND
THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT.

120 0 120 240
SCALE 1:6,000 METRES

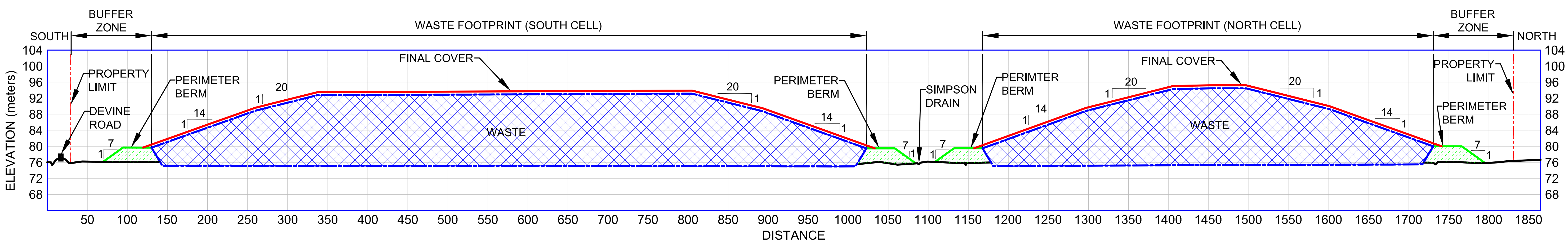
Golder Associates
Ottawa, Ontario, Canada

SCALE	AS SHOWN	TITLE	
DATE	7 Nov. 2013	**ALTERNATIVE SITE DEVELOPMENT CONCEPT B**	
DESIGN	M.L.F.		
CAD	M.L.F.		
CHECK	P.L.E.	ENVIRONMENTAL ASSESSMENT OF THE CAPITAL REGION RESOURCE RECOVERY CENTRE	FIGURE 9.3-2
REVIEW	P.A.S.		

FILE No. 1211250045-V1-EAr-9.3-2.dwg
PROJECT No. 12-1125-0045 REV.



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.

100 0 100 200
SCALE 1:5,000 HORIZONTAL METRES

20 0 20 40
SCALE 1:000 VERTICAL METRES

Golder Associates
Ottawa, Ontario, Canada

FILE No. 1211250045-V1-EAr-9.3-3.dwg		SCALE	AS SHOWN
PROJECT No. 12-1125-0045	REV. 0	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.