



June, 2009

TOWN OF MARATHON LANDFILL

Proposed Expansion Summary

Submitted to:
Corporation of the Town of Marathon
4 Hemlo Drive, P.O. Bag "TM"
Marathon ON P0T 2E0



REPORT



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1.0 INTRODUCTION

Golder Associates Ltd. (Golder), in association with Wm. R. Walker Engineering Inc. (Walker Engineering) and Harden Environmental Services Ltd. (Harden), has been retained by the Town of Marathon (the Town) to conduct a pre-feasibility analysis of the potential to expand their existing municipal Landfill, the Marathon Landfill.

For several years, the Town has been attempting to secure landfill capacity to serve their municipality upon closure of the existing Marathon Landfill. The Town is currently pursuing approvals for a new landfill, the proposed Marathon Regional Landfill (to be located at Dead Horse Creek), located approximately 64 kilometres from the Town. Due to issues arising in regards to the land acquisition necessary to implement the new Regional Landfill, the economics of operating and maintaining the proposed site and the almost completed consumption of existing Landfill capacity, the Town has decided to undertake a screening study to evaluate the alternative of expanding the existing Marathon Landfill site to provide additional capacity.

A recent review suggests that the Town has approximately one year of Landfill capacity remaining at their existing site. The Town is applying for an Emergency Certificate of Approval (C of A) Amendment for extension of the Landfill, in order to provide the required landfill space to allow for the development of the long term solution.

Ontario Regulation 101/07 (O.Reg. 101/07), under the Environmental Assessment Act (EAA), states that an expansion up to 100,000 m³ of capacity will require the completion of an Environmental Screening process. It is expected that such a screening process could take approximately two years or longer to complete.

This report presents a pre-feasibility analysis of the possible expansion of the existing Marathon Landfill. This analysis is being undertaken to evaluate the technical and economic practicality of expansion prior to embarking on the full screening process. The proposed expansion area is located to the northeast of the Marathon Landfill, in undeveloped forested lands currently owned by Marathon Pulp Inc.



2.0 BACKGROUND AND DESIGN INFORMATION

2.1 Existing Marathon Landfill

The Marathon Landfill is a natural attenuation landfill located on Lots 19 and 20, Concession 10, within the Town of Marathon, Ontario on the north side of Penn Lake Road, approximately one kilometre from the Town Centre (Figure 1). The Landfill is owned by the Town and currently operates under the Amended Provisional Certificate of Approval (C of A) No. A591801, issued March 28, 2008. This Amended C of A revoked and replaced the original C of A No. A591801, issued March 1, 1989.

The Landfill is bound to the northwest by residential development, to the southeast by the Marathon Catholic School and to the southwest by an abandoned quarry/fill. Lands to the east consist of undeveloped bush/treed area owned by Marathon Pulp Inc. The Landfill site comprises a total area of 15.2 hectares, of which 7.0 hectares are licensed for landfilling and 8.2 hectares form combined buffer zones and contaminant attenuation zones (Figure 2). Site access is from Penn Lake Road.

The Landfill is approved for a waste and daily cover capacity of 506,532 m³ (CRA, 2008a). The Site service area is limited to waste generated from within the geographic boundaries of the Town. The Landfill currently accepts domestic waste and solid, non-hazardous industrial waste. Active landfilling is occurring within the southern portion of the Landfill. The northern and central portions (about 75% of the total fill area) of the Landfill are completed and final cover has been placed. The waste placed in these areas is reported to consist primarily of municipal solid waste (MSW) intermixed with daily and intermediate sand and gravel cover.

The base grades of the Landfill range from elevation 220 to 227 metres above sea level (masl). Sidewalls of the Landfill were constructed as 1 horizontal to 1 vertical (1H:1V). Final contours for the Landfill are designed with a maximum slope of 10H:1V and a minimum slope of 20H:1V, and a maximum elevation of 233.5 masl. The toe of the slopes of the final cover ranges from elevation 227 masl (northeast corner) to 224 masl (southwest corner). It is noted that ground elevations increase substantially at a distance of 200 to 300 m east of the Landfill Site.

The Landfill is a natural attenuation design, excavated into the underlying coarse sand and gravel native soils. The final cover is designed to include a 0.6 m thick layer of low permeability soil with a remoulded hydraulic conductivity not greater than 1×10^{-6} cm/s, overlain by 0.15 m of topsoil. Cross-sections contained in the CRA (2008a) report indicate that the base of the Landfill is approximately 2.5 m above the water table, at the location of LW1-96, near the centre of the waste fill area. The water table is approximately 2 to 8 m below native grade, at an elevation of approximately 218 masl to the east, to 215 masl to the west.

Based on site surveys completed by Conestoga Rovers & Associates (CRA) and by Villeneuve Construction, the annual average consumption volumes at the Marathon Landfill between 1998 and 2007 were reported to range from 3,105 m³ to 7,238 m³. In a letter dated December 5, 2008, Walker Engineering estimated the remaining airspace available for refuse and daily cover to be 7,800 m³. The reported average annual landfill volume consumed for the period 1998 – 2007 was 6,029 m³ (CRA, 2008e). Walker Engineering estimated remaining site life to be about one year (i.e., the end of 2009), which is approximately equivalent to the annual estimated consumption rate of 6,000 m³.

With respect to nuisances, it is our understanding that there are no substantial issues related to bears, vermin, odours or litter relating to the Marathon Landfill. In the Closure Plan (CRA, 2007), it is reported that no complaints have been received in the past 11 years related to vectors or vermin. Whereas bears were formerly an issue, the installation of perimeter fencing has greatly reduced their presence. Landfill gas (LFG) is reported to be absent at the site boundaries, presumably relating to the shallow depth of fill and the permeable nature of the surrounding soils, which would promote vertical discharge of LFG.



2.2 Marathon Regional Landfill

A Design and Operations (D&O) Plan was completed by CRA, on behalf of the Town for the proposed Marathon Regional Landfill (Regional Landfill). As reported in the D&O Plan, the Regional Landfill would provide an approved waste management solution for solid non-hazardous and domestic waste disposal for the Town and surrounding area municipalities for an estimated 40 years. The Landfill is designed for a site capacity of 534,000 m³ (waste and daily cover soil).

The proposed Regional Landfill is located approximately 64 km northwest of Marathon, and about 26 km north of Highway 17 via Dead Horse Creek Road, Jack Pine Road and Vein Lake Road. It is geographically located within the Killala Lake Area, Territorial District of Thunder Bay. The service area is within a 150 km radius from the municipal office of the Town, which includes 18 municipalities and First Nations communities, as described in CRA (2008d).

The Regional Landfill is designed as a natural attenuation Landfill consisting of 6.25 hectares of waste disposal area within a total site area of 77 hectares and an additional 209 hectares extended contaminant attenuation zone (CAZ). The Landfill is designed to accept solid non-hazardous domestic and industrial wastes as defined by the General Waste Management Regulation (O.Reg. 347/90).



3.0 HYDROGEOLOGY AND ENVIRONMENTAL COMPLIANCE

Recent reports summarizing the hydrogeology include memoranda prepared by Harden Environmental (2009a and 2009b) as well as the 2007 Annual Monitoring and Progress report prepared by Conestoga Rovers & Associates (CRA, 2008a). The documents prepared by Harden Environmental provide background information regarding the hydrogeological conditions under and downgradient of the landfill, along with the results of groundwater modelling completed using a one-layer Modflow™ model developed as part of Wellhead Protection Area (WHPA) capture zone delineation studies. The CRA (2008a) report provides information on hydrogeology and groundwater flow under and downgradient of the Landfill, as well as the impacts of the Landfill Site on the groundwater, based on selected trigger parameters.

3.1 Hydrostratigraphy and Groundwater Flow

The geological sequence beneath the western edge of the existing Landfill site is best characterized at borehole MW2-98. Figures 3 and 4 provide the locations of monitoring wells in the area and a cross-section of the hydrostratigraphy. At the location of MW2-98, there are 4.3 m of sand and cobbles. This is clearly a beach deposit and is very permeable. Underlying the sand and cobbles, is a 2.5 m thick silt and clay confining layer, which acts to limit downward groundwater flow. Recharge (and thus leachate) emanating from the Landfill would therefore flow primarily to the west-southwest in the upper aquifer. According to the borehole log of MW2-98, this upper sand unit was saturated at a depth of 2.7 m. Downgradient of the Landfill, the underlying confining layer is reported to decline in elevation and become discontinuous, and as a result, the unconfined sand aquifer downgradient of the Landfill is contiguous with the unconfined unit at the Landfill Site. This is illustrated in Figures 3 and 4 of Harden (2009a).

Beneath the silt and clay is a layer of fine to medium sand. This layer is confined by the overlying silt and clay and there is artesian pressure in this unit. This artesian pressure resulted in the formation of a collapse feature on an adjacent property, which occurred due to groundwater flowing upward through the well annulus. These conditions must be kept in mind during any exploration of this area.

The underlying surface bedrock is interpreted to rise to the east of the Landfill, however, previous investigations have not mapped the outcrop in this area. The approximate location of the bedrock at or near surface is shown on Figure 5, based on outcrops observed on Peninsula Road and at Penn Lake. The depth to bedrock in this area is not known with certainty and would therefore need to be assessed in the field.

It is likely that the area of the proposed Landfill expansion area east of the Landfill (see Figure 2) is underlain by 2 to 3 m of coarse sand and gravel followed by 2 to 3 m of clay and silt. This is further underlain by additional layered clay and sand of unknown thickness overlying bedrock.

Groundwater in the upper aquifer flows towards Lake Superior. As a result of the permeable nature and high gradients, horizontal groundwater flow velocities in the unconfined aquifer are reported to be quite high, exceeding 1,000 m/a. Results of a groundwater flow model prepared by S.S. Papadopoulos and Associates (2002) indicate that groundwater flow is westerly, as illustrated on Figure 2 of Harden (2009a). Based on this model, Harden concludes that the capture zone of Municipal Well 2 does not extend under the Landfill site. As noted in Section 3.3, groundwater quality monitoring downgradient of the Landfill suggests that groundwater flow may be more so to the southwest.

Environmentally sensitive areas were reviewed, based on mapping obtained from Lands Inventory Ontario (Figure 6). The proposed landfill expansion area does not intrude on any identified sensitive lands; however this should be confirmed in the field.



3.2 Landfill Monitoring

Leachate quality at the Marathon Landfill is monitored at LW1-98, monitored annually from 1998 to 2001 and 2004 to 2007. The analytical results from the monitoring of this well in 2007, which included general chemistry, metals and volatile organic compounds (VOC), indicated Ontario Drinking Water Standards (ODWS) exceedances for alkalinity, hardness, dissolved organic carbon, colour, turbidity, iron, manganese and 1,4-dichlorobenzene.

Table 3.1 presents the range of concentrations for the trigger parameters and additional indicator parameters measured at this monitoring well since 1998 and compares them to typical leachate characteristics, the ODWS, and the Reasonable Use Criteria (RUC), taken from CRA (2008a).

Concentrations of “leachate” as measured at Monitoring Well LW1-98 are well below the initial source concentrations typically found in landfill leachate for similarly sized landfills, as provided in the Landfill Standards Guideline (Ontario Regulation 232/98). In particular, it is noted that the chloride and ammonia concentrations are lower than might normally be observed at a similarly sized landfill. Given that monitoring well LW1-98 is founded in the upper unconfined aquifer beneath the base of the landfill, it is considered that the quality monitored at this location is more indicative of leachate diluted within the upper aquifer groundwater, which is reported to flow at a relatively rapid rate in this area. It is also noted that the landfilled waste is relatively thin (approximately 6 to 7 m or less), which combined with a slow fill rate, usually results in lower strength leachate.

The 2007 Annual Monitoring and Progress Report (CRA, 2008a) indicated that the landfill has impacted the groundwater quality downgradient of the landfill at concentrations exceeding the Reasonable Use Criteria (RUC). Elevated concentrations of alkalinity, iron and DOC exceeding the RUC are reported to extend downgradient of the Landfill generally towards the municipal well. The exceedances at distance from the Landfill may be the result of landfill impacts or other activities downgradient of the landfill. It is reported (CRA, 2008a) that there are no discernable water quality impacts at Marathon’s Municipal Well 2, which may reflect significant dilution of the leachate under the landfill, as noted in OW1-98, and further dilution by groundwater drawn into the well from the larger recharge area. It is further noted that the reported exceedances for iron and DOC are for parameters which may be related to natural conditions or sources other than the landfill. Whereas alkalinity appears to be a potentially suitable indicator for landfill impacts, it is not a health or aesthetic related drinking water standard and is not unique to the landfill. Further assessment of the landfill influence on groundwater quality will be undertaken as part of the Environmental Screening process.



Table 3.1 – LW1-98 Quality Comparison to Standards

Parameter	LW1-98 Concentration Range (1998 to 2007) (mg/L)	Leachate Characteristics (Initial Source Concentration) ¹ (mg/L)	Ontario Drinking Water Standard ² (mg/L)	RUC (Trigger Level) ³ (mg/L)
Trigger Parameters (CRA, 2008)				
Aluminum	<0.01 – 0.414	- ⁴	0.1 (OG)	0.05
Iron	0.56 – 12.3 (increasing trend)	-	0.3 (AO)	0.21
Sodium	154 – 443	-	200 (AO)	102.4
Alkalinity	542 – 883	-	30 – 500 (OG)	326.5
Dissolved Organic Carbon	<0.5 – 13	-	5 (AO)	3.55
Sulphate	155 – 557	-	500 (AO)	255.6
1,4-dichlorobenzene	0.0005 – 0.005	0.01	0.005 (MAC)	1.44
Additional Indicator Parameters				
Chloride	68 – 216	1500	250 (AO)	-
Phenols	<0.001 – 0.017	-	-	-
Ammonia	0.25 – 2.05	-	-	-
Conductivity	1500 – 2920 ⁵	-	-	-
Manganese	1.85 – 3.02	-	0.05 (AO)	-
Cadmium	<0.0001 – 0.0003	0.05	0.005 (MAC)	-
Dichloromethane	<0.0005 – <0.001	3.3	0.05 (MAC)	-
Benzene	<0.0005	0.02	0.005 (MAC)	-
Toluene	<0.0005	1	0.024 (AO)	-
Vinyl Chloride	<0.0005 - <0.002	0.055	0.002 (MAC)	-

NOTES:

1. Ontario Regulation 232/98 Landfill Standards Guideline, Part VII, Section 33, Table 1.
2. MAC – Maximum Allowable Concentration, AO – Aesthetic Objective, OG – Operational Guideline
3. Reasonable Use Criteria (RUC) taken from 2007 Annual Monitoring and Progress Report (CRA, 2008a)
4. ‘-’ indicates no value available from reference.
5. Conductivity values for LW1-98 are field measured.

3.3 Compliance Summary

The 2007 Annual Monitoring and Progress Report (CRA, 2008a) indicated that the landfill has impacted the groundwater quality downgradient of the landfill at concentrations exceeding the Reasonable Use Criteria (RUC). Elevated concentrations of alkalinity, iron and DOC exceeding the RUC are reported to extend as far downgradient as MW8B-06 (500 m from the Landfill), whereas concentrations of alkalinity and DOC exceeding the RUC extend to SW1-98 (780 m from the Landfill). The direction of increased concentrations of trigger parameters is generally towards the municipal well. The exceedances at distance from the Landfill may be the



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result of landfill impacts or other activities downgradient of the landfill. It is reported (CRA, 2008a) that there are no discernable water quality impacts at Marathon's Municipal Well 2, which may reflect significant dilution of the elevated parameters by groundwater drawn into the well from the larger recharge area.

Landfill gas (LFG) is reported to be absent at the site boundaries, presumably relating to the shallow depth of fill and the permeable nature of the surrounding soils, which would promote vertical discharge of LFG.

Given the above, the following summary of observations can be made:

1. The Marathon Landfill is located above an unconfined sand and gravel aquifer. This aquifer is contiguous with that into which the Town of Marathon municipal groundwater supply wells are constructed;
2. Groundwater modelling suggests that the capture zone of Marathon Municipal Well 2 does not extend under the Landfill;
3. The Landfill has impacted groundwater quality downgradient of the Landfill Site at concentrations exceeding the RUC;
4. Elevated concentrations of alkalinity, iron and DOC exceeding the Reasonable Use Criteria (RUC) are reported to extend as far downgradient as SW1-98. There are no discernable impacts at Marathon Municipal Well 2, which may reflect dilution.



4.0 REGULATORY ISSUES RELATED TO PROPOSED EXPANSION

Ontario Regulation 101/07 Waste Management Projects was promulgated in 2007 with the intent of clarifying the approvals required for the development of new waste management facilities or changes to existing facilities. This regulation specifically addressed Landfill expansion, as well as Landfill mining. The regulation contains three options for approvals; (i) a full environmental assessment (EA), (ii) an environmental screening, or (iii) an exemption from the EA depending on the increase in the volume of waste capacity that would result and the primary purpose of the project.

Section 4 of the Regulation states that a change to a landfilling site or dump is defined as a major commercial or business enterprise or activity and is designated as an undertaking subject to an EA if the total waste disposal volume of the landfilling site or dump after the change would exceed, by more than 100,000 m³, the total waste disposal volume that the landfilling site or dump was authorized to have under the *Environmental Protection Act* before the change.

Section 14 of the Regulation states that a change to a landfilling site or dump is defined as a major commercial or business enterprise or activity and is designated as an undertaking subject to an *Environmental Screening* process if the total waste disposal volume of the landfilling site or dump after the change would exceed by 40,000 m³ or more but not more than 100,000 m³ the total waste disposal volume that the landfilling site or dump was authorized to have under the *Environmental Protection Act* before the change.

Section 12 of the Regulation provides for a possible exemption of the requirement for a change to a landfilling site or dump to be designated as an undertaking requiring either an EA or an Environmental Screening in the following circumstances:

- a) the change would result in the landfilling site or dump becoming a landfilling site or dump with a total waste disposal volume of 40,000 m³ or more but not more than 100,000 m³, and
- b) the total waste disposal volume of the landfilling site or dump after the change would exceed by less than 40,000 m³ the total waste disposal volume that the landfilling site or dump was authorized to have under the *Environmental Protection Act* before the change.

The final discretion as to the approval process required is left to the Director of Approvals for the MOE.

An expansion of the existing Marathon Landfill of up to 100,000 m³ would require an Environmental Screening process. The steps the Town would have to undertake to fulfill the requirements of an Environmental Screening process are as follows:

1. Prepare and publish Notice of Commencement of a Screening Project;
2. Identify problem or opportunity and provide project description;
3. Apply screening criteria checklist to identify potential environmental effects;
4. Describe the potential environmental effects, concerns and issues to be addressed;
5. Consult with interested persons, Aboriginal peoples and government agencies to identify any issues or concerns;
6. Conduct studies and assessment of potential environmental effects;
7. Develop impact management measures (e.g., mitigation measure);
8. Consult with interested persons and government agencies to identify any issues or concerns;
9. Identify, if any, significant net effects and resolve concerns;



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10. Conduct additional studies and assessment of effects and mitigation measures (if significant net effects and/or all concerns not resolved) in consultation with key parties/agencies;
11. Prepare Environmental Screening Report (including results of review and consultation, mitigation and impact management measures);
12. Publish Notice of Completion of Environmental Screening Report and begin 60 day review period;
13. Address Elevation of Project Status Requests, if any; and,
14. Submission of Statement of Completion to the Ministry.

The above screening steps are described in detail in the Ministry of Environment's *Guide to Environmental Assessment Requirements for Waste Management Projects*, Part B – Environmental Screening Process, Section B.2.1 (March 15, 2007).



5.0 PROPOSED LANDFILL EXPANSION

5.1 Design

The proposed size of the expansion of the Marathon Landfill is 100,000 m³, based on the maximum size allowed within the Screening Approach under Reg. 101. At an approximate annual filling rate of 6,000 m³/a, this would represent approximately 16 years of capacity.

It is recognized that the Town will require an Emergency C of A amendment for the placement of waste for an interim period at the existing site, until the long term waste management facility is in place. Placement of additional waste in the interim period will most likely be in the portion of the Landfill that has not received final cover (i.e., the south side of the Landfill). In the Closure Plan (CRA, 2007), it is suggested that a one to five year capacity could be achieved by marginally increasing the sideslopes and peak by up to 1 metre.

The proposed expansion area is to the northeast of the Landfill (see Figure 2), which is completed and capped in that area. Potential design alternatives for the expansion would require a footprint of approximately 2 ha, plus an area for the surrounding access roads and stormwater drainage modifications.

Given the hydrogeological conditions, location, design and current impact of the Marathon Landfill, an Environmental Screening study will be used to assess alternative approaches to the design of the expanded landfill. The current design of the site is based on “natural attenuation” (i.e., no liner or leachate collection system), which would form the baseline of the screening assessment. In addition to the natural attenuation design, the alternatives would consider various engineered containment systems in the event that the screening suggests that potential impacts from the Landfill would require mitigation. The alternative design options to be assessed in addition to natural attenuation would include construction of a lined cell with leachate collection system and a soil or geosynthetic cover. These alternatives would be assessed on the basis of the incremental impact of the Landfill expansion on the water resources.

5.2 Comparison of Regional Landfill vs Expansion Alternatives

A preliminary comparison of the proposed expansion of the Marathon Landfill to development and use of the Regional Marathon Landfill immediately following the anticipated closure of the existing Landfill is provided in Table 5.1. This comparison includes cost considerations, environmental impacts, operational issues and approvals. This assessment was undertaken in order to evaluate the current suitability of the Regional Marathon Landfill as compared to the proposed expansion, given the current financial issues related to operation of the Regional site solely for the Town of Marathon.

The estimated cost to construct a new cell at the existing Marathon Landfill (i.e., expansion Options 1 and 2) ranges from \$3.7 to \$5.5 million. The overall cost for development of the first stage (100,000 m³) of the Regional Landfill (approximately \$8.2 million including \$2.7 million for the upgrade of Dead Horse Creek Road) exceeds that of the proposed Marathon Landfill expansion. Completion of the construction of the Regional Landfill to the final design volume of approximately 534,000 m³ would require additional funds.

Advantages of the proposed expansion of the Marathon Landfill include the use of existing infrastructure at the current landfill, as well as the shorter haul route, resulting in overall lower annual operating costs over the approximately 16 year lifespan of the Landfill. Disadvantages include the need to undertake a screening level study.

It is recognized that the Regional Landfill has draft EA approval, and would ultimately provide significant additional Landfill space to that of the proposed expansion, however not all of this volume would be for use by the Town. It is further noted that other municipalities would be required to participate in the use of the Landfill in order for the necessary equivalent tipping fees to match those normally expected for a landfill in this area. We understand that many of these municipalities do not yet require an alternative to their existing waste disposal sites.



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Table 5.1 – Comparison of Marathon Landfill Expansion to Regional Landfill Construction

	Expanded Marathon Landfill	Regional Marathon Landfill
Total Lifespan	16 years	16 years (first 100,000 m ³); 40 years total
Capital Cost (for first 100,000 m³)	\$3,640,000 - \$5,460,000	\$5,460,000
Road Upgrade Cost		\$2,700,000
Annual Operating Cost	\$186,500	\$537,750
Approvals	Screening Study Required	Studies Complete, Draft C of A approved
Land Issues	Purchase of expansion land required, however expropriation may be necessary. Re-zoning is likely required.	Purchase/Transfer of lands maybe affected by First Nations issues
Municipal Partnering	Not required	Required to effectively operate landfill
GHG emissions – Landfill	Similar	Similar
GHG emissions - Transport	10 km	64 km
Design	Natural Attenuation (current)	Natural Attenuation
Potential Public nuisance	Incremental increase in existing (minimal) impacts to surrounding municipality	No public nuisance anticipated
Incremental Environmental Impact on Natural Environment	Limited to footprint of expansion	Entire footprint of Landfill
Impact on Water Resources	Incremental impact on existing – currently exceeds RUC due to limited property area	New impact – modelled to meet RUC within large property footprint

A possible constraint to the expansion of the existing landfill is the need to acquire property. The proposed expansion area is located to the northeast of the existing Landfill on undeveloped lands owned by Marathon Pulp Inc. (MPI). MPI recently shut down the local mill indefinitely and has filed a notice of intention to make a proposal under the Bankruptcy and Insolvency Act (Canada). PriceWaterhouseCoopers Inc. are acting as trustee and have indicated that, at the present time, they have no authority to sell specific assets of MPI. They indicate that they are attempting to sell the operation as a “going concern”.

If the trustee is unsuccessful in selling the MPI operation as a going concern, the next step could be a sale of MPI’s assets, at which point the Town may be able to acquire the property. However, an asset sale such as this is speculative and a schedule for any divestiture of assets is not known at this time.

As a result, the Town may have to consider other alternatives to secure the property, including expropriation and measures available in the event of non-payment of taxes.



6.0 IMPLEMENTATION

The screening process for the proposed expansion should involve an assessment of the Landfill impacts on the surface water resources relative to the alternative design criteria noted above.

A screening study would require additional investigations to be undertaken, including:

1. Assessment of the hydrogeology in the area of the proposed expansion including the construction of additional monitoring wells to determine hydrostratigraphy and depth to the water table;
2. Evaluation of leachate quality for the existing and expanded landfill based on the requirements of Regulation 232/98;
3. Development of a three-dimensional groundwater flow model capable of assessing the mass loading of the existing and expanded Landfill options, including the resultant groundwater quality downgradient of the Landfill;
4. Preparation of more detailed cost estimates and alternative engineering designs.

These tasks would be undertaken as part of an Environmental Screening process. It is recommended that consultation with the MOE be undertaken at the beginning of the Environmental Screening process. In addition, it is noted that a public meeting would likely be required to describe the reasons for and approach to the screening process.

As noted above, the remaining capacity of the Marathon Landfill is insufficient for the Town's current waste disposal needs beyond the end of 2009, and potentially earlier depending on incoming waste volumes. It is our understanding that there are no nearby landfills which are licensed to accept waste from outside municipalities, which includes the municipalities of Manitouwadge, Terrace Bay and Sault Ste. Marie. As a result, it is recommended that the Town apply for an Emergency C of A to allow landfilling at the Marathon Landfill to continue while the screening process is undertaken. Based upon the reported average annual volumes (6,000 m³/a) and the estimated two year screening process, it is recommended that the Town apply for an increase of 12,000 m³.



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All of which is respectfully submitted,

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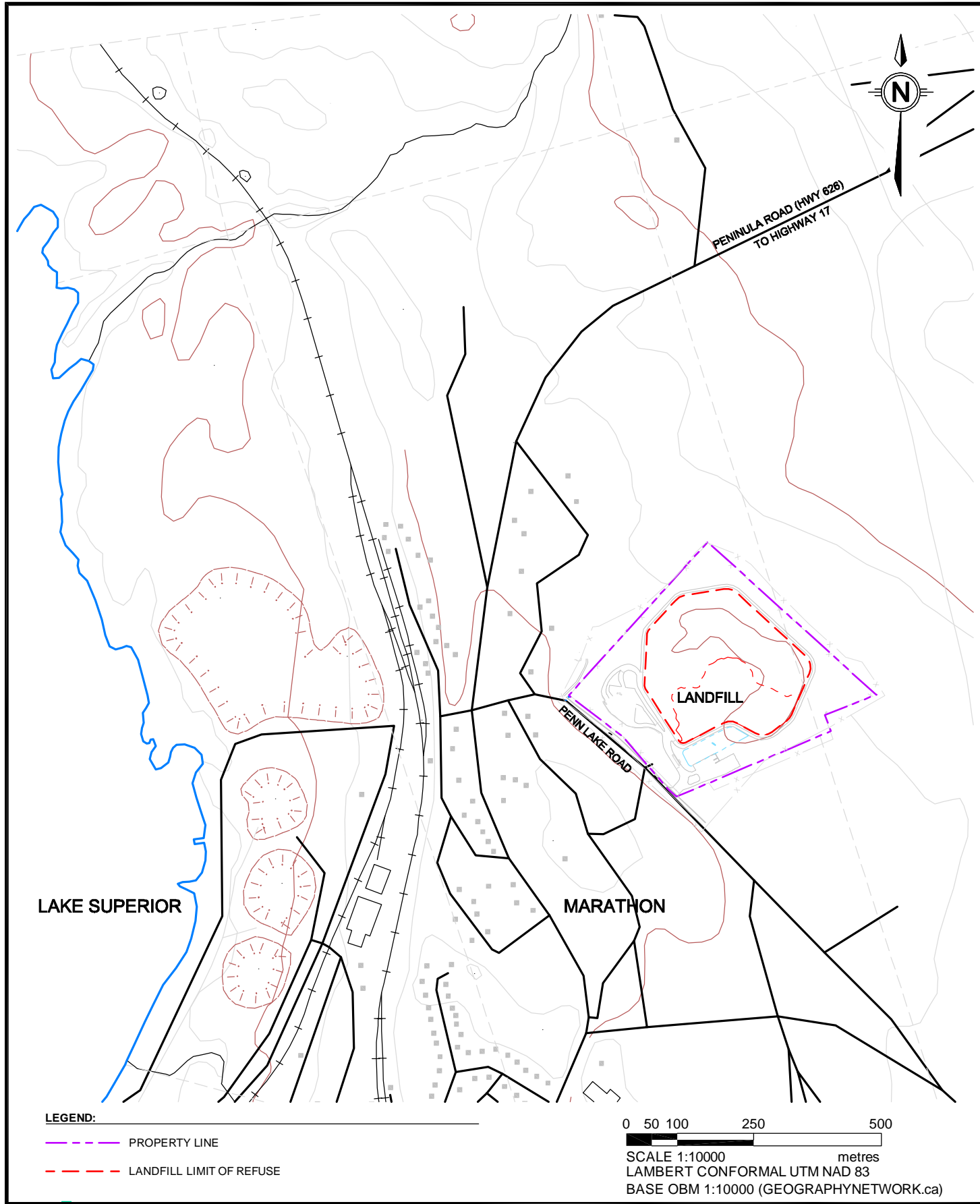
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FIGURES

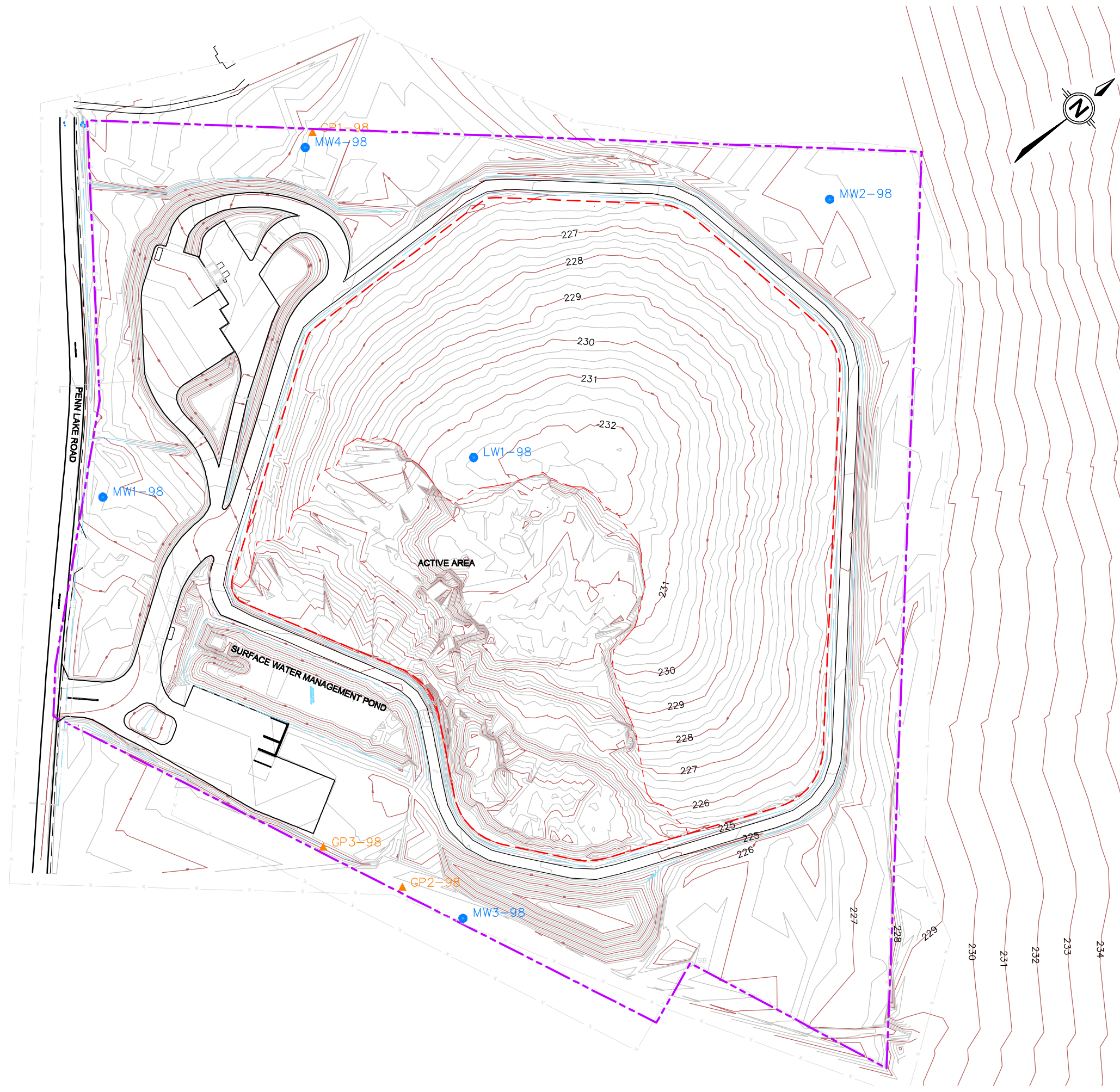
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LEGEND:
 - - - - - PROPERTY LINE
 - - - - - LANDFILL LIMIT OF REFUSE

0 50 100 250 500
 SCALE 1:10000 metres
 LAMBERT CONFORMAL UTM NAD 83
 BASE OBM 1:10000 (GEOGRAPHYNETWORK.ca)

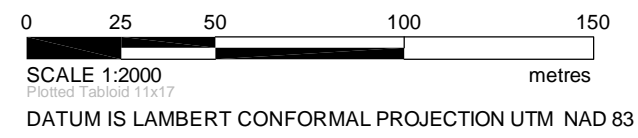
 <p>Golder Associates Barrie, Ontario, Canada</p>	SCALE	AS SHOWN	<h2>AREA LOCATION MAP</h2>
	DATE	Apr. 17, 2009	
	DESIGN		
	CAD		
FILE No.	0911700070AAAREA.dwg		<h3>MARATHON LANDFILL</h3>
PROJECT No.	REV.	REVIEW	
			FIGURE 1




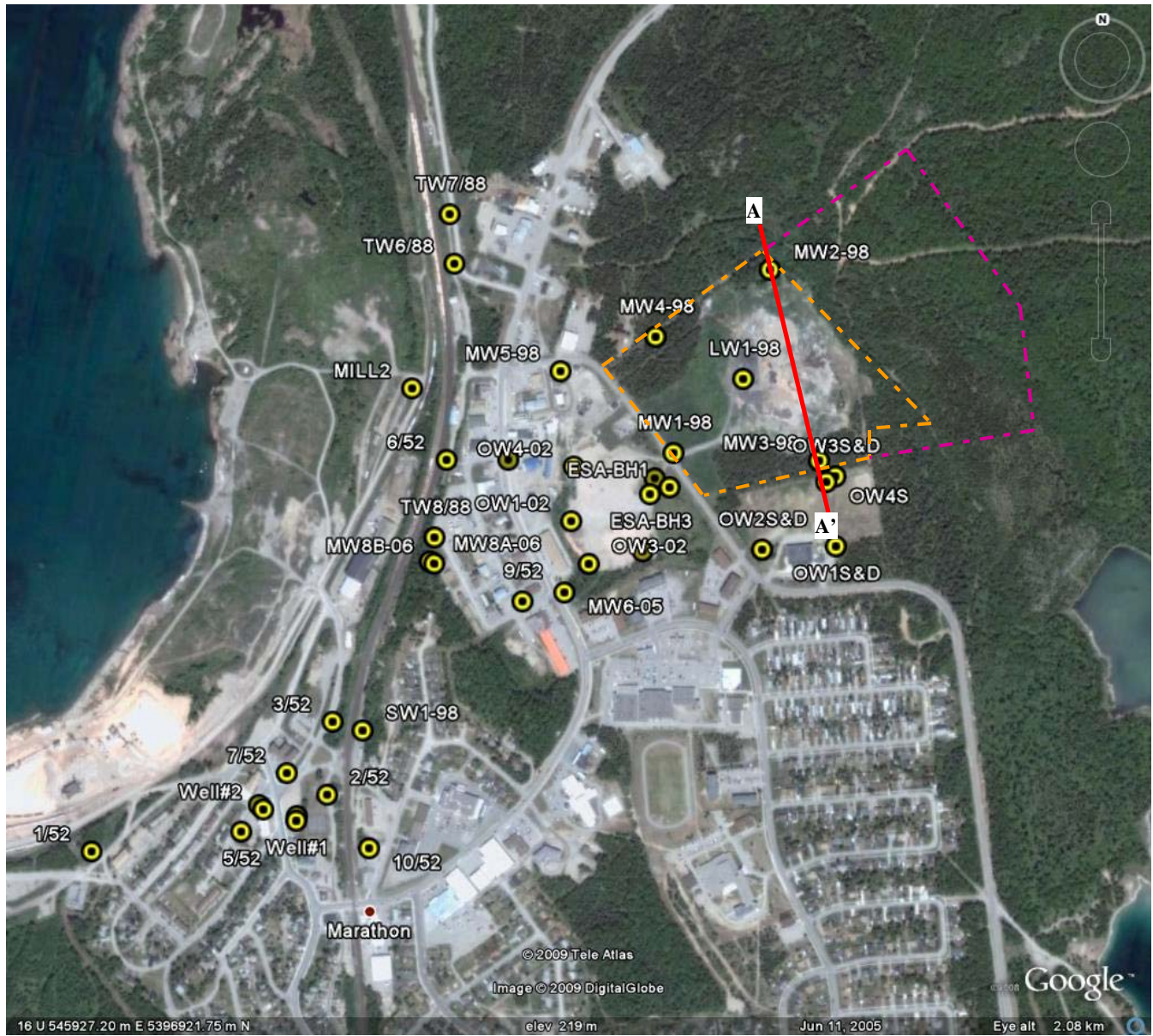
LEGEND:

	PROPERTY LINE
	LANDFILL LIMIT OF REFUSE
	EXISTING MONITORING WELL
	EXISTING GAS PROBE

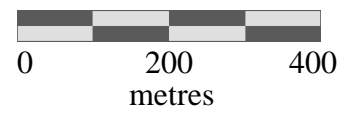
- REFERENCES:**
- MAPPING BASED ON CONESTOGA ROVERS ASSOCIATES 2008
 - LANDFILL SITE CONTOUR INTERVAL 0.25 m
 - ONTARIO BASE MAP 1:10000 CONTOURS (INTERPOLATED 1 masl INTERVAL)

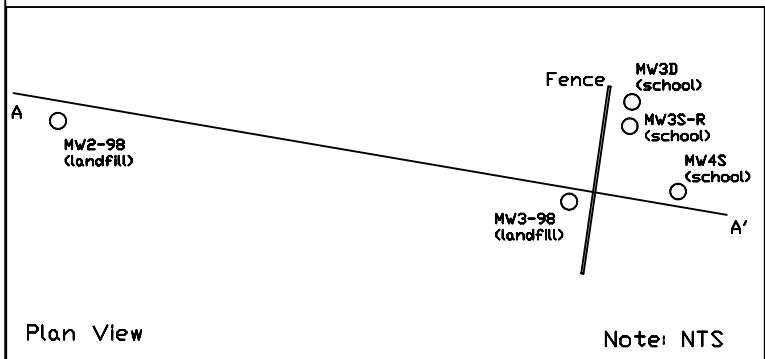
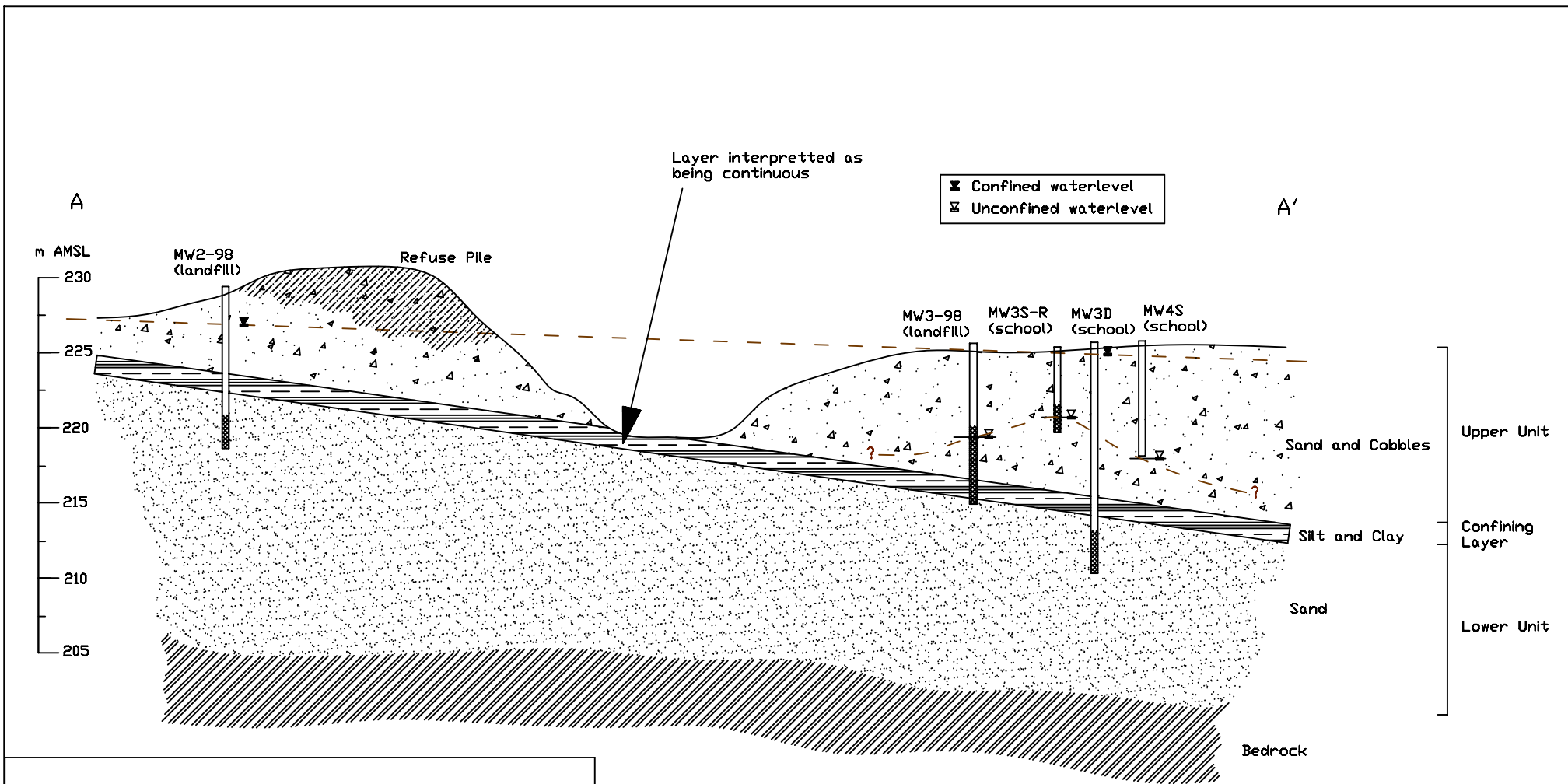


TITLE		SITE LOCATION MAP	
TOWN OF MARATHON LANDFILL PRELIMINARY EVALUATION OF LANDFILL ALTERNATIVES			
 Golder Associates Barrie, Ontario, Canada	SCALE	AS SHOWN	
	DATE	17 APR 2009	
	DESIGN		
	CAD	J REGIER	
FILE No.	0911700070AASITE.dwg	CHECK	FIGURE
PROJECT No.	09-1170-0070	REV.	2
	REVIEW		



- Existing Landfill Property Boundary
- Proposed Landfill Extension Boundary
- Existing Monitor Location
- Location of Cross Section (see Figure 4)



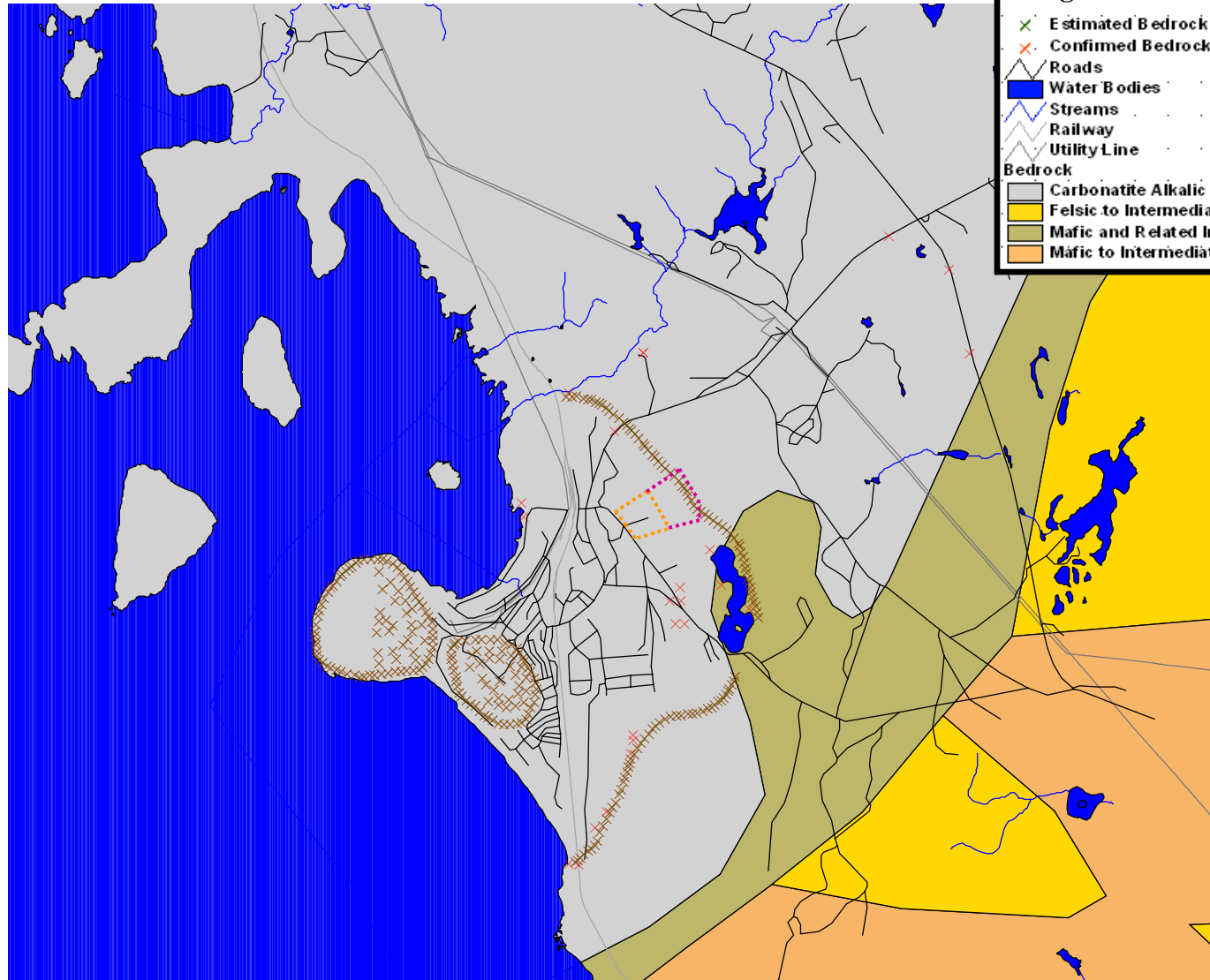


Note: Geological and hydrogeological conditions between boreholes have been interpreted and may not be accurate.

HARDEN ENVIRONMENTAL

Figure 4: Marathon Landfill Conceptual Cross Section

DATE: March 2009	DRAWN BY: AW
PROJECT: 0905	SCALE: As Shown



Legend

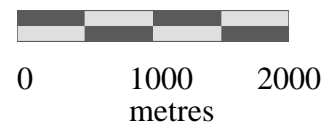
- x Estimated Bedrock Outcrop
- x Confirmed Bedrock Outcrop
- Roads
- Water Bodies
- ~ Streams
- Railway
- Utility Line

Bedrock

- Carbonatite Alkalic Intrusive Suite Unit 32
- Felsic to Intermediate Metavolcanic Rocks Unit 6
- Mafic and Related Intrusive Rocks Unit 31c
- Mafic to Intermediate Metavolcanic Rocks Unit 5

----- Existing Landfill Property Boundary

----- Approximate Landfill Extension Boundary



Geology Data Source: Land Information Ontario
 Bedrock Outcrop Source: Harden, 2002



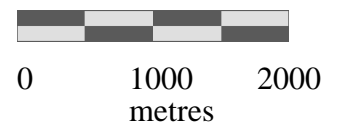
Project No: 0905	FIGURE 5	Estimated Bedrock Outcrops
Date: Mar 2009	Drawn By: AW	

Legend

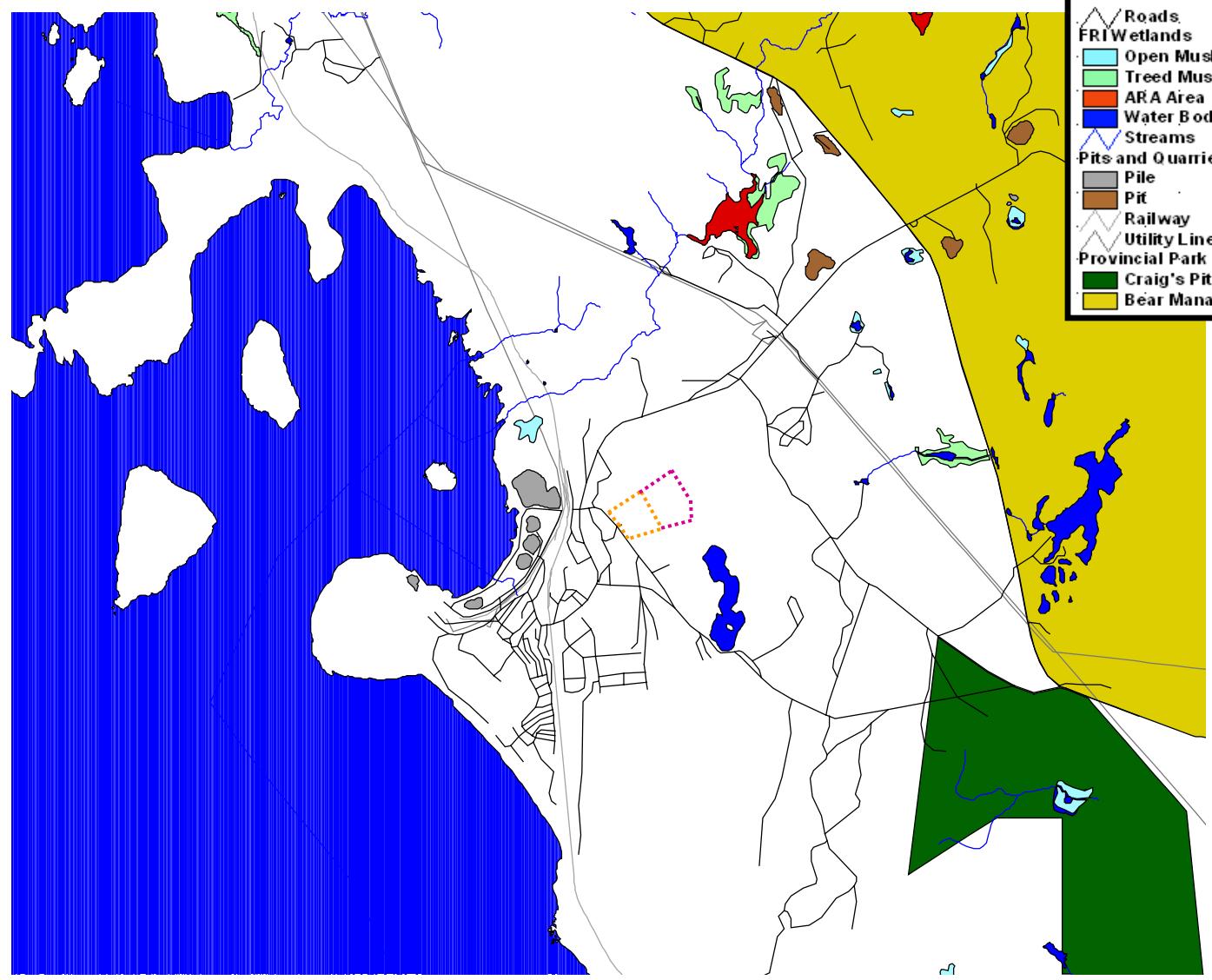
- △ Roads
- FRI Wetlands
 - Open Muskeg
 - Treed Muskeg
- ARA Area
- Water Bodies
- Streams
- Pits and Quarries
 - Pile
 - Pit
- △ Railway
- △ Utility Line
- Provincial Park Area
 - Craig's Pit Provincial Park Addition
 - Bear Management Area

----- Existing Landfill Property Boundary

----- Approximate Landfill Extension Boundary



Data Source: Land Information Ontario



Project No: 0905	FIGURE 6	Areas of Ecological Importance
Date: Mar 2009	Drawn By: AW	

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