Warwick Landfill Expansion
Environmental Assessment

September 2005

WASTE MANAGEMENT

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EXECUTIVE SUMMARY

Waste Management of Canada Corporation (WM) is applying to expand its Warwick Landfill, as detailed in this Environmental Assessment document (EA). The expansion is needed to allow WM to continue to dispose of solid non-hazardous municipal, industrial, commercial and institutional waste generated in Ontario. The proposal is to allow 750,000 Tonnes per year of such waste, exclusive of cover material, to be disposed of at the site for a period of approximately 25 years. The expansion would occur adjacent to the existing Warwick Landfill on property that is owned by WM and is within the Township of Warwick.

WM believes the expansion should be approved because:

1. This Environmental Assessment (EA) has been completed in compliance with the requirements of a "Terms of Reference" document (ToR) approved by the Ontario Minister of Environment on January 11, 2000 (Appendix A). The ToR prescribes the mandatory components of an EA for this specific project. In approving the ToR, the Minister set out the requirements necessary for the proposal to meet the public interest as expressed in the *Environmental Assessment Act* (EAA).
2. This EA submission describes an extensive process of research, design, consultation, analysis and review supporting the proposal to expand the Richmond Landfill. This EA meets the purpose, intent and approval standard of the EAA because it:

- Satisfies the prescriptive requirements of the ToR and
- Demonstrates no significant residual environmental impacts of the undertaking; and,
- Meets the purpose of the EAA providing for the betterment of the people of Ontario including the conservation and protection of the environment.

This EA process and documentation relies on the terms set out in the ToR and is submitted in conjunction with an *Environmental Protection Act* application.

Since 2000, the Environmental Assessment process, conducted in accordance with the approved ToR, has been documented in nine Discussion Papers (DPs) (**Appendix B**) which evaluated the various components of the landfill expansion. The process involved significant outreach to the relevant stakeholders and feedback from them. WM extensively sought and/or achieved communication with, involvement with, and/or input from:

- the Township of Warwick (Township) and its Peer Review Team (PRT) – consisting of technical experts hired by the Township to review each DP and technical background report; and to report directly to the Township any comments, issues or recommendations relating to the work prepared by Waste Management,
- the County of Lambton,
- the Environmental Assessment Study Group (EASG) – a group of local stakeholders formed to provide input into the EA process,

- provincial ministries including the Ministries of the Environment; Transportation; Natural Resources;; Agriculture, Food and Rural Affairs; Municipal Affairs and Housing; and Citizenship, Culture and Recreation,
- federal departments including the Canadian Environmental Assessment Agency, Health Canada, and Environment Canada,
- the St. Clair Region Conservation Authority,
- the public health unit, and
- the general public.

In addition to approval under the EAA, the expansion requires approval under Ontario's *Environmental Protection Act* (EPA), *Water Resources Act* (OWRA) and the *Planning Act*. In particular the EPA governs primarily on-site technical and engineering matters, and it provides for the Certificate of Approval that will govern the construction, operation, closure, and post-closure care of the site. Applications for the Certificate of Approval for the expansion and for the Official Plan amendment and zoning By-law amendment under the *Planning Act* are also being submitted.

The EA Study Report is organized into 9 chapters as follows.

- Chapter 1 contains introductory remarks.
- Chapter 2 describes the nature of the undertaking.
- Chapter 3 identifies the preferred alternatives for four significant design aspects of the undertaking that required a decision.
- Chapter 4 describes the facility characteristics and the construction plan,
- Chapter 5 describes the "baseline" conditions in the area.
- Chapter 6 describes the impacts of the expanded landfill across a range of disciplines of study.
- Chapter 7 describes the impact management plan and includes plans for monitoring and contingencies.
- Chapter 8 describes the public consultation in the EA process.
- Chapter 9 contains concluding remarks.

Appendices include the Terms of Reference, all the Discussion Papers, consulting reports on baseline conditions and impact assessments and documentation on public communication and participation.

Alternative Methods of Carrying Out the Undertaking

Among other requirements, the ToR mandated that "alternative methods" be examined for four particular aspects of the landfill design – alternatives for: (1) the landfill footprint, (2) the transportation haul routes, (3) leachate treatment, and (4) the end use for the property. In accordance with the evaluation methodology as set out in the ToR, a preferred alternative was identified for each issue. While Chapter 3 describes the examination and recommendations the results were as follows:

1. The proposed expansion of the Warwick landfill site would consist of a footprint Located on a portion of the existing landfill site but primarily adjacent to and west of the existing landfill site (between the existing site and County Road 79.
2. The preferred haul route uses County Road 79 with the primary haul route being from Highway 402, south on County Road 79 to a proposed new site entrance off County Road 79, approximately 300m south of Zion Line.
3. Three leachate treatment alternatives were found to be essentially equivalent and equally viable in terms of environmental and human impact. The recommended alternative would involve on-site full treatment with no liquid effluent discharge to surface waters. (e.g. phytoremediation using poplar trees to evapotranspirate treated effluent) Since the poplar tree plantation requires time to become viable, other alternatives with effectively equivalent environmental performance (e.g. off-site trucking of pre-treated leachate or surface discharge of fully treated effluent) may be used as interim, medium-term or even contingency measures.
4. WM has consulted with the community and proposed a process for finalizing the end use plans closer to the time of landfill closure.

Assessment of the Undertaking

WM used specialists across the relevant disciplines of study related to the human and natural environment (e.g., noise, air, groundwater, health, social, economic etc.) to provide a comprehensive evaluation of the study area and to evaluate potential impacts to the study area arising from the undertaking. Through this evaluation process it was determined that the expansion of the Warwick landfill, with specific mitigation and impact management programs in place, will meet all regulatory standards. Further, the process showed that the net effects on public health and safety and the natural environment will not be significant after best practice design, operation and impact mitigation measures are implemented.

From a social perspective, with the full range of mitigation measures identified by the technical disciplines, many of the effects will be within existing standards and, to a large degree, minimized. The remaining social impacts on a number of residents and on the community can be addressed with a regular monitoring program, implementation of identified impact

management measures, and an open communication process between the company, residents and the Township. Such an approach will minimize the negative effects and enhance the positive effects and result in the overall impact of the project being low and manageable.

From and economic perspective, the facility construction and operation will have a significant positive economic impact in the community.

Conclusions of the Assessment

The results of the assessment identified no significant residual adverse environmental or human health effects in the study area arising from the undertaking. Mitigation and on-going monitoring will be required to ensure that any potential impacts will be minimized. Impact management measures have been designed to address the predicted, as well as any unanticipated, social, economic, natural and health related impacts of the proposed landfill expansion upon individuals, families, community facilities and the larger community. WM proposes to implement various Impact Management measures, a Property Value Protection Program and a Community Commitments Agreement to address any remaining impacts on residents and the community due to the presence of the facility.

1. INTRODUCTION

1.1 Background

Waste Management Inc., through its subsidiary Waste Management of Canada Corporation (WM), owns and operates the Warwick Landfill located in the Township of Warwick. WM needs to expand this landfill's capacity to continue to dispose of municipal, industrial, commercial and institutional solid non-hazardous waste generated in central and western Ontario.

WM seeks approval to expand the Warwick Landfill on land it owns at and adjacent to the existing site and proposes that the expanded landfill will accept up to 750,000 tonnes per year of waste, exclusive of cover material for a period of approximately 25 years. The expanded landfill will accept municipal, industrial, commercial and institutional solid non-hazardous waste generated within Ontario.

This Environmental Assessment (EA) has been completed in compliance with the requirements of a "Terms of Reference" (ToR) document approved by the Ontario Minister of Environment. The ToR prescribes the mandatory components of an EA for this specific project. In approving the ToR, the Minister set out the requirements necessary for the proposal to meet the public interest as expressed in the *Environmental Assessment Act* (EAA).

This EA submission documents an extensive process of research, design, consultation, analysis and review supporting the proposal to expand the Warwick Landfill. This EA meets the purpose, intent and approval standard of the EAA because it:

- Satisfies the prescriptive requirements of the ToR and
- Demonstrates no significant residual environmental impacts of the undertaking.

This undertaking meets the purpose of the EAA providing for the betterment of the people of Ontario, including the protection and conservation of the environment, through the proposed design and operation of an environmentally responsible and secure waste disposal facility.

A "Table of Concordance," included in Section 1.4, shows where to find each requirement of the ToR in this report.

1.2 The Proponent

WM is Canada's leading environmental services provider. It offers advanced residential, industrial, commercial and institutional waste collection, recycling and disposal services throughout the country. The company employs over 3,300 people in Canada at 116 locations in eight provinces. WM serves 4.5 million residential customers and 170,000 industrial, commercial and institutional customers.

WM is a subsidiary of Waste Management, Inc., headquartered in Houston, Texas. Together, Waste Management Inc.'s over 51,000 employees serve nearly 21 million municipal, commercial and industrial customers throughout Canada, the United States and Puerto Rico.

Since 1996, WM has increased its market position in Ontario through business growth and through consolidation of a number of waste management companies. It is an efficient, integrated waste management solutions company which provides both public and private sector customers with collection, processing, transportation and disposal services. In Ontario, the company operates many collection fleets, 20 transfer stations, eight material recovery facilities and five active landfills **(Exhibit 1-1)**. WM also operates a number of waste management facilities under contract for public sector clients.

WM is committed to providing cost effective, environmentally responsible, and sustainable non-hazardous solid waste management solutions for its Ontario customers.

WM places a priority on maintaining the health, safety and environmental security of its employees, its facilities and the communities in which it operates. WM has a highly sophisticated internal Environmental Management Program. The program requires significant reporting directly to the senior executive level of the company and ensures routine audits of facilities. In particular, the program:

- Provides technical leadership to facility managers to improve the efficiency and environmental safety of its operations;
- Ensures compliance with environmental regulations and standards;
- Requires development and management of monitoring systems for groundwater, surface water, air quality and landfill gas management, as appropriate, at its facilities; and
- Confirms the adequacy of financial reserves for managing its landfill closure and post-closure responsibilities.

WM is a major player in recycling and waste diversion activities. While WM's public and private sector customers are ultimately responsible for recycling and diversion, WM often provides the necessary capital, technical knowledge and human resources to implement these initiatives. An example of WM's waste diversion innovation was that, in 2001, WM became the first major company to focus on "single-stream" residential recycling. This can greatly increase recycling rates by allowing customers to mix recyclable paper fibre, plastic, plastic, aluminium, steel and glass.

In the local communities where WM operates, the firm supports the local waste diversion, recycling and disposal needs through a formal "Community Commitment Agreement" and as part of this agreement, the firm works to increase public awareness with its community neighbours to enhance the diversion of their wastes from landfill.

1.3 Rationale

The ToR, as approved by the Minister, did not require the EA to provide a statement of the rationale, or the "need" for the undertaking and the approval of the EA is not conditional upon WM's establishing the "need" for the undertaking. Nonetheless, as additional background information this section describes the WM's rationale for the undertaking.

The rationale for a private sector undertaking is necessarily different from that for a public agency or government. In particular, private sector companies have inherent constraints:

- Private sector companies have a principal field of business and it is not reasonable to expect them to pursue an undertaking that is beyond their business ambit;
- Private sector companies have a responsibility to make a reasonable rate of return for their owners; and
- Private sector companies do not have powers comparable to those of governments (such as powers of expropriation for land acquisition).

During the preparation of the ToR, WM reviewed its options for meeting the required disposal capacity, both in terms of its business case and in terms of its environmental suitability. Based on an environmental screening process for several options, WM identified expansion at the Warwick landfill as its preferred option.

Taking the above issues into account, the rationale for this proposal is:

- Ontario needs more waste disposal capacity, even if ambitious waste recycling and diversion targets are met (section 1.3.1);
- Among disposal options, landfill is the best choice (section 1.3.2);
- Ontarians believe there is a waste disposal crisis and want a "made in Ontario" solution (section 1.3.3);
- WM manages a large waste stream for disposal but will run out of landfill space in under 5 years (section 1.3.4); and to service the landfill needs of its Ontario customers and to avoid more waste export WM needs to expand landfill capacity (section 1.3.4);

and these issues are explored below.

1.3.1 The Need for Waste Disposal Capacity in Ontario

This section describes the current demand conditions for waste management in Ontario, building upon the information provided in the ToR.

Ontario currently exports a significant amount of waste for landfilling. –The Ontario Waste Management Association states that Ontario is currently exporting 3.5 million tonnes of waste to Michigan annually.

Ontario is growing. Population projections prepared by the Ontario Ministry of Finance indicate that the Provincial population will grow from 12.2 million at the beginning of 2003 to 15.6 million by the end of 2028, with the most significant growth occurring in southern Ontario. Estimates prepared for WM demonstrate that population and employment growth in Ontario will result in a substantial increase in the generation of non-hazardous waste.

Waste diversion (recycling, composting, reuse) will increase. The June 2004 Ministry of the Environment discussion paper, "Ontario's 60% Waste Diversion Goal, A Discussion Paper" sets an ambitious goal of diverting 60% of Ontario's solid waste from disposal by the end of 2008. As a result, it is anticipated that, between 2004 and 2009, a lower percentage of the generated waste will flow to disposal.

Waste requiring disposal will still increase despite increased diversion. According to an Ontario Waste Management Association study – the Kelleher report, although a significant portion of the generated waste will be diverted from disposal it is still estimated that annual volumes of waste requiring disposal will rise from 12.3 million tonnes in 2004 to 13.0 million tonnes in 2009 due to economic and population growth.

Waste export will still be required unless Ontario disposal capacity increases. At the current 25% rate of waste diversion, that number will increase to nearly 5 million tonnes in 2010. At 40% waste diversion, Ontario will be sending more than 3 million tonnes of waste to Michigan until 2016, and more in subsequent years. Even at 60% diversion, Ontario will still be sending about 1.5 million tonnes of waste to Michigan". [1]

If the U.S. borders were to close to waste import, Ontario would need to find alternatives for its waste disposal and the province would face a waste crisis.

1.3.2 Landfill is the Best Choice Among Disposal Options

Landfilling is the preferred option – it is a feasible solution for increased disposal capacity. Landfilling involves the disposal of solid waste on land in controlled conditions by placing the waste in layers, compacting it and then covering the wastes with soil. Landfilling requires controlling the production and emission of leachate into the ground and surface water, and the emission of gases to the atmosphere, as well as the mitigation of other environmental effects. Landfilling can potentially impact the natural and social environment, however, provincial regulations, and in particular, Ontario Regulation 232/98 strictly regulates the design of landfills to ensure that there is containment of leachate and the protection of water resources. As a disposal option landfill is approvable, technically feasible, and commercially viable in today's waste market.

1. *Nigel Guilford, President of the Ontario Waste Management Association. Ontario Facing a Looming Crisis in Managing Waste, May 2005.*

Other options reviewed, but not identified as the preferred option, were:

- Increased waste diversion/recycling,
- Incineration, and
- Export.

Waste diversion will not make up for the lack of disposal capacity. Waste diversion systems can be managed in an environmentally responsible manner with negligible or no impacts to land, water, or air and minimal nuisance impacts to others. However, the projections show that, even achieving ambitious waste diversion targets will not be enough to reduce the need for residual waste disposal. If increased waste reduction and diversion is not combined with a waste disposal option, it may result in significant unmitigatable negative economic consequences for Ontario.

Incineration, the controlled combustion of solid wastes, is another option to address the need for waste disposal capacity. The combustion produces heat, gases, and ash. Incineration reduces the volume of material requiring landfill. Incineration requires measures to limit air pollution and requires controlled disposal of ash as well as the mitigation of other environmental effects. While this method of waste disposal can be engineered to meet regulatory standards, the cost to the consumer is substantially higher than other approaches. These facilities also require massive capital investment, and a guaranteed steady stream of consistent combustible material for facility viability. The public has significant concerns about air quality and residual wastes of combustion. The combination of all of these factors make incineration a lesser option compared to landfill.

Waste export to the U.S. carries significant risks. There has been a great deal of public and political resistance in receiving communities to dispose of Ontario's waste and there is a large effort underway to ban the practice. Opponents cite environmental impacts, presence of locally banned materials, health risks, security concerns, traffic congestion, and border crossing slow-downs to encourage law-makers to close the borders to the shipment of waste and state law-makers have been receptive and supportive. Furthermore, recent regulatory changes in the United States will likely result in significant increases to tipping fees and/or government import taxes and duties.

Exporting waste outside of the country produces environmental impacts in Ontario in terms of traffic, air quality and noise, etc. primarily related to the large volume of trucks transporting wastes. In the receiving jurisdiction, the impacts will depend on the ultimate disposal technique, local environmental conditions, and the regulatory regime in the receiving jurisdiction.

Therefore, an increase in Ontario-based landfill capacity is WM's preferred option to address future waste disposal requirements. The reasons for selecting this option are primarily due to the current landfill requirements of WM's Ontario customers; and that this option has relatively low potential effects on the environment – effects that can be minimized through standard mitigation measures.

1.3.3 Made in Ontario Solutions

A public opinion research study conducted by IPSOS for the Ontario Waste Management Association revealed that 80% of Ontarians believe the province is in a waste management crisis and a large majority of Ontarians want a "made in Ontario" solution that includes both enhanced recycling and increased disposal.

Political leaders in Ontario at all government levels are essentially uniform in their agreement that Ontario's waste disposal should be managed in the province.

1.3.4 WM's Landfill Capacity and Business Needs

WM is the largest private sector collector and processor of recyclable and waste materials in Ontario. WM currently owns and/or operates material recovery facilities and landfill sites in Ontario and is committed to the ongoing development of both its waste diversion and disposal business.

WM is a leading material recycling, waste disposal and waste export firm. WM requires approxsimately 2.7 million tonnes of disposal space annually to meet customer obligations.

In 1998, at the start of the Warwick Landfill expansion EA process, WM had approximately 10 million tonnes of landfill capacity. Currently, WM has 4.5 million tonnes of approved disposal capacity in Ontario and is subject to a maximum annual fill rate of just over 1 million tonnes. In less than 5 years, without any expansion, WM will have zero landfill capacity in Ontario.

Exhibit 1-1. WM Inventory of Ontario Landfill Capacity (July 2005)

	Estimated Remaining Site Life (Years)	Permitted Waste	Waste Service Area	Remaining Permitted (Tonnes)	Permitted Annual Fill Rate (Tonnes)
Richmond LF Napanee, ON	1.1	IC&I, MSW	Ontario	130,400	125,000
Ottawa LF Ottawa, ON	2.9	IC&I, MSW	Ontario	1,363,900	470,300
Warwick LF Warwick, ON	5.75	IC&I, MSW	Southwestern Ontario	316,500	56,000
Petrolia LF Petrolia, ON	6.9	IC&I, MSW	Ontario	2,683,000	365,000
Blenheim LF Blenheim, ON	0.6	IC&I, MSW	Southwestern Ontario	24,000	40,000
Total				**4,517,800**	**1,056,300**

WM's landfills in Ontario are licensed to receive just over 1 million tonnes per year – just 39% of its need. The other 61% of WM's customers' waste requiring disposal is sent to third party landfills in the U.S. and elsewhere in Ontario.

Without any expansion, WM's 4.5 million tonnes of approved disposal capacity in Ontario will be filled in less than seven (7) years, and the Warwick Landfill's capacity will be exhausted in just over five years. The situation is worse if the requirements for landfill capacity to serve WM's Ontario customers increases in the next 5 years. In short, WM will soon have no Ontario landfill capacity (one of its core business activities) to satisfy its customers' requirements.

WM is pursuing opportunities to obtain approval for sufficient annual disposal capacity in Ontario to meet their current level of waste requiring disposal in their system.

1.4 Terms of Reference

On June 16, 1999, the Minister of the Environment designated that the proposed Warwick Landfill Expansion be an undertaking subject to the requirements of the *Environmental Assessment Act* (EAA), pursuant to O. Reg. 367/99. This initiated WM's Environmental Assessment (EA) process and the first step for the company was to prepare and submit a Terms of Reference document (ToR) to the Ministry of Environment (MOE) for the Minister's review and approval.

WM submitted the ToR, on August 18, 1999. The ToR documents the process and work plan that WM proposed to follow in completing the EA and governs the preparation of the final EA document for the undertaking.

The Ministry of the Environment's, "An Introduction to Environmental Assessments in Ontario" (June 2000) describes a ToR as follows:

> *"[…] the ToR sets out a framework that will guide and focus the preparation of an EA. Approval of the ToR is the first statutory decision by the Minister in the EA planning and approval process.*
>
> *[…] the ToR includes a work plan for the preparation of the EA, and must describe the public and agency consultation undertaken during the preparation of the ToR. It must also describe the kinds of public/agency consultation that will take place during the preparation of the EA.*
>
> *The proposed ToR is submitted to the ministry for public and government agency comment and review. The proponent also submits background information and supporting material setting out the justification for any proposal to dispense with the consideration of alternatives to the undertaking, or alternative means of proceeding. This enables interested parties to understand the basis of the proposal submitted for the Minister's consideration. It should be noted that the ToR sets out, at a minimum, what the proponent will do in the preparation of an EA. The proponent may undertake to do more, but cannot do less than is agreed to in the approved ToR. Once it has been approved by the Minister, the proponent may prepare the EA. […]"*

The Minister approved the Terms of Reference on January 11, 2000 (**Appendix A** – submitted under the name "Canadian Waste Systems," WM's previous corporate name).

Section 6.4 of the *Environmental Assessment Act* states that the approval by the Minister confirms that the Minister "is satisfied that an environmental assessment prepared in accordance with the approved terms of reference will be consistent with the purpose of this Act and in the public interest."

Section 6.1(1) requires the proponent to prepare the EA in accordance with the Terms of Reference.

The Terms of Reference, as approved by the Minister did not require WM to establish "need" or to address the "rationale" for the undertaking. Further, the approval by the Minister also eliminated the requirement to examine alternatives other than those set out in the Terms of Reference. In addition, the approval of the Terms of Reference means that WM is not required to examine alternative fill rates, capacities or lifespan of the proposed landfill.

Consequently, this Environmental Assessment has been prepared in accordance with the requirements of the Terms of Reference. The following table (**Exhibit 1-2**) shows how the requirements of the Terms of Reference are addressed in this EA document.

Exhibit 1-2. Table of Concordance

Terms of Reference or EA Act Requirement	Section of this EA Report
A description of the purpose of the undertaking	Chapter 2 – Section 2.2
A further definition and description of the undertaking	Chapter 2 – Section 2.1
An assessment of the alternative methods of carrying out the undertaking	Chapter 3
A description of the environment potentially affected by the undertaking and the alternatives	Chapter 5
A description of the effects that will be caused or that might reasonably be expected to be caused to the environment by the undertaking and the alternatives	Chapters 3 & 6
A description of mitigation measures that are necessary to prevent, or reduce significant adverse effects on the environment	Chapter 6
An evaluation of the advantages and disadvantages to the environment as a result of the undertaking and the alternatives	Chapter 6
A report on the consultation undertaken by WM in carrying out and preparing the environmental assessment	Chapter 8

1.5 Overview of the EA Process

The purpose of the Environmental Assessment Act is set out in Section 2 of the Act, "The purpose of this Act is the betterment of the people of the whole or any part of Ontario by providing for the protection, conservation and wise management in Ontario of the environment."

The Act takes a broad view of "the environment", which is defined as:

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 of combination of the foregoing and the interrelationships between any two or more of them,

in or of Ontario."

The Environmental Assessment documents the planning, consultation and decision-making process conducted for the purpose of compliance with the EAA. The ToR defines the process that must be used to develop the EA.

WM's EA process started with very general matters such as alternative concepts for the landfill, and progressed to more specific issues such as the possible environmental impacts of the site, and how they should be prevented or managed.

The ToR specified approximately sixty-one "criteria" covering all aspects of the environment (as described in the Act). They were used each time a decision was made.

The Township of Warwick established a Peer Review Team (PRT) early in the process to review, evaluate and comment on the technical work. Comments from the PRT, interested agencies, and the public, influenced the decisions made in the EA process.

This EA documents the decisions that were made about the project so that others may now read and understand the process. The decisions include which alternatives design elements are preferred, and which design changes and/or mitigation measures WM will use to eliminate or minimize impacts to the environment.

1.6 Supporting Documents

1.6.1 Discussion Papers

The ToR laid out a 13-step process for the completion of the EA. These steps required the preparation of Discussion Papers (DPs) #1 to #9. These DPs documented the technical analysis carried out as part of the EA process, and the DPs include two background reports in each of 13 technical disciplines and one background report in one further technical discipline **(listed in Exhibit 1-4)**. The Discussion Papers are as follows:

DP #1: Proposed Public Consultation Program – a description of the opportunities for consultation with stakeholder groups.

DP#2: Proposed Criteria and Indicators for the Assessment of Alternatives – the alternatives, and the proposed criteria and indicators to be used to evaluate them.

DP#3: Preferred Alternatives – results of the evaluation - preferred alternatives.

DP#4: Impact Assessment Process – the proposed impact assessment criteria, disciplines, study areas, and study methods.

DP#5: Baseline Conditions – the current environmental conditions (with the existing landfill operating, but without the expansion of the landfill), and baseline conditions anticipated during the next 25 years (again, without the expansion, but with the assumption that the existing landfill is closed).

DP#6: Facility Characteristics Assumptions – description of the proposed landfill facility, based on the preferred alternatives.

DP#7: Impact Assessment – summary of impacts, mitigation, and net effects, by discipline.

DP#8: Conceptual Design and Operations Plan – summary of the "D&O" plan, building on landfill facility characteristic assumptions and incorporating mitigation.

DP#9: Impact Management Plan – management plan for net effects after mitigation, including an outline of the Community Commitments Agreement (CCA).

Exhibit 1-3, the Environmental Assessment Planning Process, illustrates the steps involved to complete the EA and their relationship to the various discussion papers. **Appendix B** is a compilation of these discussion papers.

These discussion papers were widely distributed to the public, interested agencies and the Township of Warwick's PRT. As a result of input on draft DPs, WM conducted additional analysis which is reflected in the final versions of the DPs and in this EA document. More information on this Discussion Paper process is in Chapter 8, which outlines the consultation process.

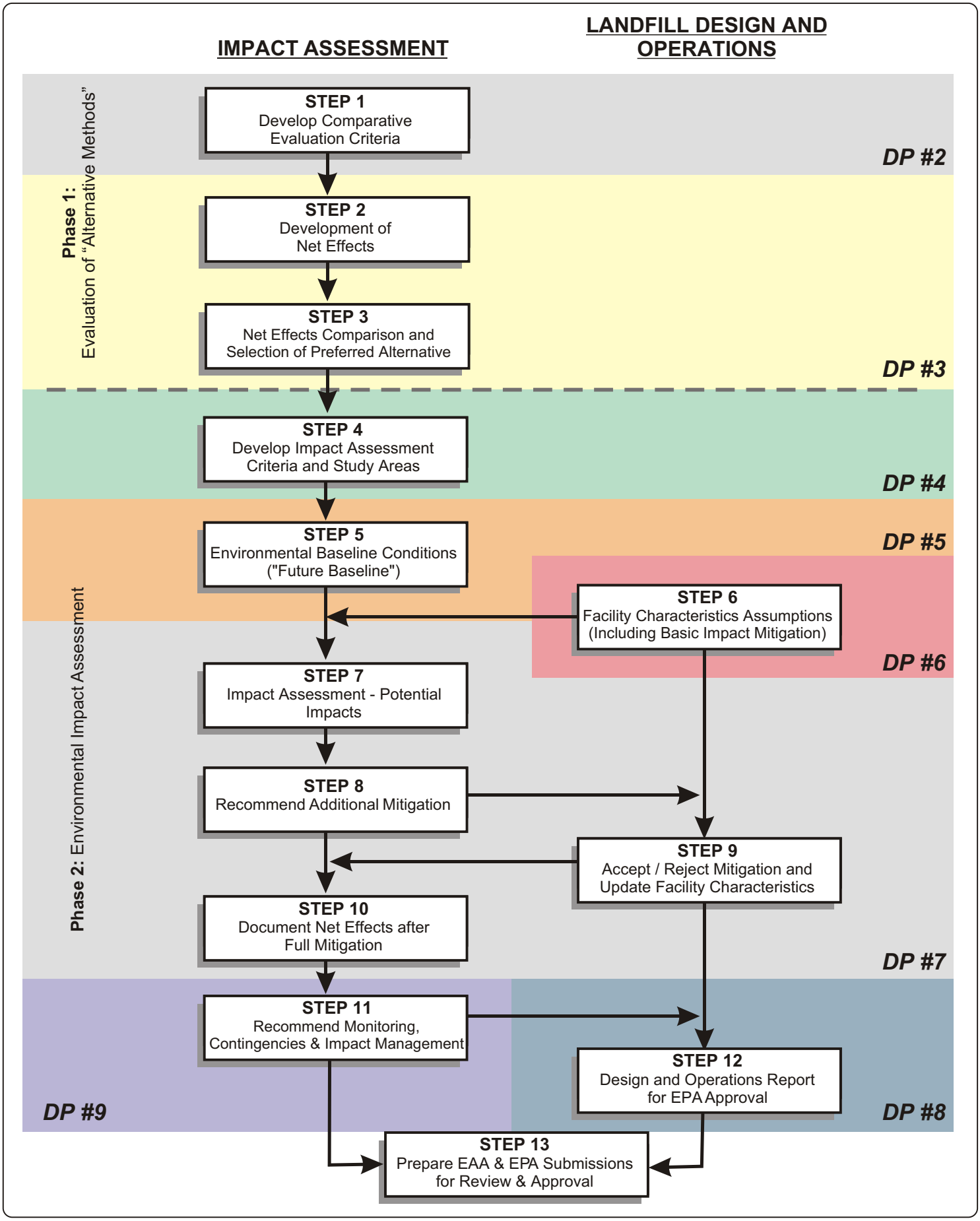


Exhibit 1-3

Waste Management of Canada Corp.

Environmental Planning Process

WARWICK LANDFILL
TOWNSHIP OF WARWICK, ONTARIO

WASTE MANAGEMENT

1.6.2 Technical Background Reports

WM commissioned two technical background reports from each of a number of disciplines, listed in **Exhibit 1-4** below. The first report was a Baseline Conditions report while the second was an Impact Assessment report. The reports are included as **Appendix C** (Baseline Conditions) and **Appendix D** (Impact Assessment), organized by the following disciplines:

Exhibit 1-4. Consultants and Their Disciplines

Agricultural	Stantec Consulting Limited
Air Quality	RWDI
Archaeology	Archaeological Services Inc.
Built Heritage and Cultural Landscape	Archaeological Services Inc.
Diversion Impacts	Environmental Strategies Limited
Economic	urbanMetrics Inc.
Human Health Risk Assessment	Cantox Environmental (Impact Assessment only)
Hydrogeology	Jagger Hims Limited
Land Use	Weston Consulting
Natural Environment	Gartner Lee Limited
Noise	Aercoustics Engineering Ltd.
Social	IER Planning Research and Management Services
Transportation	Cansult Ltd.
Visual	Baker Turner Inc.

These consultants' background technical reports were integral to the writing of the discussion papers and the design decisions through the EA process.

2. THE UNDERTAKING

2.1 Overview

This chapter provides the purpose and the description of the Undertaking.

2.2 The Undertaking

As indicated in the approved ToR, the undertaking is to expand the Warwick landfill to accept up to 750,000 tonnes per year of waste, exclusive of the landfill cover material. WM is applying to accept municipal, industrial, commercial and institutional solid non-hazardous waste, including non-hazardous contaminated soil generated within Ontario at the expanded Warwick Landfill site.

2.3 Purpose

The purpose of this undertaking, as stated in the Terms of Reference, is to "provide additional annual waste disposal capacity of up to 750,000 tonnes in Ontario at a site west of the Greater Toronto Area".

2.4 Details of the Undertaking

2.4.1 Service Area

The proposed site service area is the Province of Ontario.

2.4.2 Waste Type, Waste Receiving Hours and Waste Volume

Residential and IC&I Waste

The best estimates of the type of waste to be received at the site initially are as follows:

- Residential waste - 40 to 50 percent of total waste;
- Industrial, commercial and institutional (IC&I) waste - 50 to 60 percent of total waste; and

Up to 750,000 tonnes/year of residential and IC&I waste.

The waste received at the site is anticipated to be generated primarily from central and western Ontario.

The design of the facility has contemplated that the amount of residential waste may increase in the future, and that the residential component could increase to 70 percent of the waste, with the IC&I component reduced to 30 percent of the total waste stream.

Contaminated Soil

Non-hazardous soil from waste cleanups consisting mainly of soil contaminated with hydrocarbons and heavy metals, or material from waste processes, but in conformance with Schedule 4, Regulation 347, as amended by O. Reg. 326/03, is anticipated to be received at the site, and may be used as daily cover material, where appropriate. Soils less than 1/10 Toxicity Characteristic Leaching Procedure (TCLP) values (Schedule 4, Regulation 347 amended to Ontario Regulation 326/03) may be used for daily cover and included in daily tonnages. Soils greater than 1/10 TCLP values will be landfilled as waste on a daily basis as received.

WM has maintained the possibility of receiving contaminated soil from local cleanups on occasion, since this is more efficient than trucking the waste out of the area. However, WM will not be actively seeking specific quantities of contaminated soil because of the recent amendment to the existing sites Certificate of Approval that allows for the monofilling of contaminated soils. This reduces the need for the importation of additional contaminated soils as part of the expansion.

Waste Receipt

Waste will be received at the site from 7:00 a.m. to 7:00 p.m., Monday to Saturday.

The average rate of waste input will be approximately 2,625 tonnes/day, based on a 5.5 day week (Saturday is not usually a full working day).

Transfer trailers - 72 @ 33 tonnes each	2,376.0 t/d
Residential Packers – 3 @ 8 tonnes each	24.0 t/d
Roll-offs - 5 @ 5 tonnes each	25.0 t/d
50 light vehicles @ 0.02 tonnes each	1.0 t/d
20 light vehicles @ 0.02 tonnes each (diversion)	0.4 t/d
15 medium and heavy vehicles @ > 5 tonnes each (diversion)	100 t/d
Approximate Total	**2,526.4 t/d**

The peak day rate for waste will be approximately 3,900 tonnes per day. "Peak day rate" means the highest rate of input to the site which could be sustained for a period from one day up to three weeks. During peak times, the following waste loads per day are anticipated:

Transfer trailers - 108 @ 33 tonnes each	3,564.0 t/d
Residential Packers – 4 @ 8 tonnes each	32.0 t/d
Roll-offs - 7 @ 5 tonnes each	35.0 t/d
75 light vehicles @ 0.02 tonnes each	1.5 t/d
60 light vehicles @ 0.02 tonnes each (diversion)	1.2 t/d
45 medium and heavy vehicles (diversion)	300 t/d
Approximate Total	**3,934 t/d**

Receipt of contaminated soil may result in an occasional traffic increase, increasing such a day's input by up to 2,000 tonnes.

Anticipated Site Life

The site is expected to have a planned life of about twenty-five (25) years based upon expected fill rates.

Site Capacity

Anticipating a site life of twenty-five (25) years and an input of domestic and IC&I waste of 750,000 tonnes/year, the site would receive approximately 19.1 million tonnes for the proposed expansion. The total landfill volume, including daily and final cover is 26.5 million m^3, but the ultimate site volume will be governed by final contours for the landfill as approved by the Certificate of Approval for the site.

The proposed expansion estimates of the waste volumes and other relevant quantities for the expansion are in **Exhibit 2-1.**

For this exhibit, the following assumptions were made:

- The gross volume includes the airspace for waste, daily cover and final cap material.
- Daily cover has been assumed to be 15 percent of waste and daily cover volume.

Exhibit 2-1. Summary of Landfill Size, Capacity and Volume

ITEM		Quantity
Landfill Size / Life	Area (ha)	73.7 ha
	Top Elevation (mASL)	279
	Site Life (yrs)	25.5
Landfill Capacity	Waste Volume (m^3)	23,908,000
	Daily Cover (m^3)	3,587,000
	Gross Volume (m^3)	26,555,100
Waste Tonnes	Waste Tonnage (t)	19,100,00
Landfill Excavation	Volume of Excavation (m^3)	8,519,400
	Berms (m^3)	407,000
	Excess Material (m^3)	2,400,000

3. ALTERNATIVE METHODS OF CARRYING OUT THE UNDERTAKING

3.1 Introduction

The approved Terms of Reference (ToR) requires that this Environmental Assessment (EA) examine alternative methods of carrying out the undertaking. Alternative methods are different ways of approaching the undertaking.

Section 3.0 of the approved ToR identified the following four aspects of landfill design that required a review of alternative methods, which had to be considered and assessed during the EA. They are:

- Landfill Footprints (described below in Section 3.3);
- Leachate Treatment (described below in Section 3.4);
- Haulage Routes and Site Access (described below in Section 3.5), and
- End Use (described below in Section 3.7).

As explained in the approved ToR, the selections from among the alternative methods would form the basis for the landfill design concept. Using the preferred alternatives, a landfill design concept would establish:

- The footprint dimensions, footprint area and footprint location;
- The top landfill elevation, bottom landfill elevation, basic landfill contours for the slopes and the volumetric capacity;
- Other fundamental design concepts including, leachate treatment, haul routes and end use.

Chapter 4 is the Facility Characteristics and Construction Plan for the undertaking. In it, WM describes the landfill design concept (incorporating the matters described above).

This chapter explains the assessment of alternative methods, and how public and agency (government agencies, etc.) input were considered in selecting "Preferred Alternatives".

3.2 Evaluation Methodology for Comparing Alternatives

The ToR established that:

> *"Alternatives will be evaluated utilizing a comparative evaluation methodology of their net environmental effects.*
>
> *In a comparative evaluation, alternatives are evaluated based on their differential impacts. Differential impacts refer to the relative difference between two or more alternatives (e.g., Option A produces more noise than Option B)."*

A standard methodological approach was used for all 4 decisions requiring the comparison of alternative methods:

WM refined the description of alternative methods.

WM established the evaluation criteria that would be used to compare the alternative methods.

Appendix A of the ToR identified the assessment criteria which would be used for the assessment of the net effects of the proposed landfill expansion.

In Discussion Paper #2 **(Appendix B),** WM took the full list of EA criteria from the ToR Appendix A, and used it to develop a short-list of criteria to be used in the specific comparison. Indicators for each of the criterion were proposed in DP#2, and later used to guide the comparison.

Comments by the Public, Agencies, and the Township of Warwick Peer Review Team on the Proposed Criteria and Indicators outlined in DP #2 were also considered while compiling the short-list of criteria and related indicators.

A public workshop was held on November 29, 2001 to help identify community preferences. The community workshop is described in Section 3.2.1, and the detailed results are found in **Appendix E**.

Each alternative was compared against the others to distinguish relative differences in impacts to the environment, taking into account possible approaches to mitigate environmental effects.

Tables were prepared to compare each of the alternatives and help identify the preferred alternatives.

The initial screening used basic factual information on potential effects (after mitigation), using the proposed indicators, to establish the differences between the alternatives.

Where there are differences, the preferred alternative(s) for each criterion was shaded on the table showing a “preference”. If there was no significant difference between the alternatives, all “equal” alternatives were shaded.

The alternatives were compared overall by:

WM adding the total number of preferences in the evaluation tables. This gave a sense of the technically preferred alternative or alternatives.

The Terms of Reference sorted the criteria into categories of criteria representing components of the environment - specifically Public Health and Safety; Natural Environment and Resources; Social and Cultural; and Economics. Where the first comparative analysis resulted in more than one preferred alternative, the alternatives were then sorted in a table that organized the criteria by category to take into consideration the order of public preference (as expressed in the workshop).

Where necessary (in the case of the leachate treatment alternatives and site access options) WM instructed its technical consultants, across all disciplines of study, to review these alternatives in further detail during the detailed impact assessment phase of the EA.

Based on the entire decision process above, WM identified the Preferred Alternative(s).

While this consistent methodological approach was used for each of the four alternative methods, the approach for each of the 4 decisions followed a particular trajectory.

The "**Landfill Footprint**" alternatives followed the standard methodology and yielded a clear preferred alternative both in terms of all criteria groups. (see Section 3-3)

The "**Leachate Treatment**" alternatives analysis followed the full extent of the standard methodology, because a clearly preferred result did not emerge from the first 6 steps of the process above. The lack of a clear result required consideration of local community's ranking of the relative importance of the categories of the many criteria (health and safety; natural environment and resources; social and cultural; and economic). However, this still did not lead to a clearly preferred result. At this point, step 7 was invoked and the alternatives were presented back to the consultants researching each of the many technical disciplines (air quality, health, noise, social, economic, etc.) and they were asked to review, in detail, the relative impacts of the alternatives for their discipline. Even after this more detailed analysis, the choice of a preferred alternative was still difficult. The final decision was made taking all factors into account with a bias towards the public's preference for which categories of criteria were perceived to be more important (see Section 3-4).

The "**Haulage Routes**" alternatives followed the standard methodology During the evaluation of alternatives, MTO advised WM that they would not approve the 2 new service road alternatives that connected with County Road 79 near the highway 402 interchange. As a result, WM concluded that the existing haul route was preferred (see section 3.5)."Site Access" options were introduced to the EA process during the detailed impact assessment phase as a result of WM acquisition of property between County Road 79 an the landfill site. These access options were prepared using only stages 7 and 8 of the standard methodology. A preferred option was clearly identified (section 3.5).

The "**End Use**" alternative evaluation became unnecessary after the first three stages of the methodology, because a local community consensus was reached that the decision on post-closure use should be deferred until much closer to the date of the closure of the expanded landfill. (see Section 3-6)

3.2.1 Public Workshop

Purpose

A public workshop was held on November 29, 2001 at Centennial Hall, Watford for all interested stakeholders. The workshop included a session on how criteria are prioritized, a presentation on the Warwick expansion site alternatives and criteria, and a small group discussion on criteria and trade-offs.

The purpose of the public workshop was to obtain input from the community on the relative ranking of the impact assessment criteria and the categories of criteria under which they are organized. The workshop participants gave their views on which criteria and categories of criteria are most important in determining how leachate would be treated and determining the main access route to the site.

This input was intended to be used to assist WM in determining the selection of preferred alternatives. Given the limited participation, WM decided to use this input in a limited specific manner. Where the comparative evaluation resulted in relatively equal alternatives, WM used the public weighting of categories of criteria to guide the choice of preferred alternative.

Notification

Notification of the workshop was made to the public by means of advertisements in local papers, distribution of flyers, follow-up phone calls, and direct notices. Interested parties were encouraged to participate and asked to register for the workshop. 21 people attended the workshop. Participants included:

- Public Liaison Committee (LAC)
- Environmental Assessment Study Group (EASG) members;
- Current and former municipal officials
- Surrounding land owners; and
- The general public.

Workshop Methodology

The workshop actively engaged participants. The participants were broken up into small groups to work through a workbook of the criteria and indicators proposed to compare alternatives. For each alternative, they were first asked to rank the categories of criteria of criteria (i.e., Public Health and Safety, Natural Environment and Resources, Social and Cultural, and Economics). Then they were asked to rank each of the individual criteria. A copy of the workbook is provided in **Appendix E**. Participants discussed the criteria and asked questions about the various technologies for leachate treatment for consideration in their analysis.

WM consultants were available to assist the participants in answering any questions. The participants ranked the relative importance of the criteria by circling High, Medium, or Low and provided any extra comments they wished.

The results of the workshop indicate a few general conclusions. The detailed results are included in **Appendix E**.

The ToR schematically illustrated these general concepts (see Figure 3 of the ToR), but noted that "*variations in height, depth, and buffer widths may be combined with these alternatives during the evaluation*" (ToR, p. 8). WM undertook to refine the dimensions of the two options, in each case working towards the target volume of 23.5 million cubic metres[2].

When looking at the four general criteria groups for the different alternatives there was a clear ranking of importance:

- Public Health and Safety
- Natural Environment/Economics
- Social and Cultural

The ranking of Health and Safety always ranked as highest importance across the project components. The ranking of Natural Environment and Economics alternated between alternative methods. They were considered of equal importance for the Landfill Footprints, but Economics was ranked higher in importance for Access Routes, and Natural Environment was ranked higher for Leachate Treatment Methods.

When looking at the Landfill Footprint Alternatives, three criteria are clearly rated high to the public participants. They are:

- Disruption to use and enjoyment of properties due to nuisance effects (Social and Cultural)
- Visual impact of the landfill (Social and Cultural)
- Property Value Impacts (Economics)

When looking at the Leachate Treatment Methods, two criteria are clearly most important to the public participants.

- Effects due to fine particulate exposure (Public Health & Safety)
- Disruption to use and enjoyment of properties due to nuisance effects (Social and Cultural)

When looking at the Haul Route Alternatives, two criteria are clearly most important to the public participants.

- Potential for traffic conflicts, including pedestrians and farm equipment (Public Health & Safety)
- Property value impacts (Economics)

2. *This target for total volume of waste and daily cover was proposed by WM at the outset of the EA process because it provided about 25 years of capacity at the maximum proposed fill rate. It has been used as a constant for both footprint options for comparison purposes.*

3.3 Landfill Footprint Area Alternatives

3.3.1 Overview of the Alternatives

The approved ToR described two general options for the landfill "footprint" (the area within the WM property where waste could be deposited):

- ***"West" Footprint Option***
  The intent of the "west" option is to use the northern portion of WM's land holdings (west of where the current landfill is located) and thus provide the greatest possible setback between the landfill and Watford to the south.
- ***"Central" Footprint Option***
  The "central" option was raised during public consultation for the ToR and is intended to balance the setback to the north and to the south by centering the landfill on the WM property.

In response to additional comments received through the public and agency consultation process during the EA, the footprint concepts have been refined to include two footprint options to the west and two footprint options centrally located. The general characteristics and location of each option are presented in **Table 3-1** and **Exhibits 3-1, 3-2, 3-3a and 3-3b**. These exhibits also provide significant elements of the data used in the comparative evaluation of these footprint options. This information is considered sufficient to distinguish the options and their potential impacts for comparative evaluation purposes.

Table 3-1. Landfill Footprint Alternatives – General Characteristics

Characteristic	West 1A	West 1B	Central 2A	Central 2B
➢ **Capacity** *(million m^3)*	23.5	23.5	23.5	23.5
➢ **Height** *(above existing grade)*	39 m	35.5 m	39 m	29 m
➢ **Buffers**	*North:* .....100 m *East:* .....100 m *South:* .....30 m *West:* .....30 m	*North:* ..... 100 m *East:* ..... 100 m *South:* ..... 100 m *West:* ..... 100 m	*North:*.....100 m *East:*.....100 m *South:*.....100 m *West:* .....100 m	*North:*.....100 m *East:* .....100 m *South:* .....100 m *West:* .....100 m
➢ **Footprint Area**	76.28 ha	78.56 ha	78.55 ha	95.98 ha

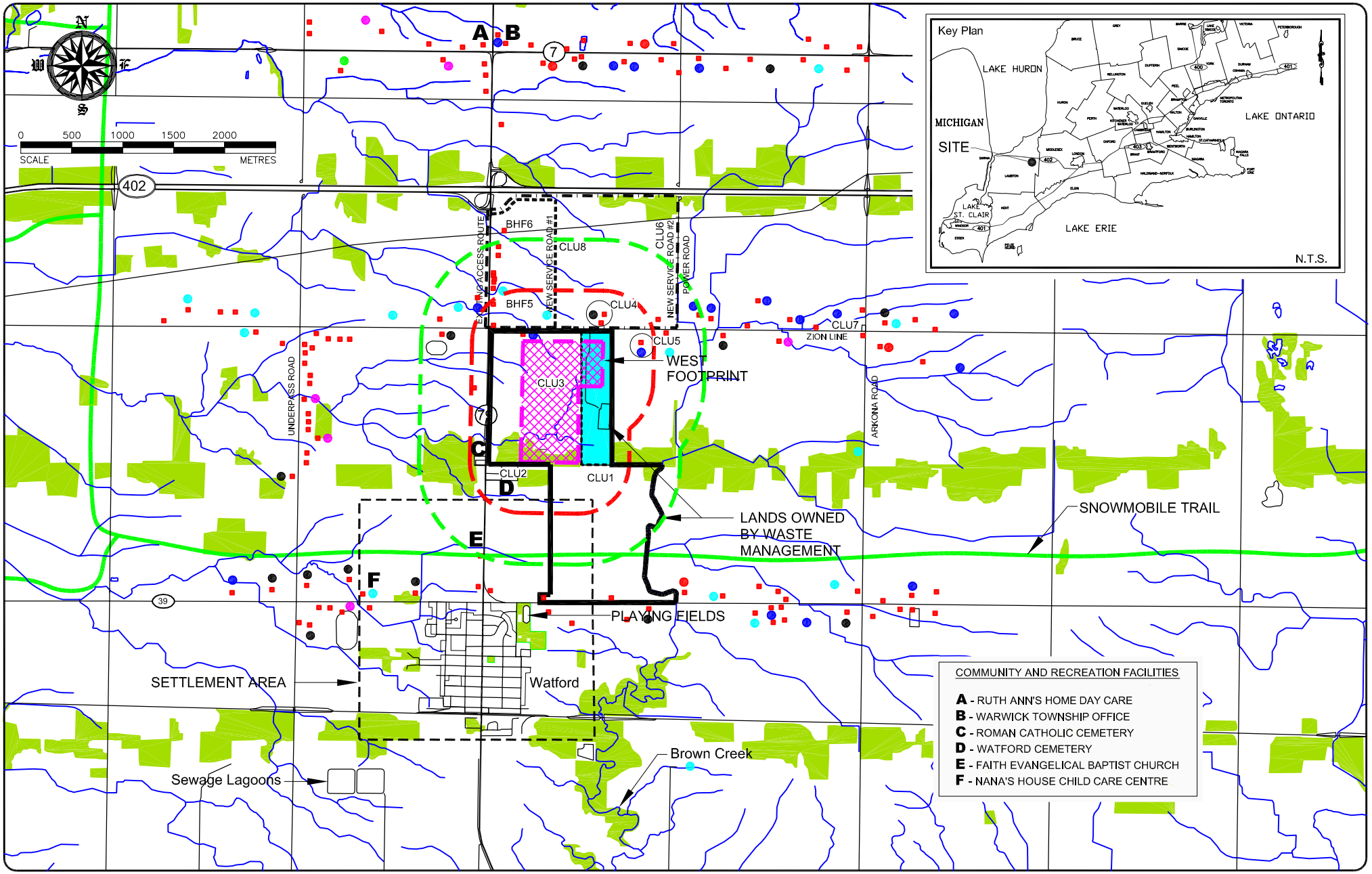


EXHIBIT 3-1

DWN BY: JEP DATE: 20/02/02
CHK BY: P.J.B. SCALE: 1: 50,000

WASTE MANAGEMENT OF CANADA CORP.

DRAWING NO. 1

WARWICK LANDFILL EXPANSION
SITE LOCATION

WEST FOOTPRINT 1A

LEGEND:

- OUTLINE OF WEST FOOTPRINT
- LIMIT OF 500m STUDY AREA
- LIMIT OF 1000m STUDY AREA
- RESIDENCE

- AGRICULTURAL – BEEF, DAIRY
- AGRICULTURAL – CASH CROP
- AGRICULTURAL – SWINE, POULTRY
- AGRICULTURAL – VEGETABLES
- AGRICULTURAL – HORSE
- AGRICULTURAL – RETIRED

CLU1 – AGRICULTURAL LANDS
CLU2 – CEMETERY
CLU3 – AGRICULTURAL LANDS
CLU4 – FARM COMPLEX
CLU5 – FARM COMPLEX
CLU6 – ROADSCAPE
CLU7 – ROADSCAPE
CLU8 – AGRICULTURAL LANDS

BHF5 – FARMHOUSE
BHF6 – FARMHOUSE

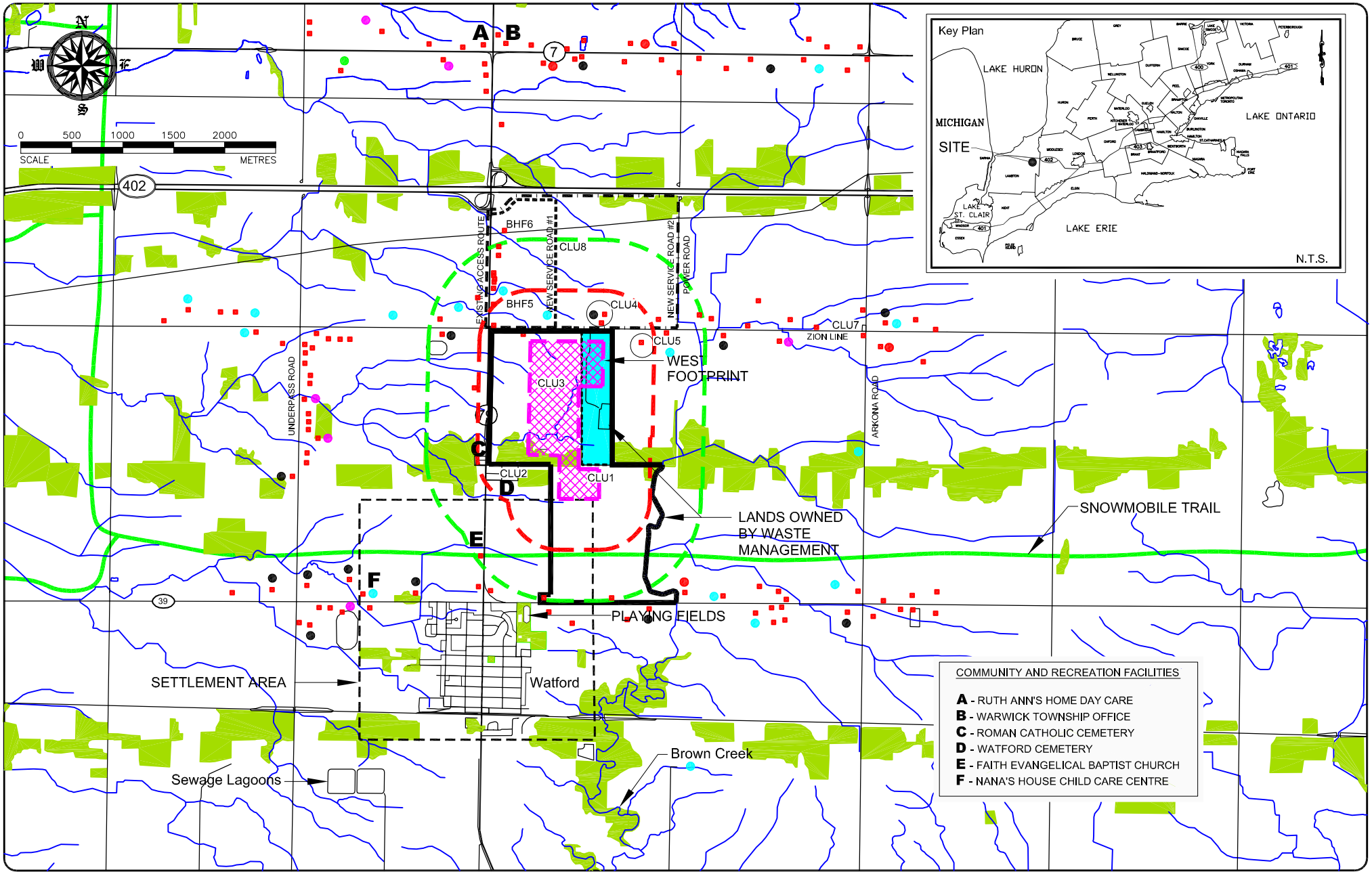


EXHIBIT 3-2

DWN BY: JEP DATE: 20/02/02
CHK BY: P.J.B. SCALE: 1: 50,000

WASTE MANAGEMENT OF CANADA CORP.

DRAWING NO. 1

WARWICK LANDFILL EXPANSION SITE LOCATION

WEST FOOTPRINT 1B

LEGEND:

- OUTLINE OF WEST FOOTPRINT
- LIMIT OF 500m STUDY AREA
- LIMIT OF 1000m STUDY AREA
- RESIDENCE

- AGRICULTURAL – BEEF, DAIRY
- AGRICULTURAL – CASH CROP
- AGRICULTURAL – SWINE, POULTRY
- AGRICULTURAL – VEGETABLES
- AGRICULTURAL – HORSE
- AGRICULTURAL – RETIRED

CLU1 – AGRICULTURAL LANDS
CLU2 – CEMETERY
CLU3 – AGRICULTURAL LANDS
CLU4 – FARM COMPLEX
CLU5 – FARM COMPLEX
CLU6 – ROADSCAPE
CLU7 – ROADSCAPE
CLU8 – AGRICULTURAL LANDS

BHF5 – FARMHOUSE
BHF6 – FARMHOUSE

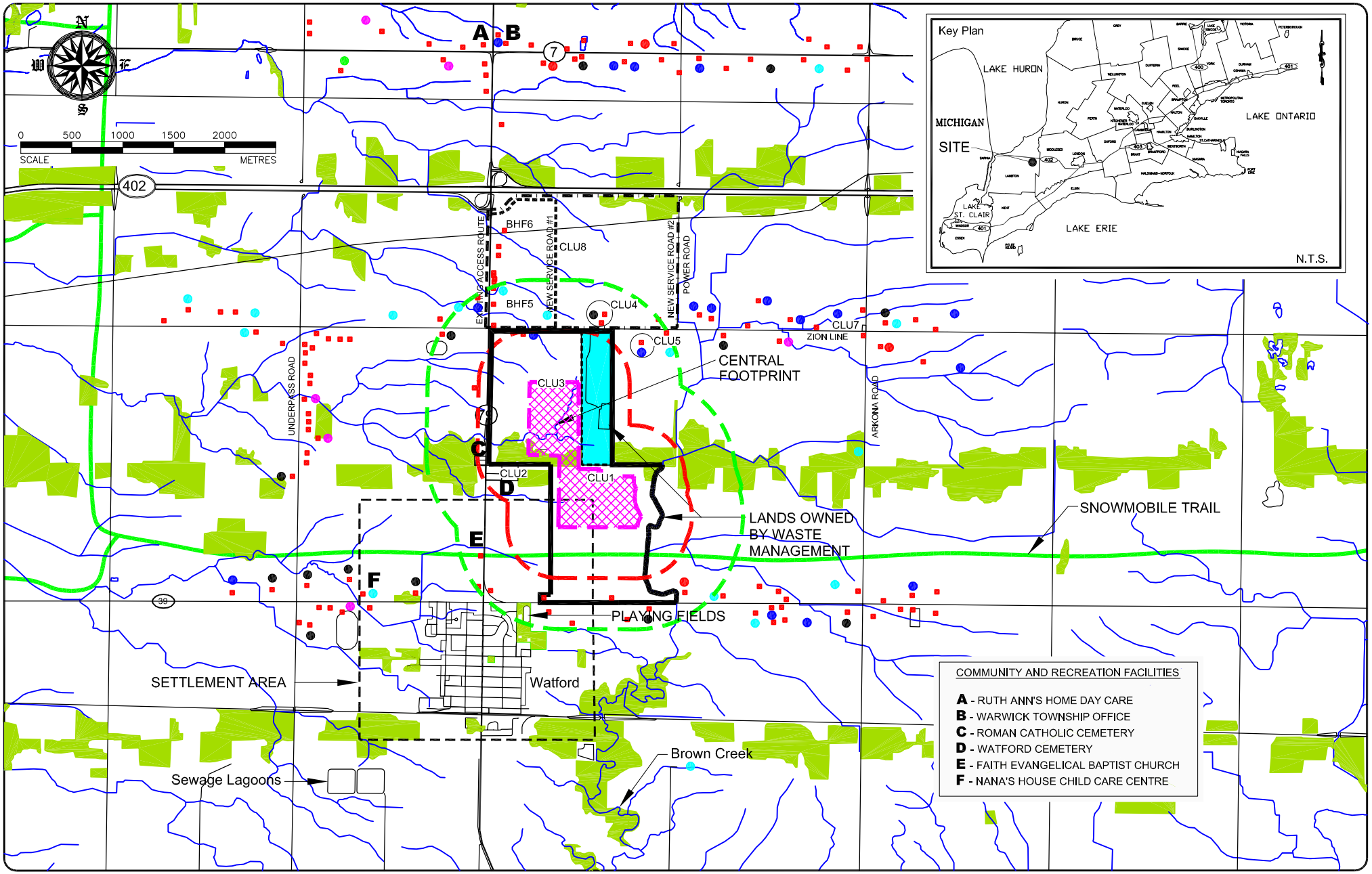


EXHIBIT **3-3a**

DWN BY: JEP DATE: 20/02/02
CHK BY: P.J.B. SCALE: 1: 50,000

WASTE MANAGEMENT OF CANADA CORP.

DRAWING NO. 1

WARWICK LANDFILL EXPANSION
SITE LOCATION

CENTRAL FOOTPRINT 2A

LEGEND:

- OUTLINE OF CENTRAL FOOTPRINT
- LIMIT OF 500m STUDY AREA
- LIMIT OF 1000m STUDY AREA
- RESIDENCE
- AGRICULTURAL – BEEF, DAIRY
- AGRICULTURAL – CASH CROP
- AGRICULTURAL – SWINE, POULTRY
- AGRICULTURAL – VEGETABLES
- AGRICULTURAL – HORSE
- AGRICULTURAL – RETIRED

CLU1 – AGRICULTURAL LANDS
CLU2 – CEMETERY
CLU3 – AGRICULTURAL LANDS
CLU4 – FARM COMPLEX
CLU5 – FARM COMPLEX
CLU6 – ROADSCAPE
CLU7 – ROADSCAPE
CLU8 – AGRICULTURAL LANDS

BHF5 – FARMHOUSE
BHF6 – FARMHOUSE

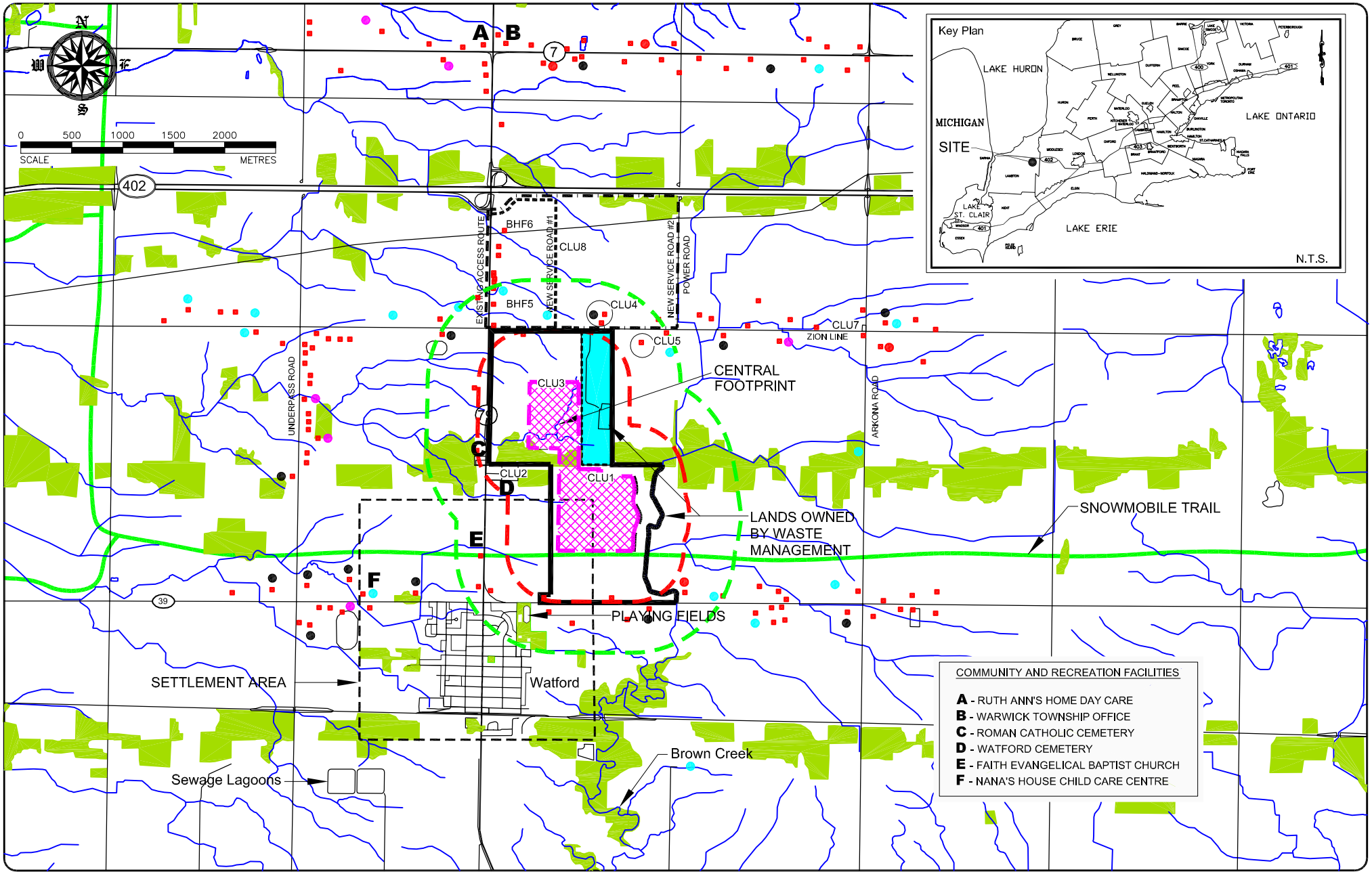


EXHIBIT 3-3b

DWN BY: JEP DATE: 20/02/02
CHK BY: P.J.B. SCALE: 1: 50,000

WASTE MANAGEMENT OF CANADA CORP.

DRAWING NO. 1

WARWICK LANDFILL EXPANSION
SITE LOCATION

CENTRAL FOOTPRINT 2B

LEGEND:

- OUTLINE OF CENTRAL FOOTPRINT
- LIMIT OF 500m STUDY AREA
- LIMIT OF 1000m STUDY AREA
- RESIDENCE

- AGRICULTURAL – BEEF, DAIRY
- AGRICULTURAL – CASH CROP
- AGRICULTURAL – SWINE, POULTRY
- AGRICULTURAL – VEGETABLES
- AGRICULTURAL – HORSE
- AGRICULTURAL – RETIRED

CLU1 – AGRICULTURAL LANDS
CLU2 – CEMETERY
CLU3 – AGRICULTURAL LANDS
CLU4 – FARM COMPLEX
CLU5 – FARM COMPLEX
CLU6 – ROADSCAPE
CLU7 – ROADSCAPE
CLU8 – AGRICULTURAL LANDS

BHF5 – FARMHOUSE
BHF6 – FARMHOUSE

3.3.2 Comparison of the Landfill Footprint Alternatives

Table 3-2 presents an overview of the comparative analysis of the four footprint options by the comparative criteria groups described earlier. The basis for the criteria group preferences presented in Table 3-2 is derived from the detailed comparison presented in DP #3 **(Appendix B)**.

Table 3-2. Comparative Evaluations of Landfill Footprints

Criteria Group	Alternatives			
	West 1A	*West 1B*	*Central 2A*	*Central 2B*
Public Health and Safety	☑	-	-	-
Natural Environment and Resources	☑	-	-	-
Social and Cultural	☑	-	-	-
Economics	☑	☑	☑	-
Overall	☑	-	-	-

Note: ☑ denotes preference

The overall ranking results indicate that West 1A is the preferred footprint. This option has the preferred ranking in all four criteria groups. No other option receives a preferred ranking in more than one criteria group.

The key reasons for a preference for the West 1A footprint are:

- the larger separation from the Watford and smaller footprint area results in lower overall impacts on residents, businesses and public facilities, and
- the footprint location reduces impacts on adjacent natural areas, in particular, West 1A does not impact Brown Creek tributary or interfere with a natural habitat corridor.

Community input indicated that Public Health and Safety, followed by Natural Environment and Economics were the most important criteria groups. Higher weighting for these criteria groups reinforces the overall preference for West 1A.

Community input further indicated that disruption to use and enjoyment of property due to nuisance effects was the most important individual criterion. While the West 1A impacts somewhat more residences in close proximity to the landfill, it impacts the fewest residences overall. The visual impact of this option, the second important criterion identified by the public, may be somewhat greater with West1A as it has the second highest of three alternative heights above grade.

The following provides a summary of the rationale for the selection of option West 1A as the preferred landfill footprint.

Public Health and Safety

- The west footprint maximizes the distance between the landfill and Watford, minimizing potential overall nuisance effects;
- West 1A has a lower number of residences within a 1,000 m zone, potentially impacted by fine particulate exposure, and has the lowest potential for this impact on residences, with least overall number of residences.
- West 1A has somewhat more residences within a 500 m zone but few are downwind from the footprint.
- West 1A has the lowest amounts of excess soil to be moved.
- West 1A is preferred based on Public Health and Safety criteria.

Natural Environment and Resources

- West 1A occupies the smallest area and displaces the least agricultural land.
- The west options have no impact on recreational resources.
- West 1A does not impact a natural habitat corridor or Brown Creek tributary.
- West 1A is preferred based on Natural Environment and Resources.

Social and Cultural

- The west footprints maximize the distance between the landfill and Watford, resulting in lower number of residences within a 1,000 m zone but somewhat more residences within the 500 m zone.
- West 1A has lowest number of residences impacted overall, disrupts fewer public facilities and the least potential to disrupt archaeological resources.
- Central 2A has lowest height above grade, followed by West 1A.
- West 1A is preferred based on Social and Cultural criteria.

Economics

- The west options impact fewer farms/businesses overall but Central 2A disrupts the fewest in close proximity.
- Property values impacts associated with business properties are similarly lowest for the west alternatives overall but lowest for those in close proximity for Central 2A.
- There is insufficient information to distinguish potential impacts between West 1A, West1B and Central 2A; all 3 options are preferred on the basis of Economics criteria.

The Preferred Landfill Footprint Option: **West 1A**

3.4 Leachate Treatment Alternatives

3.4.1 Overview of the Leachate Treatment Alternatives

The approved ToR identified seven leachate treatment methods that will be considered for the Warwick Landfill expansion. However, for the purposes of describing and evaluating these, methods (3), (4), and (5) can be grouped together, since they differ only in terms of the transportation method and/or the off-site location of the final treatment. Method (7), re-circulation of leachate is not itself a stand-alone method, but can be coupled with any of the other methods; therefore, WM has not included it specifically in the comparative evaluation of leachate treatment methods, but will re-assess it in combination with the preferred leachate treatment method following the comparative evaluation.

On-Site Treatment (no discharge)	1. The management of leachate on-site with no liquid effluent discharge to surface waters (e.g., through the use of evaporation/evapotranspiration).
On-Site Treatment (discharge)	2. Full on-site treatment with discharge of effluent to surface water.
On-Site Pre-Treatment with Off-Site Final Treatment	3. On-site pre-treatment with discharge via new forcemain to an upgraded Watford Sewage Treatment Plant. 4. On-site pre-treatment with discharge via truck haulage to an upgraded Watford Sewage Treatment Plant. 5. On-site pre-treatment with discharge via truck haulage to another sewage treatment plant (i.e., London).
Off-Site Disposal	6. Off-site disposal of raw leachate via truck haulage to the Blackwell Road Sarnia Leachate Treatment Plant.
Not a Stand-Alone Method	7. Leachate re-circulation (in combination with any other alternative(s));

A related variation to the on-site treatment method, which will also be assessed in combination with the preferred method, uses poplar trees and understorey grasses for the treatment of all or part of the leachate and/or effluent. It involves drip-irrigation of poplar trees planted on-site. In simple terms, these trees take up the irrigation through their roots and release water to the air through their leaves (a process called *evapotranspiration*)[3].

3. Further details can be found in the report "Leachate Management Plan, Warwick Landfill" prepared by Henderson Paddon Environmental Inc., March 2000.

The following describes the alternative leachate treatment methods to be evaluated.

a) Full On-Site Treatment without Effluent Discharge

The management of leachate on-site with no liquid effluent discharge to surface waters is shown conceptually in **Exhibit 3-5**. Different treatment processes and equipment are available from several companies who specialize in this technology, but in simple terms there are three basic methods for treating the leachate that is collected:

- it is combusted (burned), leaving an ash residue,
- it is heated to evaporate off the water leaving a concentrated sludge, or
- the treated leachate is applied to poplar trees and understorey grasses by drip irrigation.

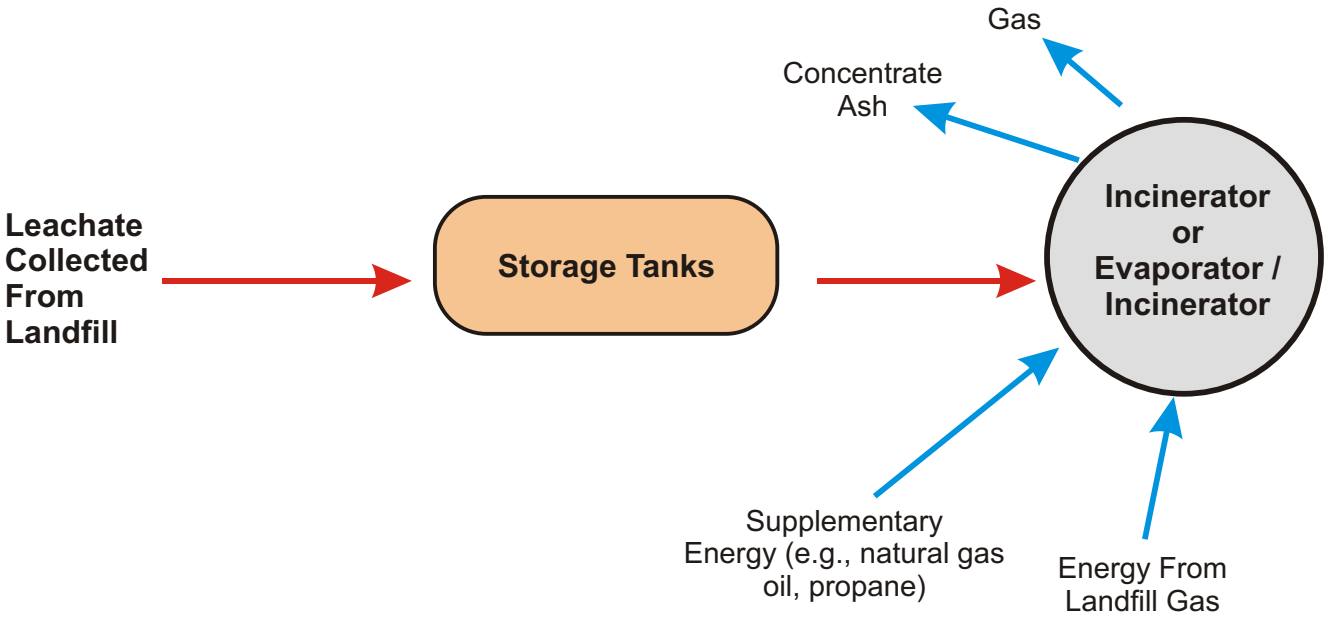
The ash or sludge could be landfilled on-site[4] (while the site is still open) or disposed of at another appropriate disposal site. The only significant inputs to the system would be energy, primarily in the form of landfill gas.

b) Full On-Site Treatment with Surface Water Effluent Discharge

This alternative is also illustrated conceptually in **Exhibit 3-5**. Leachate is collected and stored before being processed through a treatment unit. Chemicals are used in the treatment process, and energy is used to run any combination of biological (aerobic/anaerobic), filtration, evaporation/distillation, or chemical treatment processes. These processes result in treated liquid effluent that is retained in a storage lagoon and eventually discharged to a surface watercourse following testing. The surface watercourse may be the Bear or Brown Creek tributaries nearest the site, or the discharge could be done further downstream where the stream flow would provide more mixing (dilution). On-site full treatment would also result in a sludge/concentrate that may be solidified and landfilled on-site, or it may be removed from the site to an appropriate disposal or treatment facility.

4. Sludge would be solidified before landfilling.

A) Full On-Site Treatment with No Effluent Discharge



B) Full On-Site Treatment with Surface Water Effluent Discharge

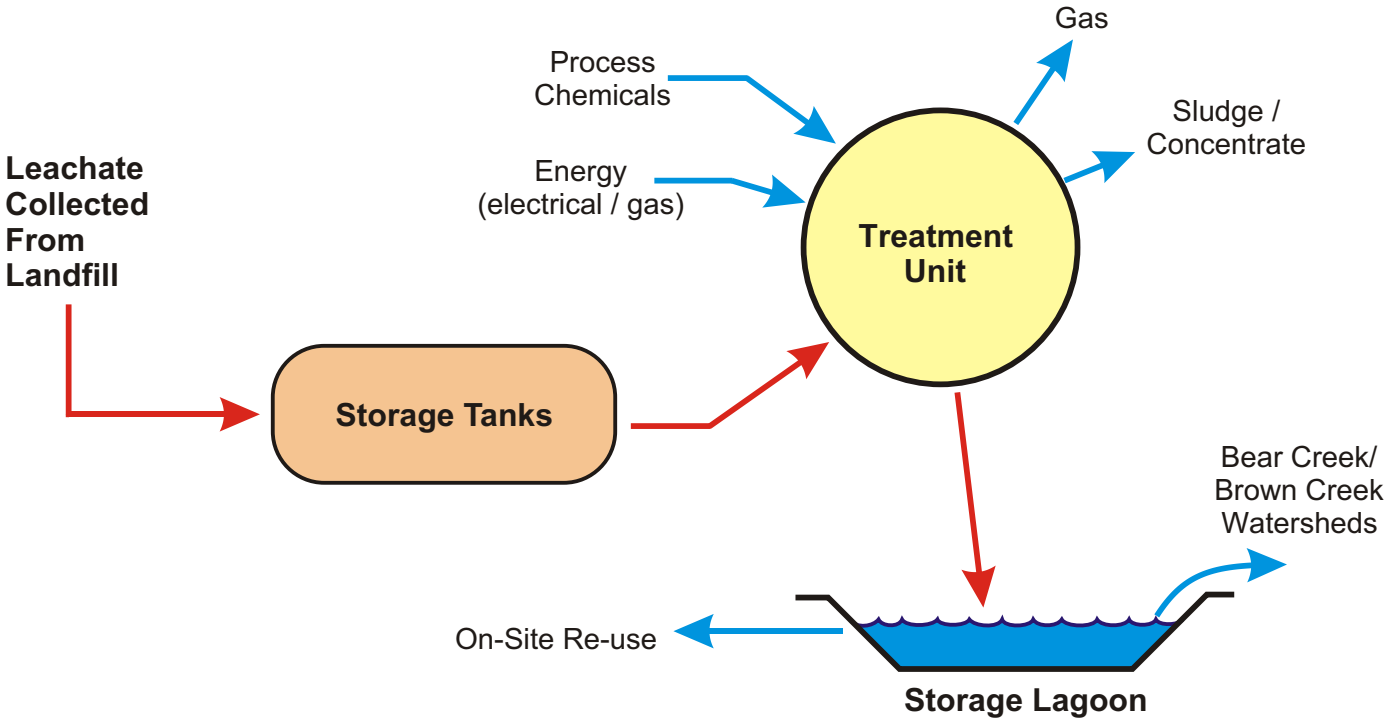


EXHIBIT 3-5

DWN BY: M.J.S DATE: Dec. 21, 1998

WASTE MANAGEMENT OF CANADA CORP.

DRAWING FILE: 97393.65\2005\Work In Progress\Documents\Draft EA Documents\EA Ch 03\97393-65-EX3-5.cdr

ALTERNATIVE METHODS
FOR LEACHATE TREATMENT

WARWICK LANDFILL
TOWNSHIP OF WARWICK, ONTARIO

WM WASTE MANAGEMENT

c) On-Site Pre-Treatment with Off-Site Final Treatment

Exhibit 3-6 conceptually illustrates the third group of alternatives, on-site pre-treatment with the effluent conveyed off-site for final treatment and discharge. Leachate is collected and pre-treated through a process that is similar to the full on-site treatment processes discussed above. A truck or pipeline then transfers the pre-treated effluent to a sewage treatment plant. This may be the Watford Sewage Treatment Plant (upgraded as necessary to accommodate the additional flow and quality of the leachate), or some other local municipal plant such as the London Sewage Treatment Plant. The exact location of the final treatment and disposal was not decided for this assessment. It was assumed that an established and suitably licensed plant would be used and that the haulage trucks would share the main landfill haul route to and from Highway 402. The exception is the Watford Plant, since it could be accessed either by a pipeline, which could have impacts associated with its construction and maintenance, or by tank trucks which would follow a route from the landfill to the plant that is different from the main haul route.

d) Full Off-Site Treatment

This alternative, full off-site treatment and effluent discharge, involves the collection and trucking of leachate directly to the Blackwell Road Sarnia Leachate Treatment Plant without any pre-treatment at the landfill site. **Exhibit 3-6** also illustrates this approach.

3.4.2 Comparison of the Leachate Treatment Alternatives

The six methods included in the comparative evaluation can be broken down into two distinct groups:

No Trucking of Leachate Required

Methods that provide ultimate treatment on-site, or partial treatment on-site with transport via force-main for ultimate treatment off-site

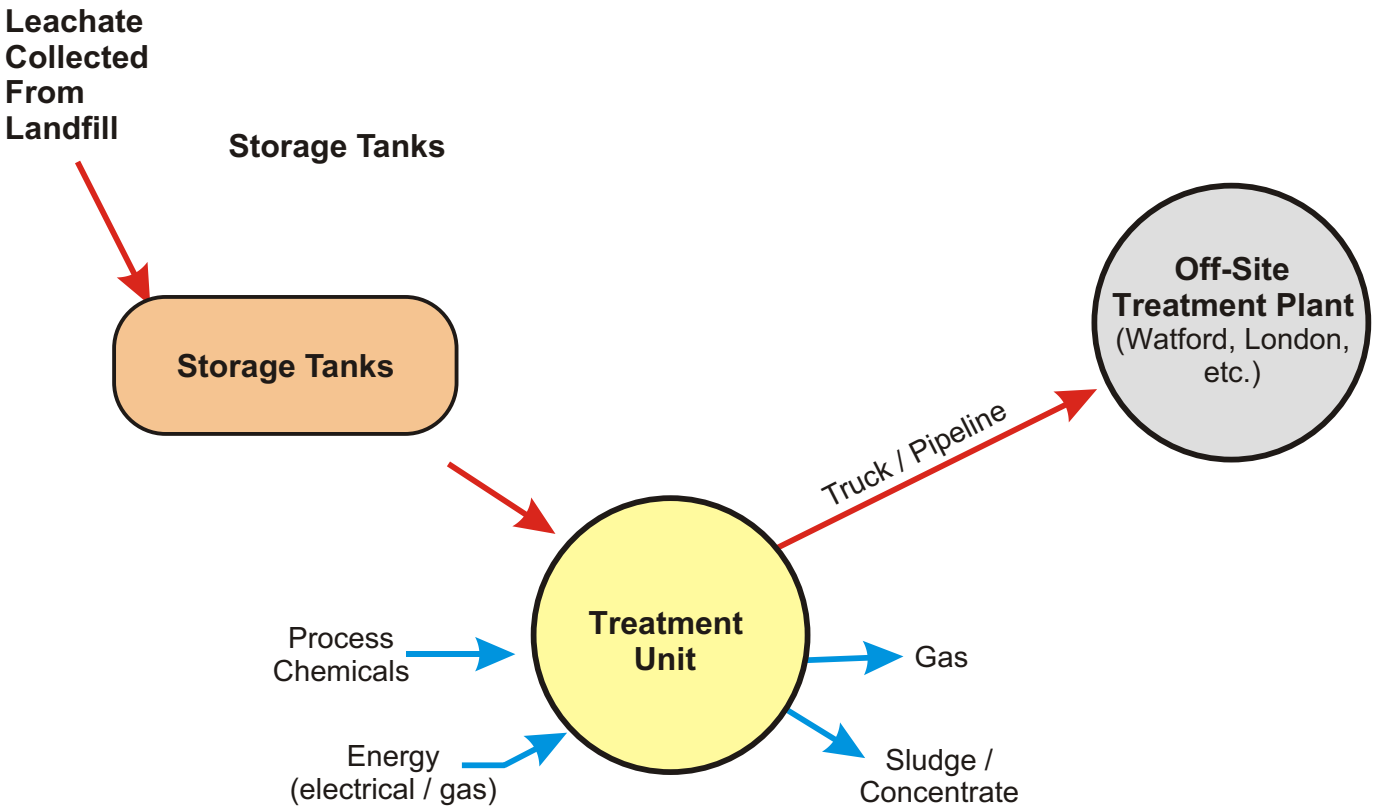
1. Full On-site Treatment with No Effluent Discharge
2. Full On-Site Treatment with Surface Water Discharge.
3. On-Site Pre-Treatment with Discharge via Forcemain to Watford STP

Trucking of Leachate Required:

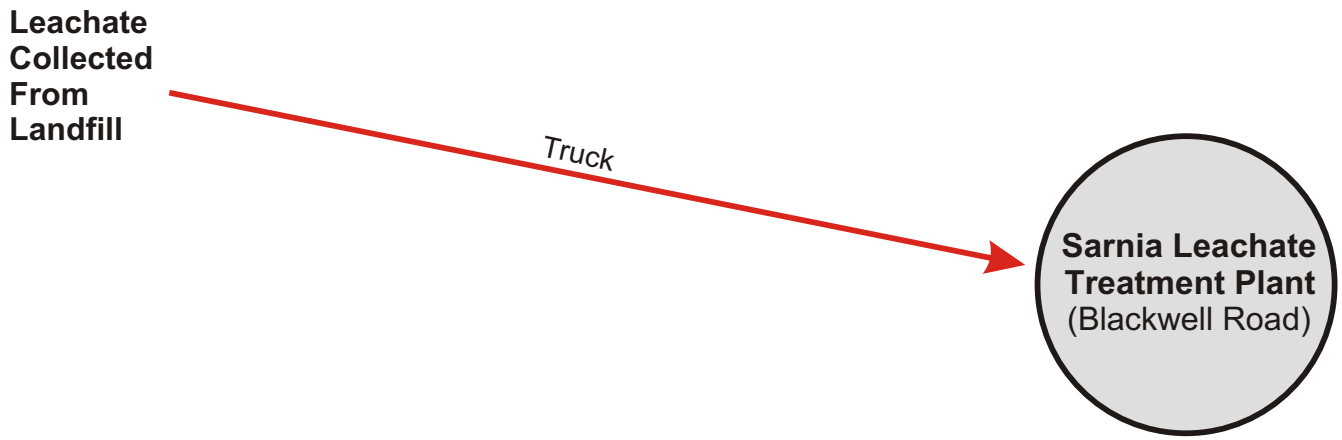
Methods which involve off-site trucking of leachate for ultimate treatment

4. On-site Pre-Treatment with Discharge via Truck Haulage to Watford STP
5. On-Site Pre-Treatment with Discharge via Truck Haulage to Other STP
6. Off-Site Treatment via Truck Haulage to Blackwell Road

C) On-Site Pre-Treatment with Off-Site Final Treatment



D) Off-Site Treatment



Two of the three trucking methods rely on pre-treatment on-site prior to trucking to a municipal sewage treatment plant. The other option provides for trucking leachate directly to a treatment facility with no on-site pre-treatment.

All of the "no trucking" methods involve on-site treatment of leachate. Total evaporation leaves no liquid effluent to be managed. Surface water discharge releases treated leachate directly to a local watercourse. Discharge via forcemain releases pre-treated leachate into the local sewage treatment system.

Table 3-3 presents an overview of the comparative analysis of the leachate treatment methods by the comparative criteria groups described earlier. The basis for the criteria group preferences presented in Table 4-3 is derived from the detailed comparison presented in DP #3 **(Appendix B).**

Table 3-3. Comparative Evaluations of Leachate Treatment Methods

Criteria Group	Alternatives					
	Full On-Site Treatment with No Effluent Discharge	*Full On-Site Treatment with Surface Water Discharge*	*On-site Pre-Treatment with Discharge via Forcemain to Watford STP*	*On-Site Pre-Treatment with Discharge via Truck Haulage to Watford STP*	*On-Site Pre-Treatment with Discharge via Truck Haulage to Other STP*	*Off-Site Treatment via Truck Haulage to Blackwell Road*
Public Health & Safety	☑	☑	☑	-	-	-
Natural Environment and Resources	☑	-	-	☑	☑	☑
Social and Cultural	☑	☑	☑	-	-	-
Economics	-	☑	☑	☑	-	-
Overall	☑	☑	☑	-	-	-

Note: ☑ denotes preference

Based on the overall ranking results, the non-trucking methods (including full on-site treatment with no effluent discharge, discharge of treated leachate to a local watercourse and use of the Watford STP) rank as the preferred treatment methods. Preference is indicated in three of the four criteria groups for each of these methods.

Leachate re-circulation was not included in the comparative evaluation, but when used to reduce leachate volume in combination with the other methods, it may reduce the potential effects of the preferred methods.

Information gathered through community input was considered to assist in further refining the evaluation. Community members ranked Public Health and Safety as the most important criteria group. The criteria differentiating methods in this criteria group are impacts associated with trucking, including fine particulate exposure, risk of leachate spills and potential for traffic conflict. Therefore, the three methods that do not rely on trucking leachate off-site are clearly preferred from a Public Health and Safety perspective.

The second most important criteria group, based on public input, is Natural Environment and Resources. Full on-site treatment that does not rely on discharge of treated liquid effluent to the natural environment and does not require pipeline construction, is preferred based on this criteria group.

Economics is the criteria group of third importance to community members. Use of the Watford STP would provide the highest potential for new business opportunities in the community and be among the lowest cost of service to consumers, but would result in a temporary disruption to business during pipeline construction. On-site treatment with discharge to a local watercourse would have little disruptive impact on business and is among the lowest cost alternatives. These two options are preferred based on the Economics criteria.

Given the comparative nature of this evaluation, it is WM's view that there was insufficient information to identify a single method as clearly preferred at this stage. It was determined to be appropriate, therefore, for WM to consider the three preferred treatment methods in the detailed impact assessment phase of the EA (Section 7).

Re-circulation also remained as a potential alternative to be used in combination with the preferred treatment method and will be carried forward for further impact assessment.

The following provides a summary of the rationale for the selection of the three preferred treatment methods.

Public Health and Safety

- All on-site treatment and pre-treatment alternatives have potential impacts associated with air emissions, only use of Blackwell Road has no health and safety effect due to plant emissions.
- Effects due to particulate exposure, risk of hazardous material spill and traffic collisions is highest with trucking alternatives.
- Non trucking alternatives preferred on basis of public health and safety criteria.

Natural Environment and Resources

- Aquatic ecosystems may be affected by controlled release of treated effluent to local watercourse.
- Terrestrial ecosystems maybe affected by construction of pipeline.
- Alternatives that avoid these potential impacts, on-site full treatment with no discharge, use of Watford or other STP with trucking and trucking to Blackwell Road are preferred based on natural environment and resources criteria.

Social and Cultural

- Noise from full or partial treatment plants may disrupt residences and public facilities in the vicinity; use of Blackwell road will have no nuisance effect in immediate vicinity.
- Only use of Blackwell Road facility will avoid the potential impact of a visible stack and plume.
- Use of Watford STP may have a benefit to public services through the plant expansion.
- Alternatives that do not require trucking are least disruptive to residences along haul routes and local traffic.
- No community facilities were identified along haulage routes, one cemetery may be impacted by the Watford STP haul route.
- Options that do not require trucking are preferred. On-site full treatment with no discharge, on-site treatment with discharge to watercourse and use of forcemain to Watford STP are preferred based on social and cultural criteria.

Economics

- Nuisance effects to business are minimized with on site full treatment where there is no pipeline construction and no off-site haulage. Truck haulage to the Watford STP involves the highest potential disturbance on business from nuisance effects.
- New business opportunities from large-scale construction contracts exist for all alternatives except use of Blackwell Road. Construction of pipeline and use of Watford STP has additional construction undertakings and potential for additional maintenance contracts at enhanced facility.
- Reliance on public facilities and potential for public costs for indirect liabilities is highest with use of Watford STP.
- Discharge to surface water and use of Watford STP result in lowest cost of service to consumers. Use of Blackwell Road has the highest potential cost.
- Discharge to surface water ranks highest on the basis of economic criteria, no effluent discharge and use of Watford STP alternatives also rank high for this criteria group.

The Preferred Treatment Methods:

- **Full On-Site Treatment with No Liquid Effluent Discharge**
- **Full On-Site Treatment with Surface Water Discharge**
- **On-Site Pre-Treatment with Discharge to Watford STP via Forcemain**

During consultation the community strongly recommended against the use of the Watford STP for leachate treatment due to capacity and capability of the plant. As a result, WM replaced this alternative with tracking leachate to a remote STP. These alternatives were then evaluated during step 7 of the standard methodology. All alternatives were considered acceptable (see DP #7). Chapter 4, the Facility Characteristics and Consultation plan outline how these alternatives will be utilized.

3.5 Access Route Alternatives and Site Entrance Options

3.5.1 Overview of Access Route Alternatives

Currently, the access route to the existing landfill site for all traffic other than direct local haul is along Highway 402 to County Road 79, south to Zion Line, then east to the site entrance. In consultation with the public and government agencies during the ToR development, WM identified two route options in addition to the existing haul route for regional access to the site from Highway 402:

Existing Haul Route: County Road 79 south to Zion Line, then east to the site entrance.

New Service Road #1: A new service road east from the existing Highway 402/ County Road 79 interchange, then south to Zion Line in alignment with the site entrance.

New Service Road #2: A new service road east from the existing Highway 402/ County road 79 interchange, then south to Zion Line along the opened road allowance, then west to the site entrance.

The three different access route options are illustrated in **Exhibit 3-4**.

The site entrance point for each option was considered from Zion Line. For the purposes of the comparative evaluation, an entrance at about the middle of the WM frontage is assumed for all options.

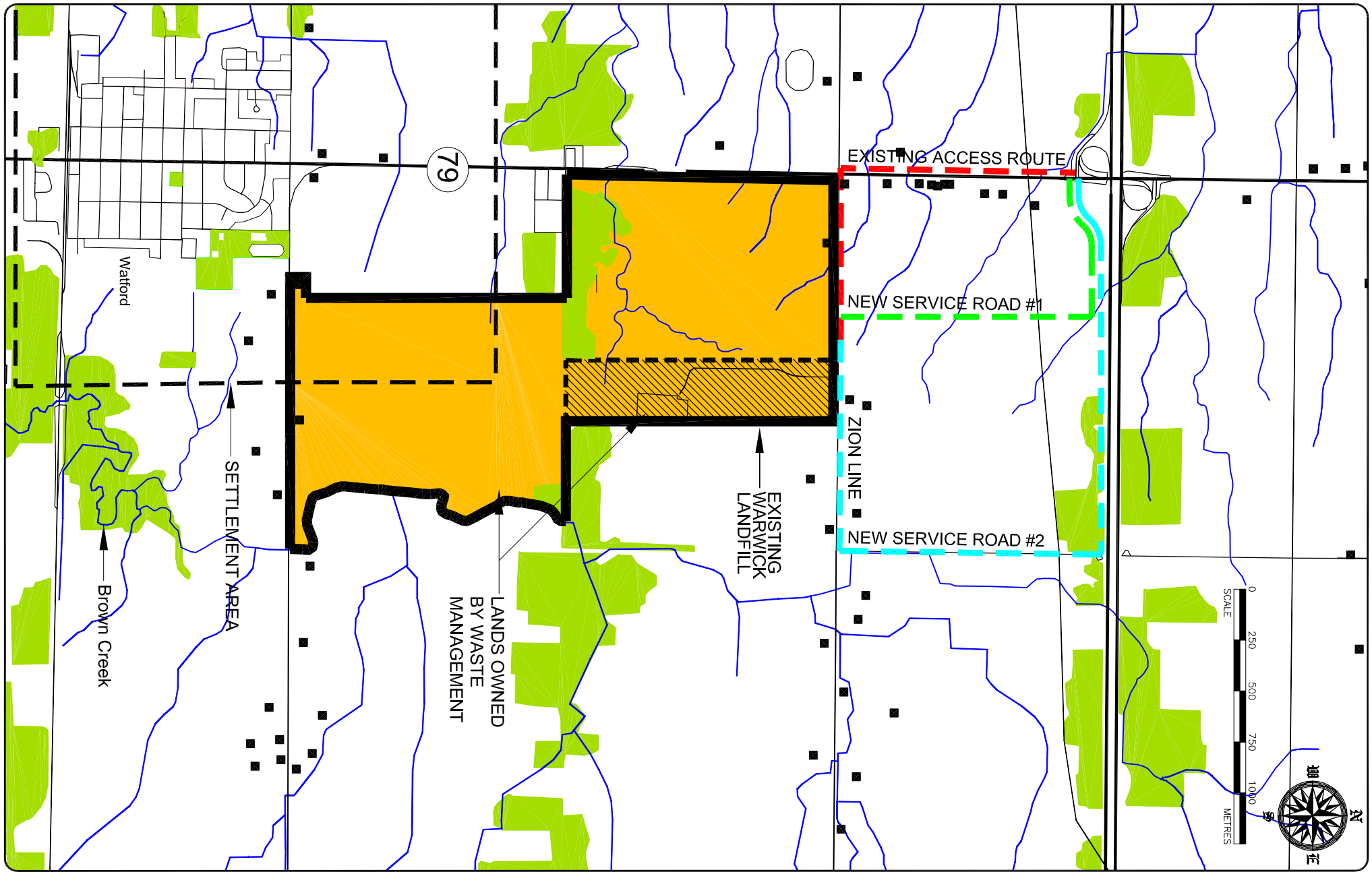


EXHIBIT 3-4

DWN BY: J.M.C. DATE: 04/18/2000
CHK BY: S.C.H. SCALE: 1: 25,000

WASTE MANAGEMENT OF CANADA CORP.

DRAWING NO. 6

WARWICK LANDFILL EXPANSION
ACCESS ROUTE ALTERNATIVES

WARWICK LANDFILL
TOWNSHIP OF WARWICK, ONTARIO

WM WASTE MANAGEMENT

REV	DATE	DWN BY	APP BY	DESCRIPTION

Oct 06, 2005 - 3:12pm N:\Projects\1997\97393.65\2005\WorkInProgress\Documents\Draft EA Document\EA Ch 03\97393-65-EX3-4.dwg

3.5.2 Comparison of Access Route Alternatives

Table 3-4 presents an overview of the comparative analysis of the access routes by the comparative criteria groups described earlier. The basis for the criteria group preferences presented in Table 3-4 is derived from the detailed comparison presented in DP7 **(Appendix B)**

Table 3-4. Comparative Evaluations of Access Routes

Criteria Group	Alternatives		
	Existing Route	*New Service Road #1*	*New Service Road #2*
Public Health and Safety	-	☑	-
Natural Environment	☑	-	-
Social and Cultural	-	☑	-
Economics	☑	☑	-
Overall	☑	☑	-

Note: ☑ denotes preference

The existing Haul Route is preferred in two of the four criteria groups. The New Service Road #1 option is preferred for three of the four criteria groups.

The highest ranked criteria group, based on community input, is Public Health and Safety. The criteria differentiating the alternatives in this criteria group are risk of contact with spilled material, exposure to dust and potential for traffic collisions. The Existing Haul Route and New Service Road #1 have the shortest haul routes. New Service Road #1 has no current residences fronting on it and, therefore, the lowest risk of contact with hazardous materials and exposure to dust. New Service Road #1 initially would be used predominately by landfill traffic and would eliminate the turn at Highway 79 and Zion Line, which is required with the current haul route. Interference with agricultural vehicles is also minimized with this New Service Road as no farm lanes/field entrances are currently identified. Consequently, New Service Road #1 is preferred for this criteria group.

The second highest ranked criteria group is Economics. The Existing Haul Route and New Service Road #1 are both ranked as preferred within this criteria group. There is little difference in the number of farms adjacent to the alternatives, however more agricultural activity may be disrupted if fields are bisected with New Service Road #1. Maintenance costs and potential impact on the tax base are lowest with the existing road as no new public road sections are required. With no residences fronting onto the route, potential impact on property value is lowest with New Service Road #1. This criterion was identified as high importance by the community. There is no clear preference between the Existing Haul Route and New Service Road #1 based on economic criteria.

Natural Environment and Resources impacts would be minimized with the Existing Haul Route. With no new construction of roadway, the Existing Haul Route would not displace or disrupt any agricultural land or terrestrial or aquatic ecosystems.

Within the Social and Cultural criteria group, the Existing Haul Route is compatible with the current road designations but increased traffic on this route has a greater potential to disrupt residences and traffic patterns. New Service Road #1 requires new land use designations but has the least potential impact on residences and traffic patterns.

The Existing Haul Route and New Service Road #1 both rank highly in the evaluation, however, new Service Road #1 ranks somewhat higher when community input is considered.

The following provides a summary of the rationale for the selection of the preferred access route.

Public Health and Safety

- Risk of contact with hauled material and fine particulate lowest with New Service Route #1 as this alternative has shorter route than New Service Road #2 and no residences directly on route.
- Potential for traffic collisions lowest with New Service Route #1 as landfill traffic diverted off local roads, number of intersections is lowest and disruption to residential/farm entrances minimized with this alternative.
- New Service Route #1 is preferred on basis of public health and safety criteria.

Natural Environment and Resources

- Displacement of agricultural land higher with new road construction options, lowest with Existing Route alternative.
- Existing route creates no disturbance to terrestrial, aquatic or recreational resources.
- Service Road #2 impacts wood lot resource Service Road #1 crosses agricultural swales.
- Existing Route preferred on basis of natural environment and resources criteria.

Social and Cultural

- Impact on use and enjoyment of properties greatest with existing route as highest number of residences along route, no residences fronting onto New Service Road #1.
- Additional traffic on existing route adds to current volume and more frequent stop turn movements with existing route indicates higher potential to disrupt local traffic network.
- New routes require designation of new road sections.
- New Service Road #1 diverts landfill traffic off existing well-traveled local roads.
- New Service Road #1 preferred on basis of social and cultural criteria.

Economics

- There is little difference in the number of farm properties adjacent to the route alternatives based on available information however New Service Road#1 may disrupt more farm operations if farm fields are bisected by the new road.
- There are more residential properties adjacent to the Existing Route potentially impacted by change in property value.
- Assuming the new service roads become public, there are higher municipal costs associated with long-term maintenance of these new sections.
- Potential for costs associated with intersection/turn lane or other intersection upgrades is lowest with New Service Road #1.
- Existing Route and New Service Road #1 both preferred on basis of economic criteria.

During this evaluation process, subsequent to the approval of the ToR, the Ministry of Transportation (MTO) advised WM that they would not approve a new service road connection to County Road 79 in close proximity to the Highway 402 interchange. It was recommended that any new connection be at least 366 m from the Highway 402 interchange. ***New Service Road #1 does not meet this requirement and therefore is not an acceptable alternative.***

If WM were to modify New Service Road #1 to meet the 366 m setback restriction and perform a comparative evaluation, the results would be similar to the Existing Haul Route. It would pass by residences, it would create another stopping and turning motion, and would add to the existing traffic levels on County Road 79. Therefore, its distinguishing benefits would be lost.

As a result, WM has concluded, that given the MTO restriction, New Service Road #1 no longer comes out at the preferred access route, instead, the Existing Haul Route is preferred. The option will be carried forward through to the detailed impact assessment phase of the EA (Section 7).

The Preferred Access Route:	**Existing Haul Route**

3.5.3 Overview of Site Access Options

Site access considerations were introduced to the EA process as a result of a WM land acquisition adjacent to the landfill expansion area providing frontage to County Road 79 (CR79). This property allowed for access to the landfill expansion directly from CR79. The Environmental Assessment Study Group (EASG), comprised of local residents and community representatives, recommended that WM consider this option against the original proposed site access from Zion Line.

Addendum #1 to DP#4 (April 2003) described the method for considering these two access options. To ensure that impacts associated with the site access options are considered within the context of the overall site development, the study team:

- Conducted an overall assessment of expansion using the leachate trucking alternative (as this is the alternative with the largest truck numbers and therefore will illustrate the worst case from a haul route perspective) and Zion Line access.
- Substituted use of CR79 access, again assuming the trucking alternative.
- Identified differences in overall environmental impact of the development assuming the two different access options are documented and considered.

The characteristics associated with the site access options are provided in Section 3.5.1. The preferred haul route (Existing Haul Route) extends from the Highway 402 interchange southbound on County Road 79 to Zion Line. From this point, two options to enter the expanded landfill site have been developed:

a) <u>Zion Line Access</u>

Haulage vehicles approach the landfill by turning eastward on Zion Line and enter the site at either of two specified entrances. Either entrance would be used for waste haulage and other vehicles, depending on the area of the expanded landfill under development and site facilities being accessed. For assessment purposes the new more westerly entrance has been assumed.

b) <u>County Road 79 Access</u>

Haulage vehicles would continue on CR 79 to a new site entrance, located approximately 300-m south of Zion Line on County Road 79. Vehicles entering the site would proceed over weigh scales and utilize internal roadways to reach the landfill footprint to the east, or other site facilities as required.

A secondary site entrance, located on Zion Line would also be maintained. Waste haulage vehicles would use this alternative entrance in emergency situations only; the entrance may also be used for staff and other small vehicles.

The alternative site access points and associated general development features are provided in E**xhibit 3-3** for the Zion Line Access and E**xhibit 3-5** for CR79 Access. E**xhibit 3-5** indicates the haul route approach for each of the access alternatives and the 500-m zone used for impact comparison purposes.

3.5.4 Comparison of Site Access Options

Overall, the analysis indicates that either option meets the requirements of the facility. For most criteria, the site entrance location does not affect the impact assessment of the development. There are some differences, however, that are relevant in selecting between the options. The following summary focuses on key issue areas and differences in impact identified through the analysis.

Public Health and Safety

- Exposure to air emissions from on-site activity and haul route traffic emissions is not a significant health risk with either access. Potential impact is somewhat lower with CR79 access as receptor exposure to particulate is lower with this option.
- Moving the main entrance from Zion Line to CR 79 improves road safety over the current condition. Waste trucks no longer travel on Zion Line, a rural road less suitable for this traffic, reducing potential conflict with farm vehicles and general traffic.
- No difference in impact due to contact with non-leachate impacted ground or surface water.
- Marginally shorter route and fewer residences with CR79 access, somewhat reduces risk associated with spills on route.

Natural Environment and Resources

- Potential disruption to an ephemeral tributary to Bear Creek in proximity to CR79 access. Recommended standard construction mitigation measures will protect stream and maintain baseflow and channel characteristics so that no significant net impact is predicted.
- There is no difference in impact on terrestrial or aquatic ecosystems, nor on agricultural and recreational resources.
- Choice of access does not influence net natural environment and resource impacts of the development.

Social and Cultural

- Disruption to use and enjoyment of residential properties due to nuisance dust is lower with the CR79 access. Truck movements on and off the site are an important factor in dust generation and nuisance dust impacts. CR79 access focuses truck traffic on CR79 where there is only one residence in proximity to the site entrance. This option also results in less intensive on-site activity at the north end of the landfill. As a result, residences along Zion Line are exposed to lower dust emissions with the CR79 option. Overall, net nuisance impacts due to dust are lower with CR79 access.
- With traffic focused on CR79, nuisance noise impacts at residences from landfill traffic is somewhat lower with CR79 access.
- Disruption to local traffic is mitigatable with either alternative. Zion Line access will require more extensive road improvements to ensure road safety and standards of operation, including intersection improvements at CR79/ Zion Line. These improvements would be disruptive to traffic flow during the construction period. Lane improvements at the site entrance are required for CR79 access but no intersection improvements; therefore the mitigation is less onerous and disruptive.
- CR79 access requires an opening in the planned berm along CR79. This discontinuity of landform will increase the visual impact of the landfill for those traveling southbound on CR79 by introducing an unobstructed view of the landfill and has a negative impact on the visual approach to the Town of Watford. Mitigation measures are recommended which will improve the visual appeal of the entrance.
- There is no difference in the displacement of residences, disruption to community facilities, displacement and/or disruption of cultural resources.

Economics

- With traffic focused on CR79, CR79 access has lower potential to disrupt farm business utilizing Zion Line for equipment movement.
- CR79 access requires less extensive road improvements and therefore represents somewhat lower capital cost to WM, potentially reducing the cost of service to customers; but within the context of the overall capital expenditure for the facility this difference in cost is considered insignificant.
- Similarly, less extensive road improvements for CR79 means lower potential for local construction contracts but in the context of significant employment impacts from the overall development this difference is insignificant.

Table 3-5 presents an overview of the site access preference by criteria group.

Table 3-5. Site Access Preference

Criteria Group	Options	
	Zion Line Access	*County Road 79 Access*
Public Health and Safety		✓
Natural Environment and Resources		
Social and Cultural		✓
Economics		✓
Overall Preference		✓

Note: ✓ denotes preference with respect to this criterion group.

3.6 End Use

3.6.1 Overview of End Use Alternatives

The approved ToR stated that "During the EA, CWS [WM] will propose one or more end uses for the site and consult with the stakeholders to determine if there are others. CWS [WM] will either: enter into a formal evaluation and decision process regarding a preferred alternative and establish a preference based on consensus among the stakeholders; or agree on a process to determine the final end use at a later date, closer to the time of site closure." (ToR, p. 10).

As a result, based on the nature and use of the site, WM is proposed two end use options to the public for review and comment:

Private Open Space: The lands would remain as private lands, *not* accessible to the general public, and kept as green space after the closure of the landfill. Where it is feasible, the green space could include partial reforestation.

Public Open Space: A portion of the lands might be used for public open space. The site would be accessible to the public for recreational uses such as playing fields, walking or cross-country skiing trails. Other parts of the site may be for more passive uses such as reforested areas.

Based on the comments received from various public meetings during the EA, it was decided not to undergo a comparative evaluation of these end use options. Instead, WM committed to proceeding with a passive private open space end use. The Community Commitments Agreement will include a mechanism to receive input from the public regarding the final end use plan closer to the closure date

3.6.2 Response to Consultation

The proposed landfill design and ancillary features, together with the characteristics of the surrounding lands held by WM suggest a number of end use opportunities and constraints. Consideration must also be given to the function and use of adjacent municipal lands and to the expressed preferences of adjacent private landowners and the broader Watford community.

This illustration reflects the physical site features which will remain after closure, (such as stormwater ponds, leachate management features), provision for maintenance activities which must carry on, (access to and security for remaining site features), natural woodlots, streams and agricultural areas which could be enhanced and/or integrated into the end use plans, and possibilities for linkages to surrounding land uses (walkways, parking lot for cemetery). The undeveloped agricultural areas have a variety of opportunities open, including continued agriculture use, enhancement for agricultural related use such as a greenhouse that provides a beneficial use for LFG, or re-naturalization of the area that opens up opportunities for passive recreational uses. As the process of public consultation proceeds at a point closer to the anticipated landfill closure date, additional public input will assist WM in refining the concepts and choosing among opportunities.

Public Consultation Process for Selecting End-Use Options

There are to two key considerations guiding the proposed end use public consultation program:

1. The public consultation program for end use will continue to offer the same range and variety of public consultation activities and events as in the public consultation programs to date.
2. The program design will balance provision of a variety of opportunities to understand and discuss the proposed suggestions for the end use of the site and also provide the opportunity for residents to suggest additional end uses as appropriate.

3.6.3 Resolution of the End Use Alternatives Issue

The Landfill Standards - Regulation 232/98 requires that a closure report be prepared describing site closure activities and post-closure care requirements, at least two years before the expected date of closure or by the time 90 percent of the site has been filled.

WM plans to consult with the community on possible end uses for the landfill site, 2½ years, at a minimum, of the landfill's expected closure. This would be 6 months prior to preparing the Landfill Closure Report. WM continues to welcome comments from the public and stakeholders on possible end uses during landfill operations. If the community wishes to initiate discussions on end use prior to that time, WM will be open to the suggestion.

The proposed Public Consultation Plan for selecting an End Use for the Warwick Landfill will include the following consultation events:

- Newsletter
- Open House
- PLC discussions

4. FACILITY CHARACTERISTICS AND CONSTRUCTION PLAN

4.1 Introduction

This chapter summarizes the description of the proposed facilities for the expanded landfill. The proposed facilities are described further in Discussion Paper #8 in **Appendix B**. Specific design characteristics are in the EPA submission documents. In addition, this section will provide information on the various phases of construction that led to the development of the impact assessments that are described in Chapter 6 of this document.

4.2 General Description

4.2.1 Site Location and Access

The expanded landfill footprint will be constructed on land, owned by WM and located on Lots 19 and 20 Concession 3, South of Egremont Road (SER), Lot 20 and Parts of Lot 21 Concession 4 SER, Township of Warwick, County of Lambton. This location is approximately 2 km south of Highway 402 and County Road 79.

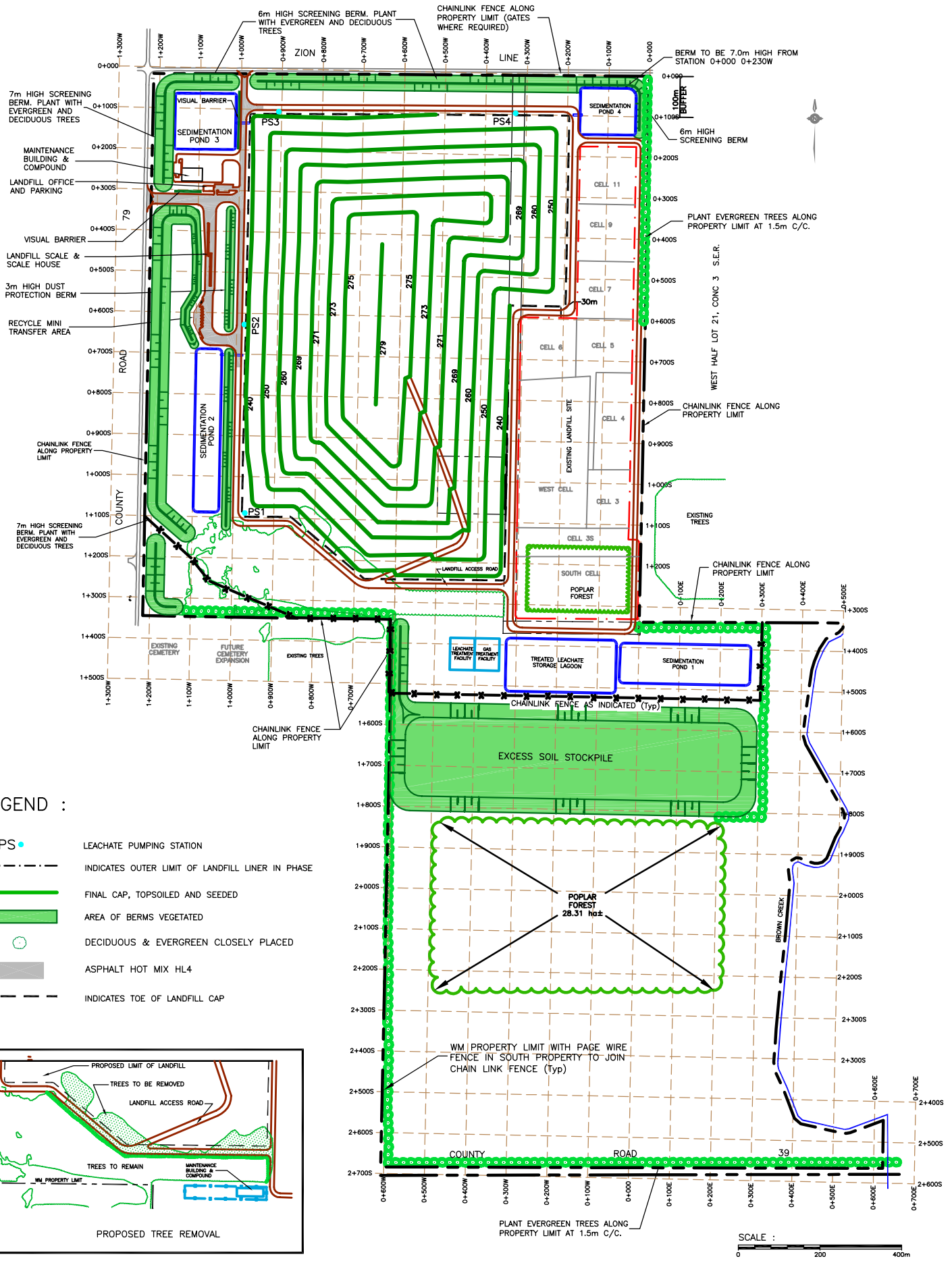
The proposed site entrance **(Exhibit 4-1)** is located on County Road 79 approximately 300m south of Zion Line. A number of improvements are proposed to County Road 79; at the site entrance, Zion Line intersection and the 402 interchange, to improve safety, effective operations, and minimize dust generation. Traffic will enter the site through the site entrance system with scales and a staging area then proceed via a system of internal roads to the landfill tip face. There will be sufficient space to queue 24 to 30 trailers outside the scale area. Drivers will be requested to turn engines off if they arrive prior to scale opening times or are in queue for an extended period of time.

A service vehicle and emergency access road will be provided from Zion Line to the northern portion of the landfill. Equipment operators and construction personnel will enter through this access when the site is active. No waste vehicles will be permitted to enter this service vehicle access road except for emergency purposes.

4.2.2 Proposed Landfill Expansion

Exhibit 4-1 shows the overall landfill expansion. The landfill footprint is located on the northern portions of the WM land holdings. Other facilities required to support the landfill operation (e.g. buildings, ponds, roads, and treatment facilities) are located in buffer zones and portions of the southern portion of WM's property.

Landfill operations are set back at least 100m from property lines and public roads to meet Ontario Regulation 232/98. The northern portion of the proposed landfill is set back 100m from Zion Line. The set back from County Road 79 is 240. The southern portion of the landfill is setback 100m from the property line except in the southeast corner the setback is increased to



LEGEND :

- PS● — LEACHATE PUMPING STATION
- INDICATES OUTER LIMIT OF LANDFILL LINER IN PHASE
- FINAL CAP, TOPSOILED AND SEEDED
- AREA OF BERMS VEGETATED
- DECIDUOUS & EVERGREEN CLOSELY PLACED
- ASPHALT HOT MIX HL4
- INDICATES TOE OF LANDFILL CAP

PROPOSED TREE REMOVAL

EXHIBIT 4-1

DWN BY: T C G
CHK BY: F C F
DATE: 12/07/05
SCALE: 1:12,500

WASTE MANAGEMENT OF CANADA CORP.

DRAWING NO. 197716-D8-4

GENERAL DEVELOPMENT

WARWICK LANDFILL

WASTE MANAGEMENT

HENDERSON, PADDON & ASSOCIATES LIMITED
CONSULTING ENGINEERS
OWEN SOUND • THE BLUE MOUNTAINS • GRIMSBY
Tele (519)376-7612 Fax (519)376-8008

minimize the removal of the existing woodlot. The western boundary for the expansion is setback 30m from the exiting landfill to allow for ongoing monitoring, maintenance and the potential for remedial actions.

The existing landfill office will be removed/relocated to the new site entrance in the buffer area adjacent to County Road 79. A new maintenance building will be constructed in the same area.

A recycling/mini-transfer area will be constructed in the buffer area adjacent to County Road 79, within the site entrance system for waste or recyclables receipt from small vehicles. Waste or recyclables will be deposited into roll-off containers. Periodically waste will be removed by the site roll-off truck and taken to the active landfill face for disposal, and recyclables taken away for processing.

A compost pad/diversion area will be constructed in the northwest portion of the landfill footprint **(see Exhibit 4-3).** This area will include a compost pad as well as storage and processing facilities for wood waste, tires, asphalt and concrete. This facility is located in the existing landfill cell 9 and 11 area. This facility will operate for approximately the first 17 years of operation and then will be replaced by landfilling.

4.3 The Existing Landfill

Existing waste input will be accommodated within the existing landfill until the new landfill commences.

Final contours will be adjusted at the north end of the existing landfill after landfilling commences at the expansion. Landfill expansion limits and buffers will be maintained as shown on **Exhibit 4-1**.

In the summer of 2004, WM received approval to receive and landfill, as monofill, contaminated soils in Cells 8 and 10 of the existing site. Refer to **Exhibit 4-4** for the cell designations for the existing site. Meanwhile, they will continue to receive the municipal/IC&I waste stream. The south one-half of Cell 9 is the present active area for residential waste. Contaminated soil is also used for daily cover of the residential waste.

The recently approved contaminated soil for monofill will likely be brought in over a three-year period and comprise a volume of approximately 350,000 m3. Total waste north of Cells 5/6 by the fall of 2007 is estimated to be approximately 630,000 to 650,000 m3. This will require filling Cells 7, 9 and approximately one quarter of Cell 11 with waste, and Cells 8 and 10 with the contaminated soil monofill.

As indicated above, all waste in Cells 7, 9 and 11 will be left in place. The monofill in Cells 8 and 10 will be excavated and a 30 m buffer restored for the area between the existing waste and the new landfill.

It is recommended that excavation of the existing monofill in Cells 8 and 10 occurs during new landfill cell development Phase 7, 8 or 9 but not later than Phase 9. The waste can be excavated from the existing Cells 8 and 10 and hauled westward to the new Phase 7 to 9 when it is being landfilled at relatively low elevations or, alternatively, used as daily cover.

Before Phase 1 of the new landfill can commence, the stormwater pond associated with the existing site will be decommissioned and the ditching diverted to Sedimentation Pond #1.

Leachate from the existing site is proposed to be irrigated on a poplar plantation planted on the south cell of the existing site. That leachate management plan will proceed. Whether or not leachate from the existing site is discharged in the future to the leachate treatment facilities for the expansion will be determined at a later date.

The north cell of the existing landfill site, which is comprised of a shallow waste mound, was proposed to be moved into Cells 11 and 12 of the existing landfill site when landfilling approached that area. That waste can be either moved into the new landfill expansion in the future, or moved anytime to the existing or new fill site.

On the east side of the south cell, on the existing site, some waste must be removed for construction of the new access road. Some waste was removed from this area in the past for construction of the ditch. No adverse effects with respect to odour, waste stability or leachate outbreaks were encountered.

4.4 New Landfill Construction Phasing

A clear understanding of the impacts was required by the various disciplines (e.g. air, noise, visual) to establish potential impacts associated with the development of the landfill. A detailed description of the sequence of phasing, including the phasing of construction of screening berms, is shown in Discussion Paper # 8 in **Appendix B**. Refer to **Exhibit 4-5 to 4-15** for a summary of landfill phasing and construction quantities.

The construction of the landfill will occur in phases beginning in the south end and progressing northerly. The phases were developed based on the following criteria:

- Basic mitigation considerations suggest that screening can best be achieved by commencing landfill activities at the southerly side and progressing northerly to screen views from the Watford community.
- Phasing has been developed sufficiently to provide landfill capacity for at least one (1) year.
- The phases must be sufficiently large to accommodate delivery vehicles and operating landfill equipment.
- Certain phases are required to be completed to sufficient elevations or extent to accommodate high level access roads to reach the maximum height of the landfill.

Completed outside slopes of the landfill will be capped, topsoiled and vegetated annually to reduce visual and dust/erosion impacts. Areas of exposed soil without vegetation provided will be minimized.

4.4.1 Berm Construction

Earth construction berms will be used to mitigate visual and noise impacts from landfill operations. The berms, location shown on **Exhibit 4-1,** are approximately 6 m high and will be used to provide visual screening, where the site is deficient of natural screening, or manage noise impacts from landfill operations. Grass vegetation has been considered on all berms.

These berms are generally 6 m in height from existing ground, 3:1 side slopes with 3 m tops. However, the berm adjacent to County Road 79 on the westerly side has been moved easterly 10 m from the westerly property line and increased to 7 m in height. The short section of berm on the northerly property line on the easterly side of the site has also been increased to 7 m to mitigate predicted noise impacts. In some cases, trees and shrubs have now been proposed. Since Phase 1 is anticipated to yield more than 300,000 m3 of excess material after construction of the site berms, the berms will be installed on-site initially as part of the site preparation in the first phase. Refer to Figure D8-5 in regard to Phase 1 site and initial preparation. A row of evergreens was planted on the southerly and westerly property lines of the south property.

4.5 Stormwater Management

The proposed landfill site is located at the headwaters for 2 creeks. Brown Creek (actually the Kersey Drain) forms the easterly property boundary of WM's land in Concession 4. The northeast part of the landfill expansion will lie within the Brown Creek watershed. Most of the expansion will lie within the Bear Creek watershed, with the upper part of that drainage system comprising the Van Kessel drain, which flows westerly to join the Bear Creek west of WM's property.

Stormwater control and stormwater management will be through a series of ditches, culverts, pipes and ponds to control runoff and to remove sediment before discharge to the area watercourses. In this site, four (4) ponds, denoted as #1, #2, #3, #4 inclusive, are proposed as shown on **Exhibit 4-1**.

The ditching will be designed to 1:25-year storm event, with freeboard provided such that overtopping does not occur with the 1:100 year storm event. A criterion is that the ponds must temporarily store runoff volumes generated from a 4-hour, 25-mm storm event. In addition, stormwater ponds will attenuate peak flow to pre-development conditions for all events up to the 1:100 year storm. Previous consultation with the St. Clair Conservation Authority requires 1:100 year storm event instead of a regional storm event for peak flow attenuation.

Discharge to both the Brown Creek and Bear Creek watersheds are anticipated to maintain similar flow rates and quantities, as compared with pre-landfill development.

The stormwater management pond for the existing site will be decommissioned. Ditches will be regraded and fill added on the west side of the existing landfill, such that the existing landfill generally will be contributory to Pond #1 in the southeast area of the landfill. Alternatively, whether the existing landfill site, once vegetated completely, can be separated from the new landfill expansion and discharged directly to Bear and Brown Creeks will be reviewed. Pond #1 could discharge to Brown Creek or Bear Creek watershed, but is anticipated to discharge to the Bear Creek Watershed at this time. Pond 4 will discharge to Brown Creek watershed. Ponds 2 and 3 will discharge to Bear Creek watershed. Pond 3 will likely discharge to the northwest via the roadside ditch and drainage swale, which also contributes to the Bear Creek watershed.

Fill or excavation will be carried out as required to control drainage and to achieve appropriate grades for ditching or flow control.

4.6 Roads

The main site entrances will be secured to prevent unauthorized entry outside operating hours. Site perimeters will be secured with appropriate 1.8 m chain link fencing.

A system of site roads will encircle the expanded landfill. Roads will be of sufficient cross section to accommodate large waste vehicles on the main access to working areas. Roads may also have an allowance for compactor and dozer equipment on the shoulder area in some locations. A length of paved access road is anticipated, as shown on **Exhibit 4-1**, to be constructed on-site from County Road 79 to control dust and mud tracking onto the municipal roads. Site roads within the landfill footprint and other minor traffic roads are anticipated to be granular surfaced.

Control of dust on unpaved roads will be by watering during dry conditions. The watering rate and number of water trucks required will be defined in the EPA documents. Dust control on paved roads will be by vacuum sweeping with water flush. To prevent any mud tracking, a lay-by inspection station near the egress from the site will be provided to inspect and clean any mud from the tires of the vehicles before exiting the site.

4.7 Leachate Management

This section outlines leachate management characteristics, including leachate containment, leachate quantity, leachate recirculation and leachate quantity and quality.

4.7.1 Hydraulic Trap

The hydraulic trap design (see Glossary) concept of the site involves excavation into the native soil sufficiently to a depth sufficient to create hydraulic gradients toward the landfill waste or leachate collector system. Excavation depths and the base of the landfill have been set such that all water-bearing zones have piezometric levels higher than leachate levels within the landfill, creating inward hydraulic gradients toward the landfill. The three (3) zones considered consist of the shallow fractured flow zone (the water table), the interstadial zone and the bedrock/sand-till interface.

Excavation to create an inward gradient condition for the hydraulic trap must be balanced against the quantity of excavation needed for liners, daily cover, cap, etc. In addition, excavation into the native soil is limited since excessive excavation depth will lead to basal instability in the excavated base.

4.7.2 Landfill Liner and Drainage System

The leachate containment system is shown on **Exhibit 4-16**. The system includes a primary drainage and leachate collection layer over a remoulded/recompacted native clay primary liner, over a secondary drainage layer equipped with leachate collectors. The underlying native Rannoch clay till is sufficiently impermeable and thick to act as a secondary liner system under the secondary drainage layer/leachate collection system. A hydraulic conductivity of 5 x 10-8 cm/s or lower can be achieved for the primary liner. The native Rannoch till is expected to have a hydraulic conductivity of between 1 x 10-8 and 1 x 10-7 cm/s. The liner and drainage layers are similar to a Regulation 232 double liner system without the HDPE components.

The raw leachate from the landfill will be pumped from the primary drainage/leachate collection system. Leachate pumping stations are anticipated on the westerly side of the site, as shown on the phasing drawings (**Exhibit 4-5 to 4-15**), and in the northwest corner of Phase 10. Leachate will be directed to the leachate treatment or pre-treatment plant via on-site forcemains. The exact nature and location of the leachate pumping stations must be determined.

The secondary drainage layer must be accessible from the ground surface and must be capable of future control as a contingency. Whether the secondary drainage layer is actually equipped initially with a permanent pumping station(s) will be assessed during preparation of EPA documents.

4.7.3 Leachate Quantity

The landfill footprint area is 73.7 ha. Leachate production will vary throughout the site development as suggested in the following representative years:

Year	Estimated Leachate *(m^3/d)*
1	55
6	75
11	126
16	188
21	213
26	202

Note: Actual flows may be less because of absorption of recirculated leachate into the waste.

The leachate volume, after the site footprints are fully developed, will be approximately 164,000 m^3/y, or 450 m^3/d (5.2 L/s).

This volume would require 6 tanker trucks per day on average to an area treatment plant, if required.

4.7.4 Leachate Recirculation

WM proposes to equip the landfill with piping to allow leachate recirculation within the landfill. The benefits of leachate recirculation are described below:

Recirculation of leachate will increase the moisture content of otherwise drier waste high in the landfill, bringing the moisture content closer to field capacity and promoting biological breakdown of waste components into water, methane and other gases. The biological process will be more uniformly exposed to the necessary moisture and nutrients. Therefore:

- The rate of methane gas generation within the landfill is increased to enhance gas recovery and improve efficiencies for gas utilization for beneficial uses.
- The period of active gas production is reduced.
- Waste contaminants are biodegraded and removed from the landfill quicker, as compared with only normal leachate infiltration acting to degrade and remove waste contaminants from the landfill.
- The contaminating lifespan of the landfill is considerably reduced.

By increasing the rate of decay of organics with leachate recirculation, the risk to the environment is reduced. More degradation and gas generation occurs in the period of active operation of the landfill, or shortly afterwards, as opposed to in the long-term post-closure period.

Recirculated leachate is stronger than leachate produced by only normal infiltration. Thus, more and stronger leachate is generated earlier in the landfill life during operation as opposed to long-term production of leachate in the post-closure period. Inorganic, organic and metal constituents will be accelerated in their removal from the waste with recirculated leachate.

Wastes, such as food, yard waste, and paper products, can be degraded in relatively few years. Other organic constituents, such as wood, rubber, plastic, leather and textiles, are more slowly degraded but will be similarly shortened in life cycle when compared with a landfill without recirculation.

A comparison of a normal, “dry (no recirculation)” landfill with a wetter landfill with leachate recirculation indicated major increases in peak methane recovery, a major increase in total methane recovery, and a significant decrease in methane emissions and other non-methane organic compound emissions to the atmosphere.

Physically, leachate recirculation will include the following facilities:

- Moisture conditioning of incoming raw waste to increase gate waste moisture content;
- A piping system installed with a horizontal gas system to recirculate leachate and to collect methane gas for the gas vacuum system (**Exhibit 4-17**);
- A leachate collection system at the bottom of the waste (**Exhibit 4-16**);
- A leachate pumping station to direct leachate to the recirculation system and/or the leachate treatment plant;
- Monitoring equipment to monitor head on the base of the primary liner (pressure sensor equipment);

4.7.5 Leachate Quality

Leachate quality was first considered without recirculation and then modified to include the effects of recirculation.

A study was used as a basis for characterizing leachate without recirculation. That study reviewed leachate quality at the Keele Valley Landfill in detail, but also included Britannia Road Landfill, Brock West Landfill, Burlington Landfill and Waterloo Landfill. Refer to **Exhibit 4-18** for leachate strength without recirculation.

HELP 3 (Hydrogeologic Evaluation Landfill Performance Model) was used to model leachate recirculation hydraulically within the landfill. Additional information can be found in Discussion Paper #8 in **Appendix B.** A reasonable leachate recirculation rate is approximately 100 mm/year in addition to infiltration. A mathematical model was used to approximate the average number of cycles of leachate particles flowing through the landfill for different rates of recirculation. Leachate was assumed to increase initially in strength linearly with the number of cycles through the landfill before accelerated decrease in strength caused by removal or other decay processes.

Predictive models were developed for various periods and rates of recirculation. Changes in the leachate strength with time because of decay coefficients were estimated.

Predictive models were compared with the results of actual leachate strength in landfills practicing recirculation. The predictive models are reasonable in predicting future strengths with recirculation and will be used for assessing various modes of leachate treatment.

Key parameters for assessing initial leachate treatment, considering leachate recirculation within the landfill, are proposed as follows:

- Chloride..... 3,420 mg/L
- BOD5 ..... 20,520 mg/L
- COD ..... 37,620 mg/L
- Ammonia..... 1,368 mg/L
- Chromium ..... 0.684 mg/L

- Cadmium ..... 0.086 mg/L
- Dichloromethane ..... 5.64 mg/L
- Benzene ..... 0.034 mg/L
- Toluene..... 1.64 mg/L

Certain identified contaminants in Keele Valley landfill have higher values with respect to chloride, conductivity, alkalinity, sodium, ammonia, arsenic, mercury, molybdenum, titanium and 1,4-dichlorobenzene when compared with those values considered in **Exhibit 4-18**. However, since the peak values in **Exhibit 4-18** were increased by approximately 170 percent for the consideration of the landfill site, the values are considered to be reasonably conservative.

4.7.6 Leachate Treatment

The facility characteristics for the following leachate treatment alternatives in order of preference:

- Full on-site treatment with no effluent discharge to surface water;
- Full on-site pre-treatment with treated effluent transported by truck or forcemain to an off-site treatment plant; and,
- Full on-site treatment with liquid effluent discharge to surface water.
- Recirculation of leachate in combination with any of the above.

All alternatives are technically feasible and were evaluated as having environmentally similar impacts. The preferred leachate treatment alternative is on-site full treatment with no liquid effluent discharge to surface waters. However, other methods of leachate treatment are environmentally acceptable and will be necessary until full on-site treatment is available.

The option for full on-site treatment with no effluent discharge to surface waters has been narrowed to mean a pre-treatment alternative followed by irrigation on a poplar plantation using evapotranspiration and phytoremediation. Since phytoremediation cannot be implemented immediately, it is proposed that leachate be pre-treated on site and delivered to a municipal or private treatment plant, if required. Leachate would be trucked to an off-site treatment plant.

As a contingency, should difficulty with phytoremediation occur, controlled direct discharge to surface water would be possible.

4.7.7 Pre-Treatment and Evapotranspiration

The leachate pre-treatment and evapotranspiration proposal provides for the irrigation of pre-treated landfill leachate for disposal for irrigation on a poplar plantation located on the closed landfill. The effluent criteria proposed for poplar irrigation are shown on Discussion Paper #8 **(Appendix B).**

Pertinent components of the evapotranspiration are as follows:

- Total area - approximately 28.3 hectares on lands south of the excess soil stockpile area (**Exhibit 4-1**).
- Growing area (assumed 75 percent useable to allow periodic rotational harvesting) - 23 hectares.
- Net irrigation after rainfall - approximately 440 mm/year.
- Total leachate generation – 73,800 m^3/year (202 m^3/day).
- Storage volume - sufficient for storage of pre-treated leachate in non-irrigated season.
- Pre-treatment is required for ammonia and recommended for chloride, boron and sodium. BOD is also recommended for treatment.

4.7.8 Interim Leachate Treatment Measures

Interim leachate treatment measures will be required since the preferred alternative cannot be immediately implemented in the short-term. These will be discussed in the following sections.

On-Site Pre-Treatment of Leachate with Discharge to London Sewage Works

The City of London Greenway Water Pollution Control Plant currently accepts raw leachate from the existing Warwick Landfill Site. Henderson Paddon and Associates Limited assessed the capacity of the plant in DP#8. that report concluded that this plant could satisfactorily handle pre-treated leachate from the site. The pretreated leachate would represent significantly less than one percent of the hydraulic capacity of the plant.

Trucking Leachate

When the landfill commences operation, leachate volumes may be relatively small because leachate quantities may lag behind landfill development. Leachate flow at various stages of site development will vary from 55 to 202 m3/day.

Once the site is fully developed and the waste has reached field capacity with respect to moisture content, it is estimated that approximately 202 m^3/day of pre-treated leachate would be generated, requiring about 6 trucks per day if all leachate were trucked.

The truck route is anticipated as follows:

- Exit the site onto County Road 79;
- Proceed northerly to Highway 402 west to Highway 401 West,
- Exit Highway 401 at Wellington Street South and proceed to Dingman Drive.

The total haul distance is 70 km from the site.

Contingencies

WM proposes the following contingencies:

- The possibility of trucking treated leachate to other area treatment plants, in addition to the London sewage system should be maintained as a contingency in case of possible upsets at the Greenway plant. The following plants could be considered:
    - Blackwell Sideroad Leachate Treatment Plant;
    - City of Sarnia Water Pollution Control Plant;

The Blackwell sideroad plant already treats leachate from the closed landfill on-site. According to a report prepared by Conestoga-Rovers and Associates, February 1991, for the County of Lambton, the plant has approximately 67 m3/d of surplus capacity. AS a result, subject to on-site upgrades to handle off-site leachate, the plant could satisfactorily handle a portion of the leachate from this site.

The Sarnia Water Pollution Control Plant is located on St. Andrew Street in Sarnia. The plant operates at over 90 percent of its hydraulic capacity on occasion. The leachate from the landfill would require pre-treatment and represents close to a percent of the plants capacity.

Both plants are located in Sarnia and would be accessed from Highway 402 West via the local road network. The haul route for both plants is approximately 50 km.

Residuals Management

Most treatment processes product a sludge by-product that concentrates contaminants from the leachate. These residuals can be handled in one of three ways as follows:

a) Disposal of sludge in the landfill;

b) Solidify and re-landfill to prevent or reduce leaching of contaminants back into the landfill; or,

c) Remove to a hazardous waste disposal site or other suitable site.

A dewatering process to reduce volumes of sludge to be disposed of may be applied to reduce handling/transportation costs, especially for options b) and c).

Sludge management of residuals will have to be reviewed at the EPA level with respect to cost implications, effectiveness and environmental approvals as part of the ongoing assessment of alternative leachate treatment technologies.

4.8 Gas Management

4.8.1 General

The purpose of the system is to control landfill gas emissions, odours and reduce/eliminate offsite migration of landfill gas. The system would allow for landfill gas utilization in the future, if economically feasible. The landfill gas collection and flaring system will significantly reduce greenhouse gas emissions over the operating life of the site and during post-closure. Refer to **Exhibit 4-1** for the location of the gas management facility. Also, refer to **Exhibit 4-19** for the gas system for the entire site.

4.8.2 Gas Production

Based on the Scholl Canyon model to estimate gas production, the Warwick landfill is estimated to produce peak amounts of landfill gas ranging from approximately 13,900 m^3/hr to 20,700 m^3/hr without leachate recirculation and 23,100 m^3/hr to 31,300 m^3/hr with leachate recirculation. Peak landfill gas production is modelled to occur one (1) year following site closure. Significant gas will be produced for thirty to forty years after site closure. It is estimated that leachate recirculation within the landfill site would increase the gas production rate by approximately 30 percent.

It is typical to assume that the landfill gas collection system will achieve collection efficiency in the order of at least 70 percent. Therefore, it is likely that between 16,200 m3/hr and 21,900 m3/hr of landfill gas of approximately 50 percent combustible gas by volume can be collected from the landfill during the peak production rate for flaring and/or utilization.

Collection and flaring of 21,900 m^3/hr of landfill gas at 50 percent methane from the Warwick landfill site would reduce greenhouse gas emissions by an approximate 1,461,000-tonnes/year carbon dioxide equivalent.

4.8.3 Gas Utilization

If economically feasible, the landfill gas collected could be used for power production. This would provide for both a significant reduction in greenhouse gas emissions and a “green” alternative to power production.

System Characteristics

The gas collection system is a portion of the system that collects and transports the landfill gas from the fill area to the mechanical and flaring system. The landfill gas collection design is based on the installation of vertical wells and horizontal landfill gas collection pipes connected by below-grade piping.

The mechanical portion of the landfill gas collection and flaring system would consist of a series of blowers installed within a building, which would provide the required vacuum to extract the landfill gas through the landfill gas collection system. The series of blowers would be phased in as landfill gas generation rates increase over the site life.

It is expected that the landfill gas would be flared within three (3) fully enclosed flares. The flare operating temperature will range from up to 950ºC, with a minimum residence time of 0.75 sec. Various safety devices would be installed within the system to ensure a proper residence time within the stack to store landfill gas and to ensure that temperatures are optimum within the stack

Control of Emissions, Landfill Gas

Landfill gas odours and emissions will be controlled by the landfill gas and leachate collection system in conjunction with regular capping and vegetation for the landfill. Progressive installation of the landfill gas system, as the working face expands into new areas, will control emissions and odours. Such gas collection systems include both horizontal and vertical systems, as proposed in the report. Other proactive work to control emissions and odours are listed below:

- Provide interim cover on areas that remain dormant for some extended time.
- Carry out annual capping of completed landfill cells with final soil and vegetation to minimize landfill odour emissions.
- Conduct regular inspections of the landfill cap to identify any fissures, cracks or erosion that could allow landfill gas to escape.
- Maintain the leachate collection system, including manholes, cleanouts, etc., under negative pressure to minimize any escape of odours.
- Develop a monitoring program to include the following:
    - Outline landfill cover inspection intervals.
    - Record odour complaints.
    - Develop a reporting system for odour complaints relating to meteorological conditions, location, wind speed and direction to refute or assist in determining odour sources and note on-site activity that might cause or exacerbate any odour complaints.
    - Institute more mitigation measures as a result of the complaint, if justified
    - Document successes in alleviating odour complaints.

4.8.4 Landfill Gas Monitoring and Safety

As part of the design and operation of landfill gas, the safety issues with respect to such gas must be contemplated and accommodated.

The following will be implemented:

- Equip foundations of on-site buildings with passive landfill gas venting systems.
- Manholes will be equipped with appropriate explosive hazard signage.
- On-site buildings, if adjacent to the landfill, will be equipped with methane detectors to detect and alarm at 10 percent of lower explosive limit.
- A monitoring program will be developed to monitor landfill gas movement and at the landfill boundary. Regular monitoring of the landfill gas monitoring probes will be implemented.
- Triggers and verification will be defined for landfill gas levels, which would initiate further remedial work, if required, consisting of passive control systems, active control systems or physical barriers.

Contingency systems will be developed if monitoring indicates the control of landfill gas is not in accordance with predictions and requires further controls. Such contingencies might involve the following:

- Inspection/testing of the collection system to determine any areas malfunctioning;
- Increasing the vacuum on the extraction system, particularly in close proximity to high value reading monitors; and/or,
- Additional gas extraction in areas of concern.

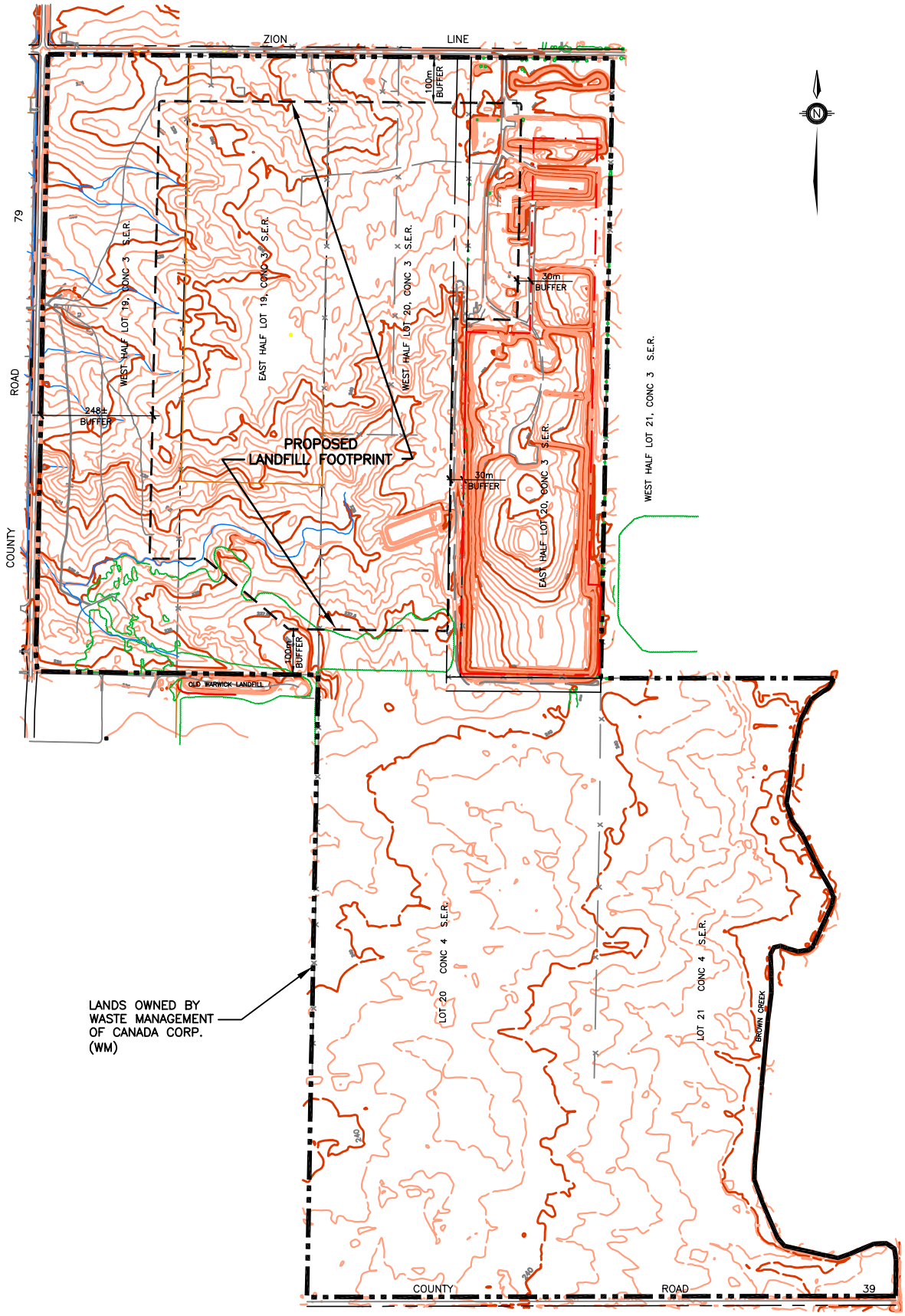


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EXHIBIT 4-2

DWN BY: T C G
CHK BY: F C F
DATE: 12/07/05
SCALE: 1:12,500

WASTE MANAGEMENT OF CANADA CORP.

DRAWING NO. 197716-D8-1

CWS LANDS

WARWICK LANDFILL

WASTE MANAGEMENT

HENDERSON, PADDON & ASSOCIATES LIMITED
CIVIL & ENVIRONMENTAL ENGINEERING CONSULTANTS
OWEN SOUND • THE BLUE MOUNTAINS • GRIMSBY
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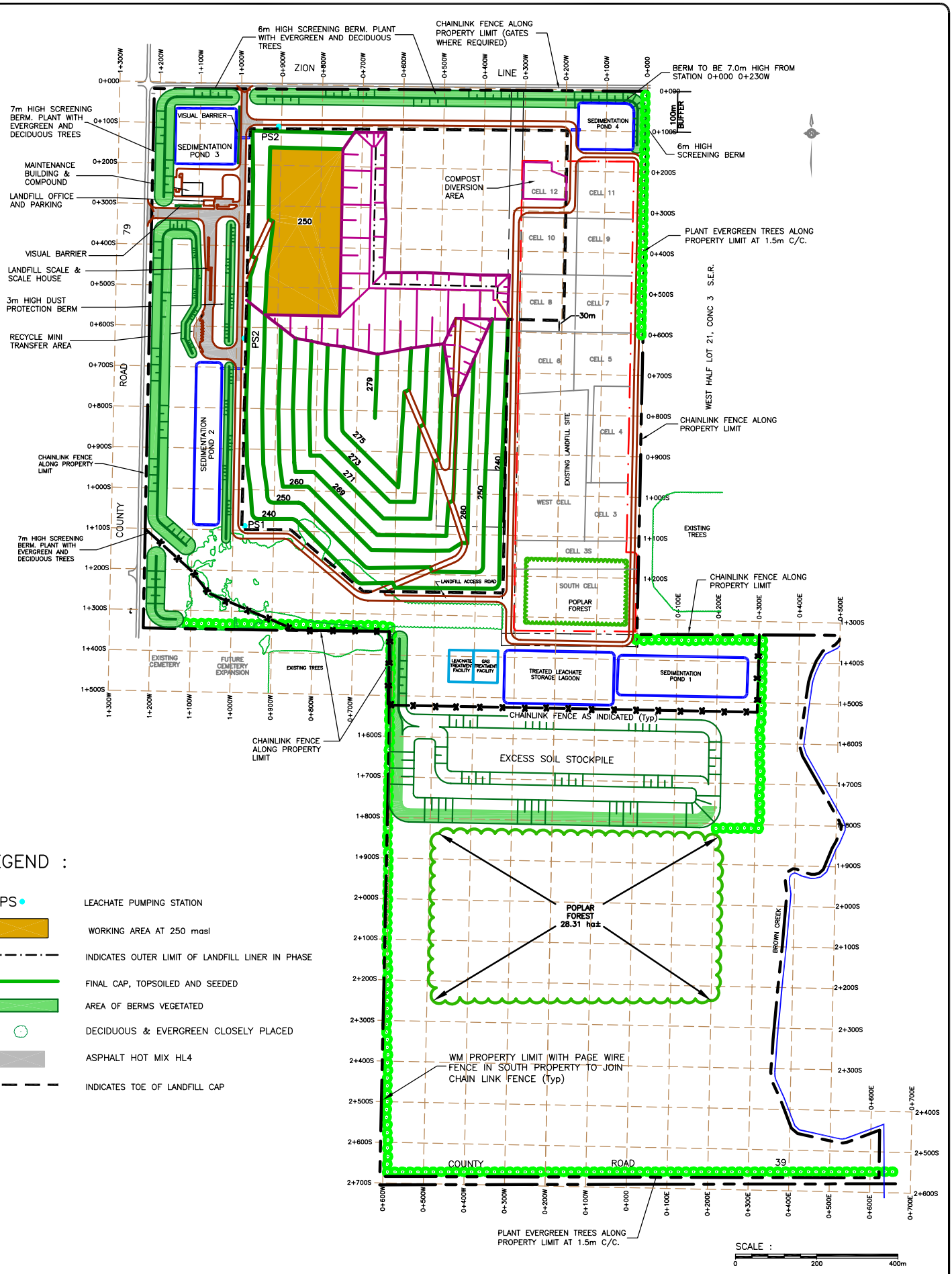

LEGEND :

- PS — LEACHATE PUMPING STATION
- WORKING AREA AT 250 masl
- INDICATES OUTER LIMIT OF LANDFILL LINER IN PHASE
- FINAL CAP, TOPSOILED AND SEEDED
- AREA OF BERMS VEGETATED
- DECIDUOUS & EVERGREEN CLOSELY PLACED
- ASPHALT HOT MIX HL4
- INDICATES TOE OF LANDFILL CAP

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EXHIBIT 4-3

DWN BY: T C G
CHK BY: F C F
DATE: 12/07/05
SCALE: 1:12,500

WASTE MANAGEMENT OF CANADA CORP.

DRAWING NO. 197716-D8-11

PHASE 7
LANDFILL DEVELOPMENT

WARWICK LANDFILL

WASTE MANAGEMENT

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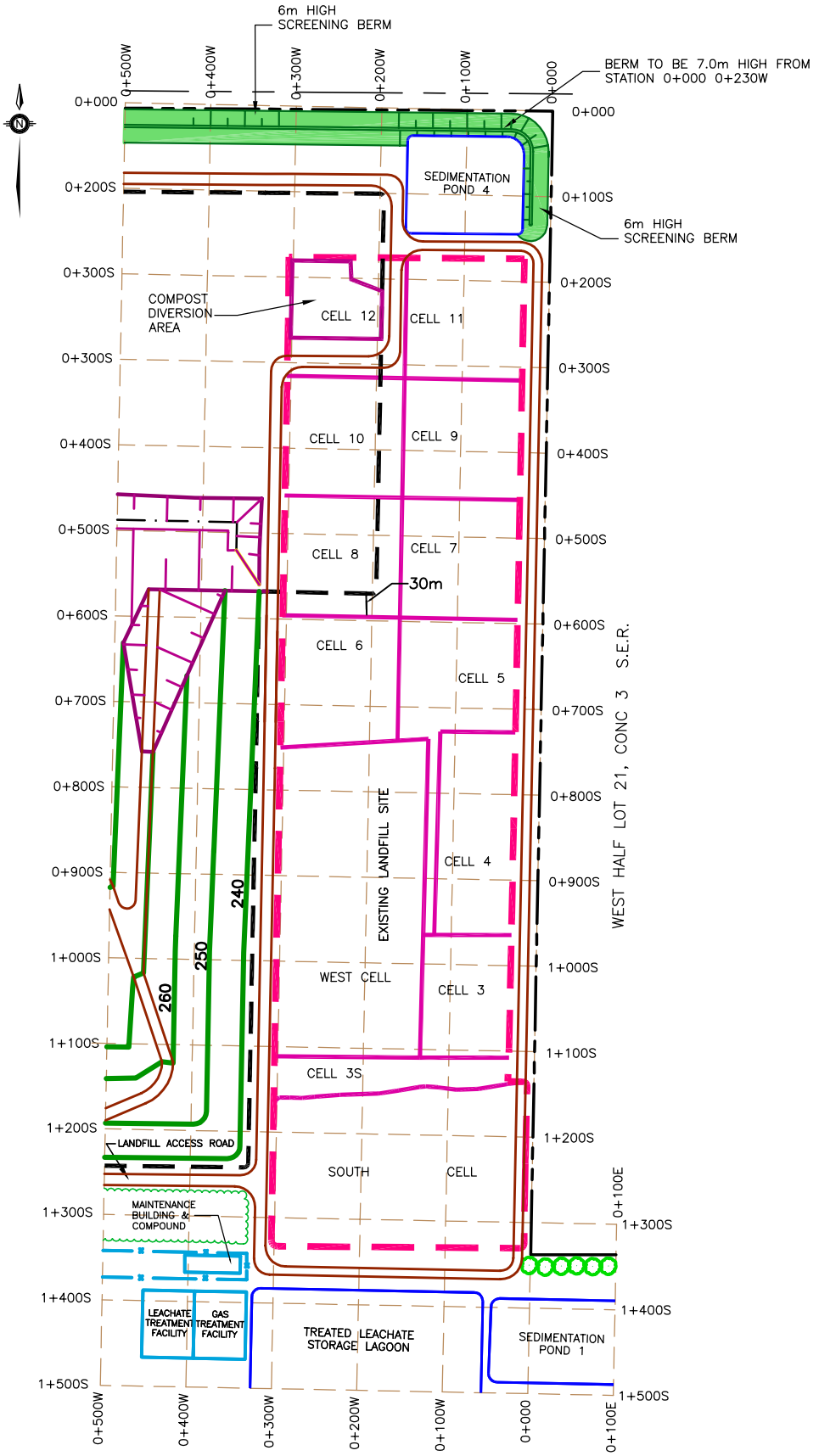

LEGEND :

- INDICATES NORTH LIMIT OF LANDFILL LINER IN PHASE
- FINAL CAP, TOPSOILED AND HYDROSEEDED
- ACCESS ROAD
- AREA OF BERMS VEGETATED

SCALE : 0 200 400m

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EXHIBIT 4-4

DWN BY: T C G
CHK BY: F C F
DATE: 12/07/05
SCALE: 1:7,500

WASTE MANAGEMENT OF CANADA CORP.

DRAWING NO. 197716-D8-11B

EXISTING LANDFILL CELLS
LANDFILL DEVELOPMENT

WARWICK LANDFILL

WASTE MANAGEMENT

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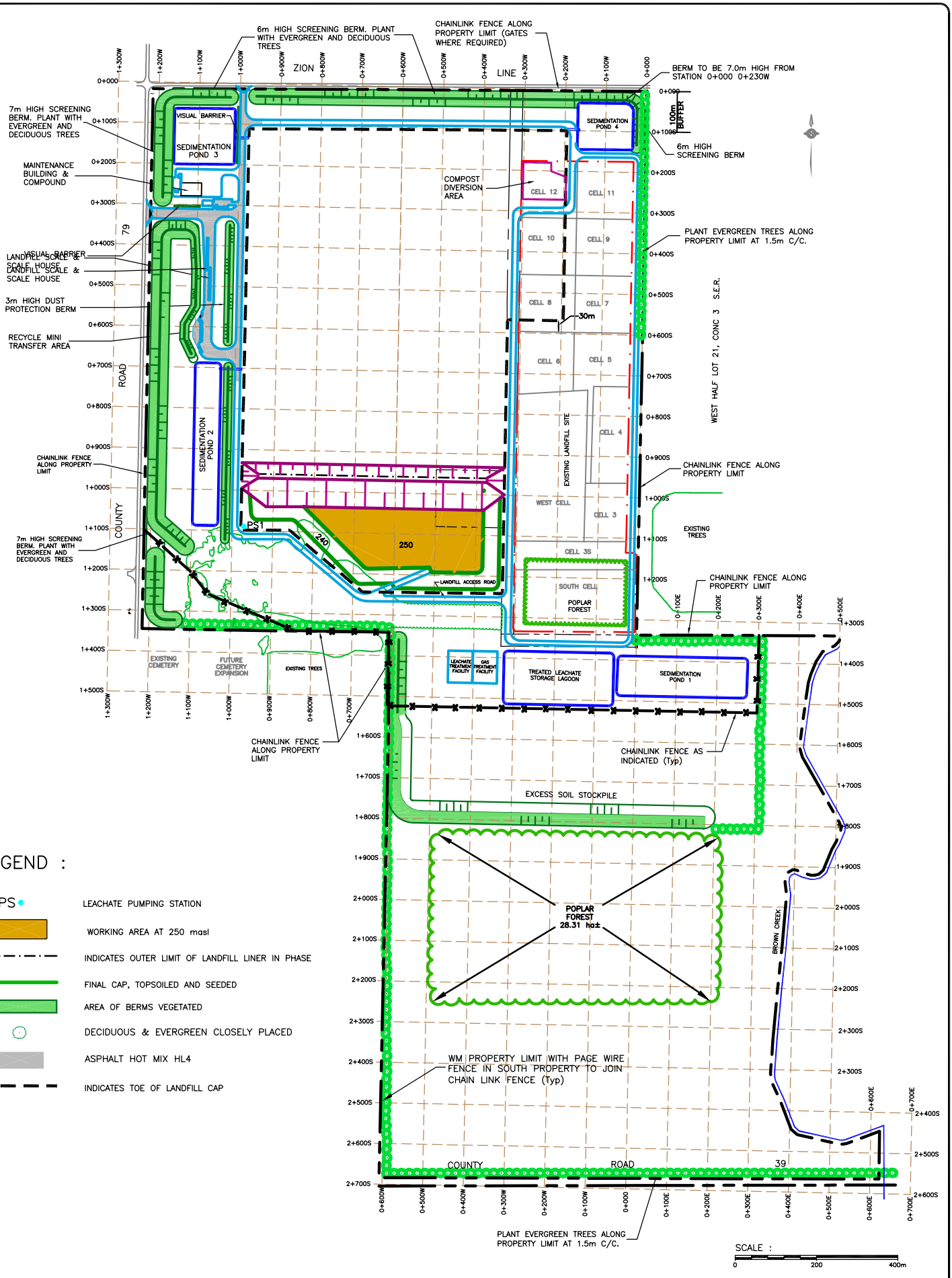

LEGEND :

- PS — LEACHATE PUMPING STATION
- WORKING AREA AT 250 masl
- INDICATES OUTER LIMIT OF LANDFILL LINER IN PHASE
- FINAL CAP, TOPSOILED AND SEEDED
- AREA OF BERMS VEGETATED
- DECIDUOUS & EVERGREEN CLOSELY PLACED
- ASPHALT HOT MIX HL4
- INDICATES TOE OF LANDFILL CAP

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EXHIBIT 4-5

DWN BY: T C G
CHK BY: F C F
DATE: 12/07/05
SCALE: 1:12,500

WASTE MANAGEMENT OF CANADA CORP.

DRAWING NO. 197716-D8-5

PHASE 1
LANDFILL DEVELOPMENT

WARWICK LANDFILL

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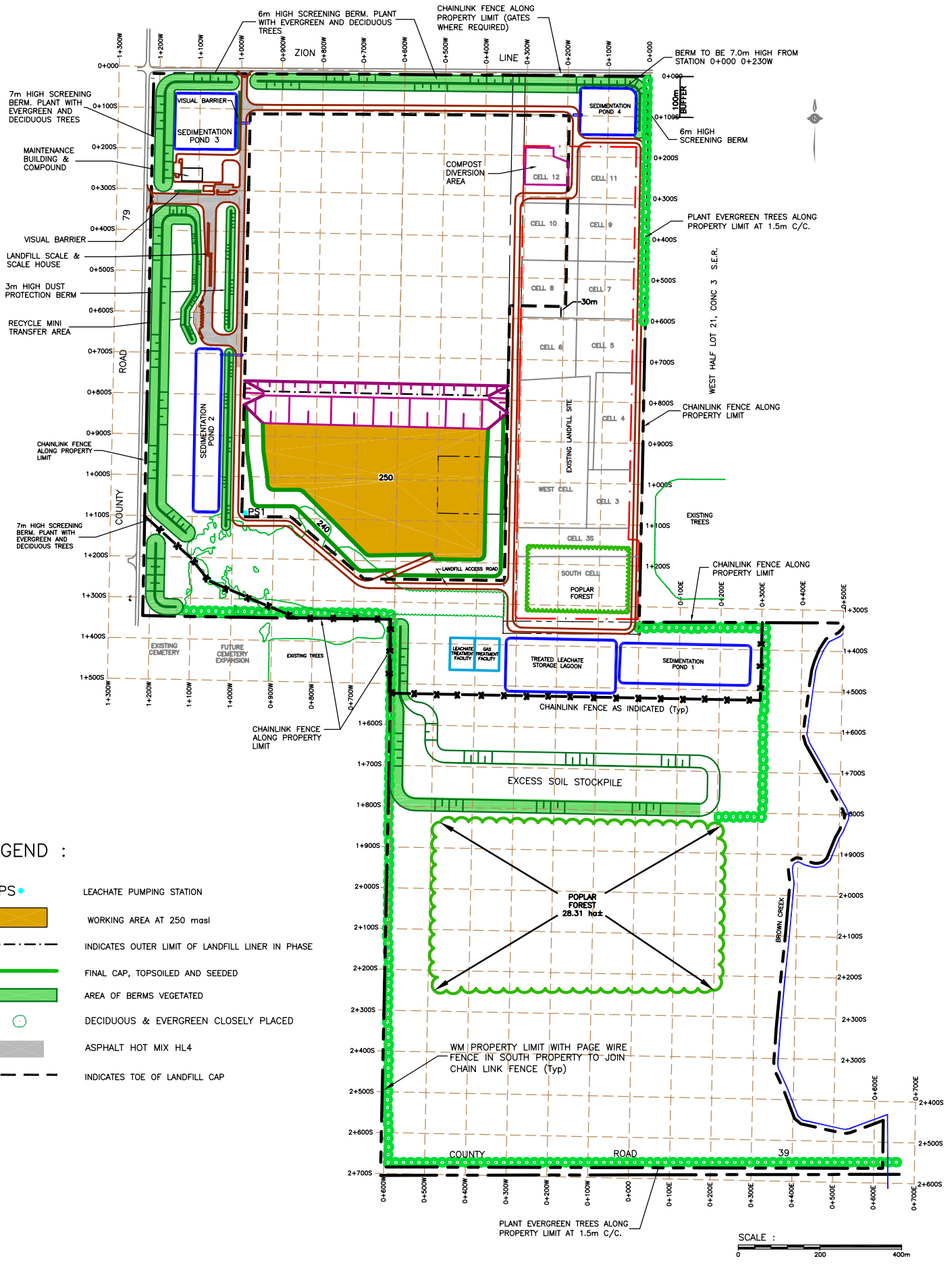

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- PS — LEACHATE PUMPING STATION
- WORKING AREA AT 250 masl
- INDICATES OUTER LIMIT OF LANDFILL LINER IN PHASE
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- ASPHALT HOT MIX HL4
- INDICATES TOE OF LANDFILL CAP

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EXHIBIT 4-6

DWN BY: T C G
CHK BY: F C F
DATE: 12/07/05
SCALE: 1:12,500

WASTE MANAGEMENT OF CANADA CORP.

DRAWING NO. 197716-D8-6

PHASE 2
LANDFILL DEVELOPMENT

WARWICK LANDFILL

WASTE MANAGEMENT

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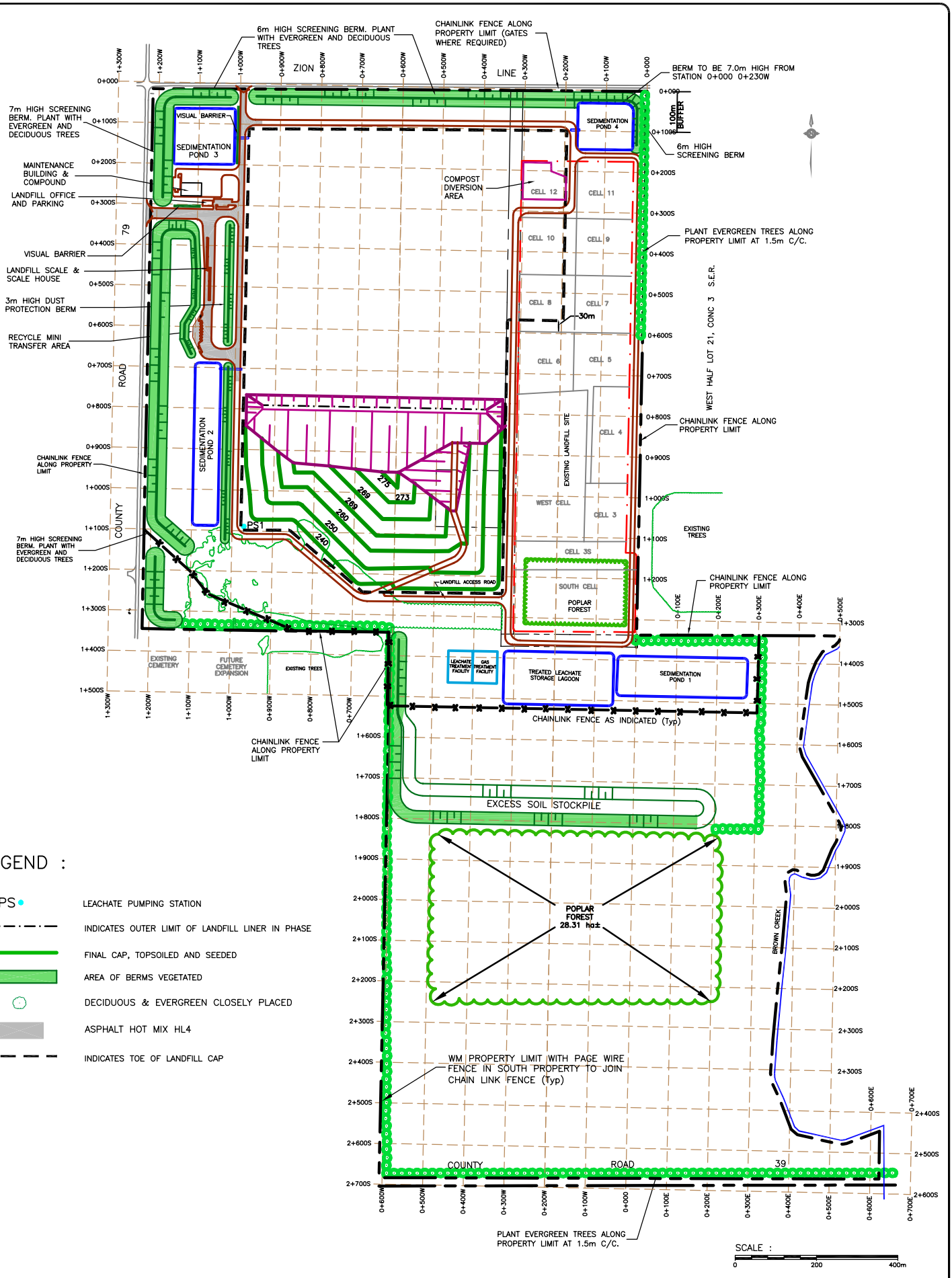

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- ASPHALT HOT MIX HL4
- INDICATES TOE OF LANDFILL CAP

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EXHIBIT 4-7

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CHK BY: F C F
DATE: 12/07/05
SCALE: 1:12,500

WASTE MANAGEMENT OF CANADA CORP.

DRAWING NO. 197716-D8-7

PHASE 3
LANDFILL DEVELOPMENT

WARWICK LANDFILL

WASTE MANAGEMENT

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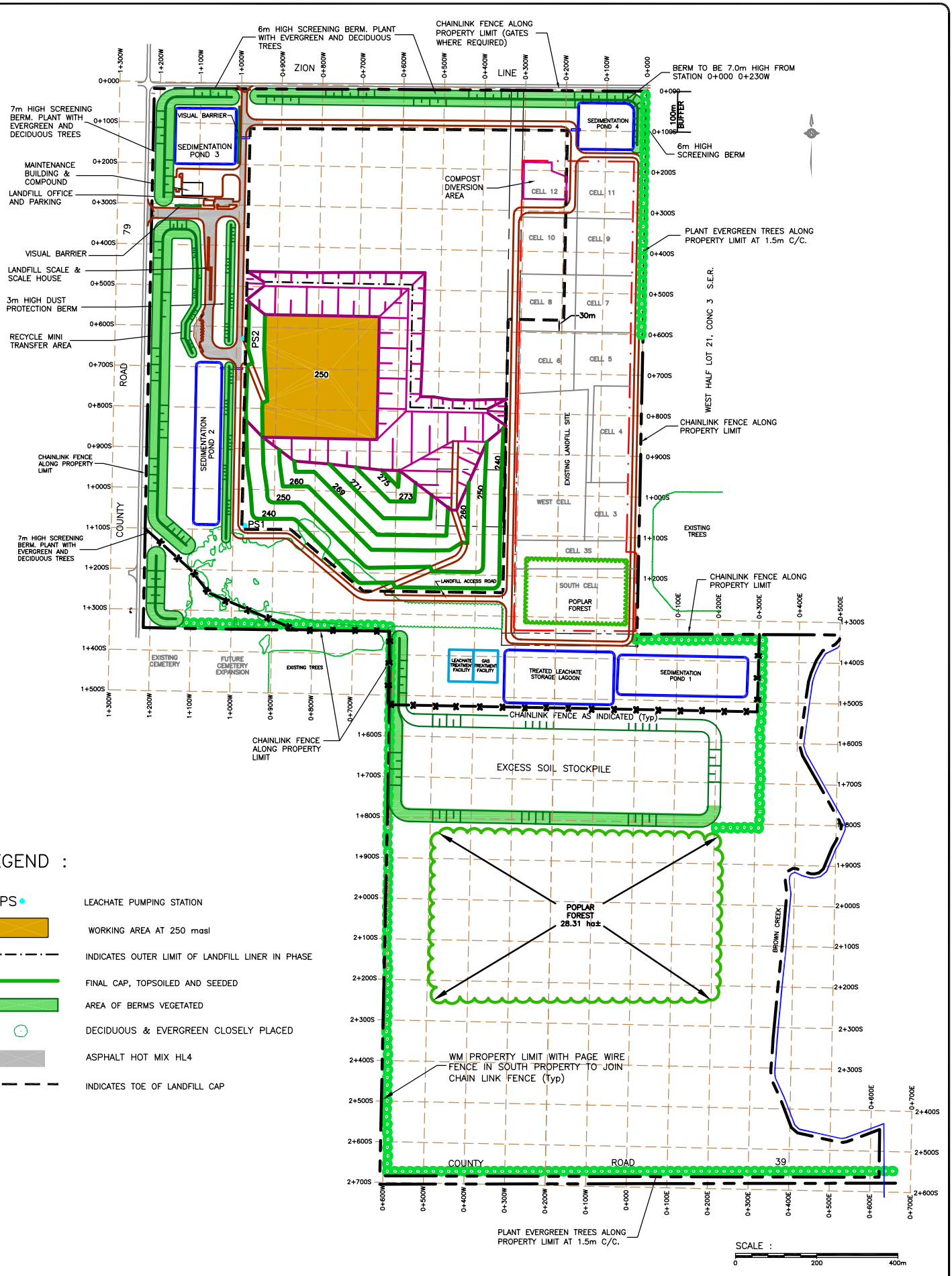

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- ASPHALT HOT MIX HL4
- INDICATES TOE OF LANDFILL CAP

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EXHIBIT 4-8

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DATE: 12/07/05
SCALE: 1:12,500

WASTE MANAGEMENT OF CANADA CORP.

DRAWING NO. 197716-D8-8

PHASE 4
LANDFILL DEVELOPMENT

WARWICK LANDFILL

WASTE MANAGEMENT

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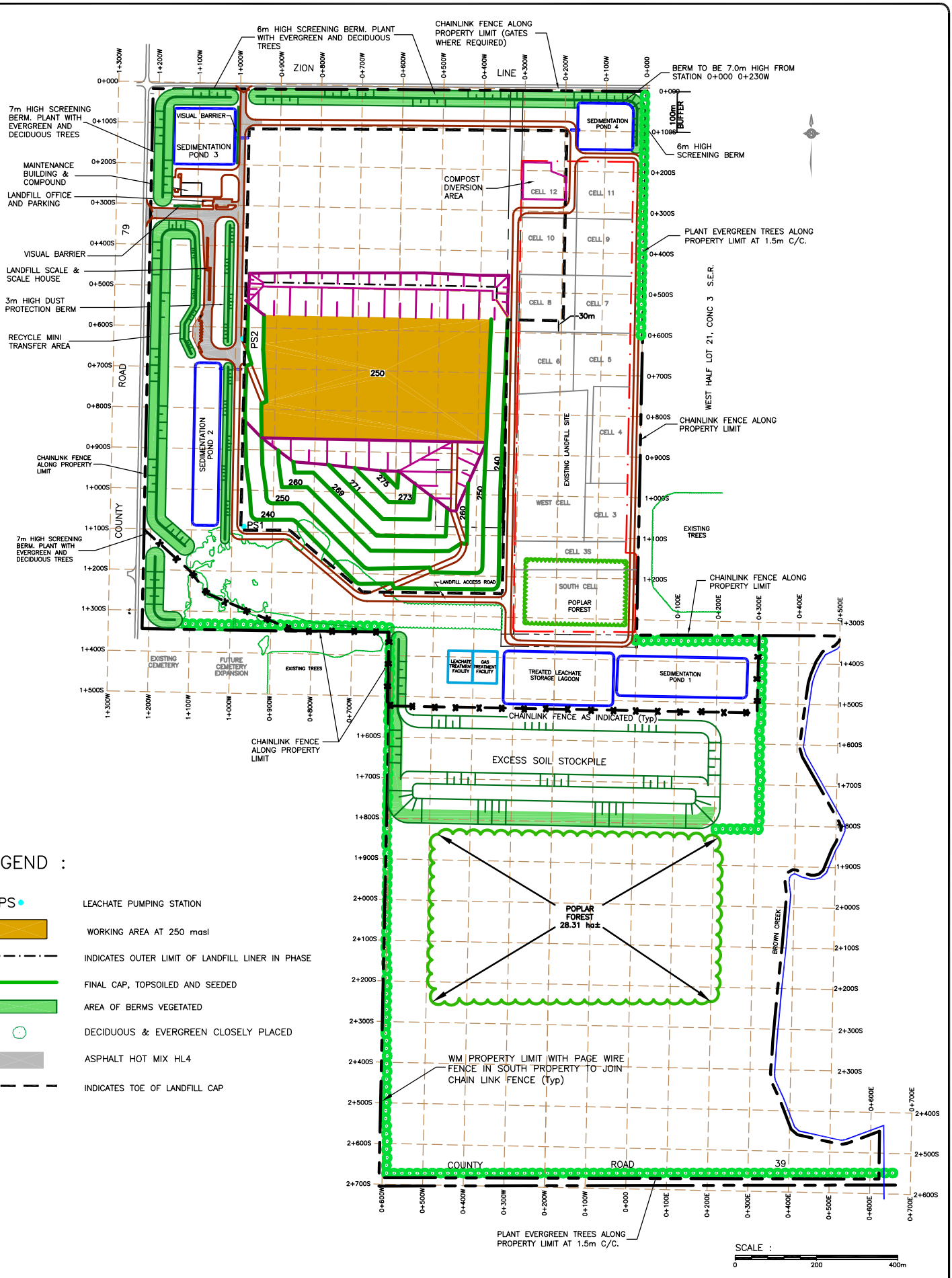

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EXHIBIT 4-9

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DATE: 12/07/05
SCALE: 1:12,500

WASTE MANAGEMENT OF CANADA CORP.

DRAWING NO. 197716-D8-9

PHASE 5
LANDFILL DEVELOPMENT

WARWICK LANDFILL

WASTE MANAGEMENT

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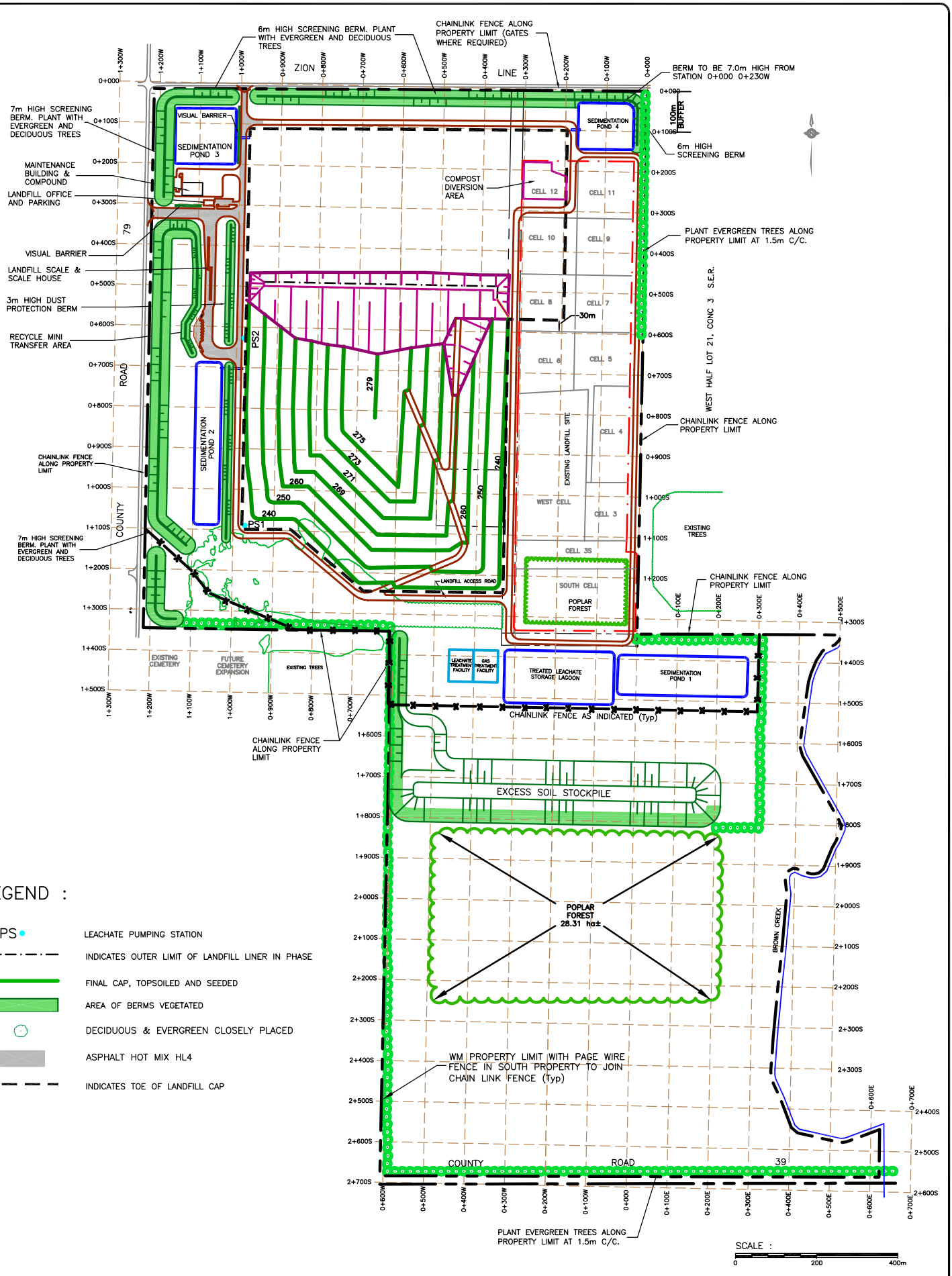

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EXHIBIT 4-10

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CHK BY: F C F
DATE: 12/07/05
SCALE: 1:12,500

WASTE MANAGEMENT OF CANADA CORP.

DRAWING NO. 197716-D8-10

PHASE 6
LANDFILL DEVELOPMENT

WARWICK LANDFILL

WASTE MANAGEMENT

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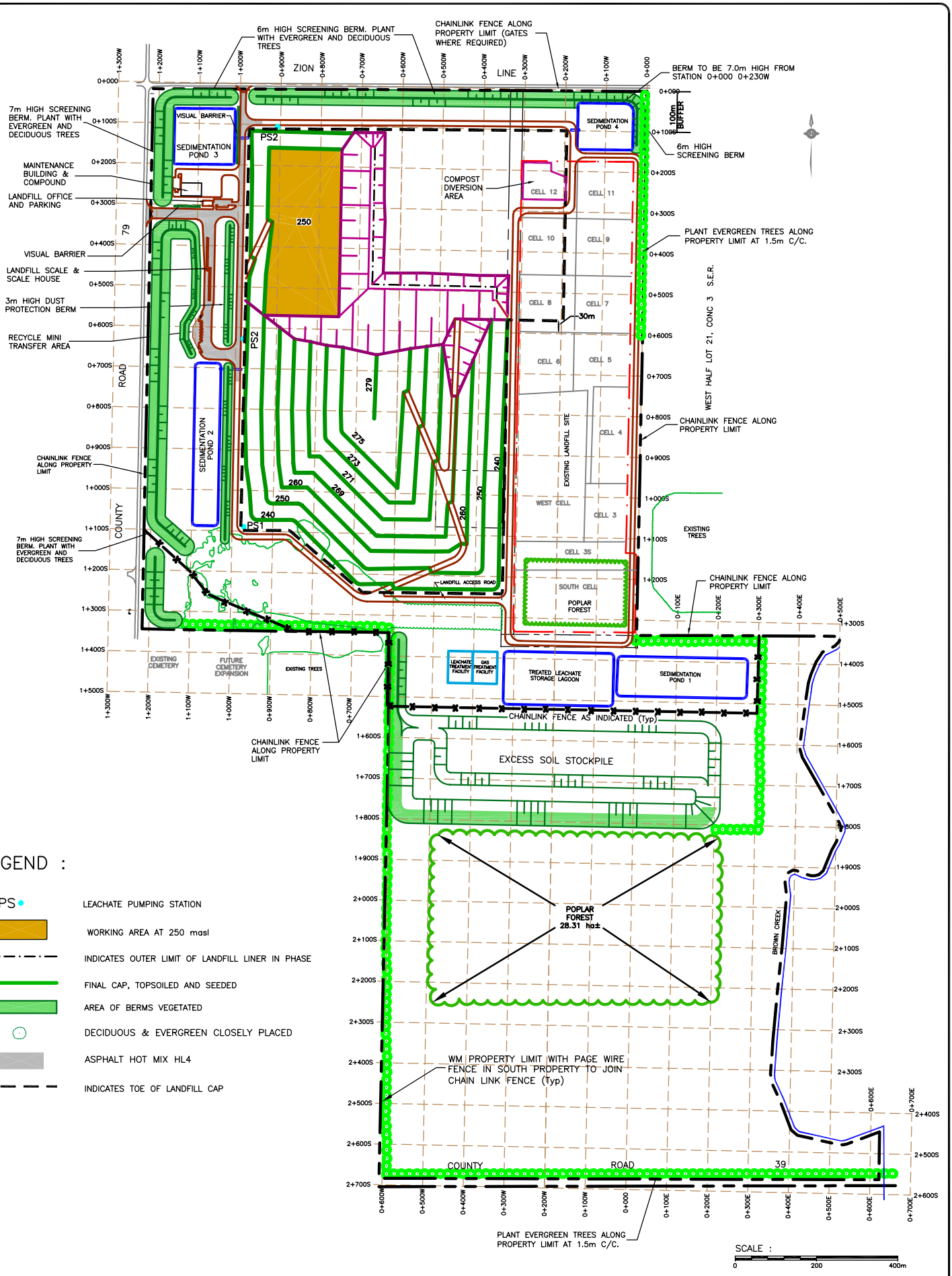

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- INDICATES TOE OF LANDFILL CAP

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EXHIBIT 4-11

DWN BY: T C G
CHK BY: F C F
DATE: 12/07/05
SCALE: 1:12,500

WASTE MANAGEMENT OF CANADA CORP.

DRAWING NO. 197716-D8-11

PHASE 7
LANDFILL DEVELOPMENT

WARWICK LANDFILL

WASTE MANAGEMENT

HENDERSON, PADDON & ASSOCIATES LIMITED
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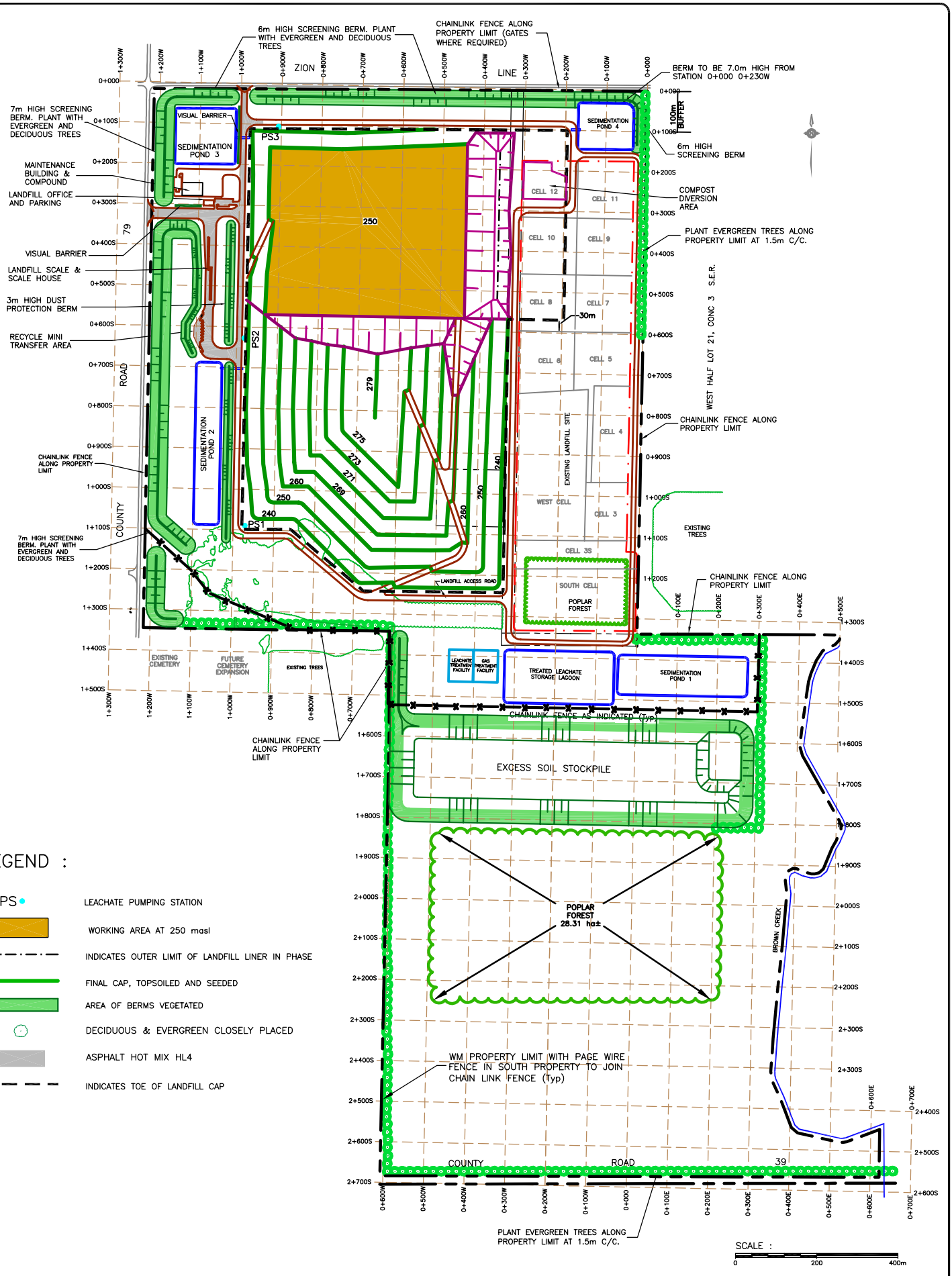

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- FINAL CAP, TOPSOILED AND SEEDED
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- ASPHALT HOT MIX HL4
- INDICATES TOE OF LANDFILL CAP

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EXHIBIT 4-12

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CHK BY: F C F
DATE: 12/07/05
SCALE: 1:12,500

WASTE MANAGEMENT OF CANADA CORP.

DRAWING NO. 197716-D8-12

PHASE 8
LANDFILL DEVELOPMENT

WARWICK LANDFILL

WASTE MANAGEMENT

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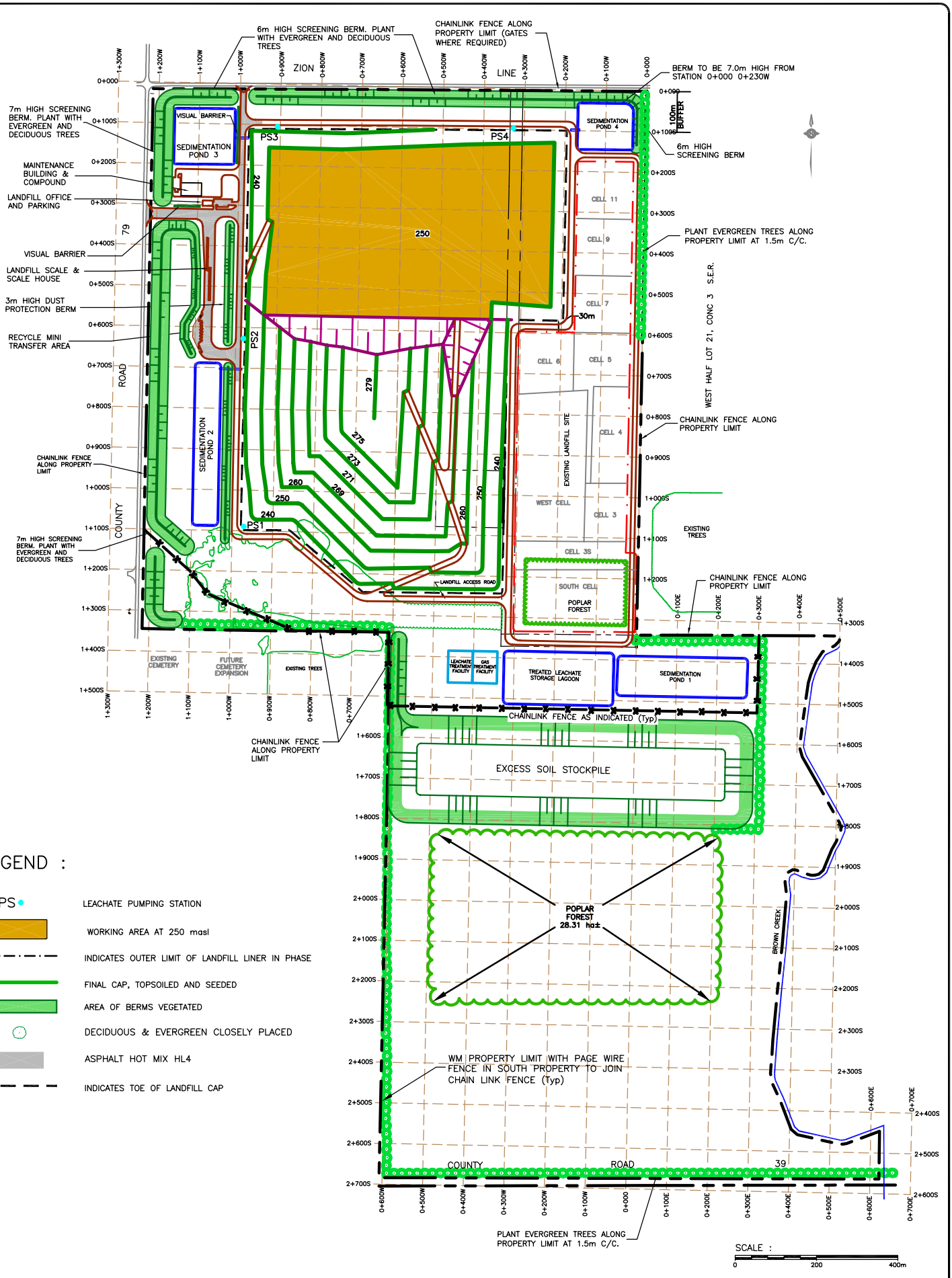

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- FINAL CAP, TOPSOILED AND SEEDED
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- ASPHALT HOT MIX HL4
- INDICATES TOE OF LANDFILL CAP

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EXHIBIT 4-13

DWN BY: T C G
CHK BY: F C F
DATE: 12/07/05
SCALE: 1:12,500

WASTE MANAGEMENT OF CANADA CORP.

DRAWING NO. 197716-D8-13

PHASE 9
LANDFILL DEVELOPMENT

WARWICK LANDFILL

WASTE MANAGEMENT

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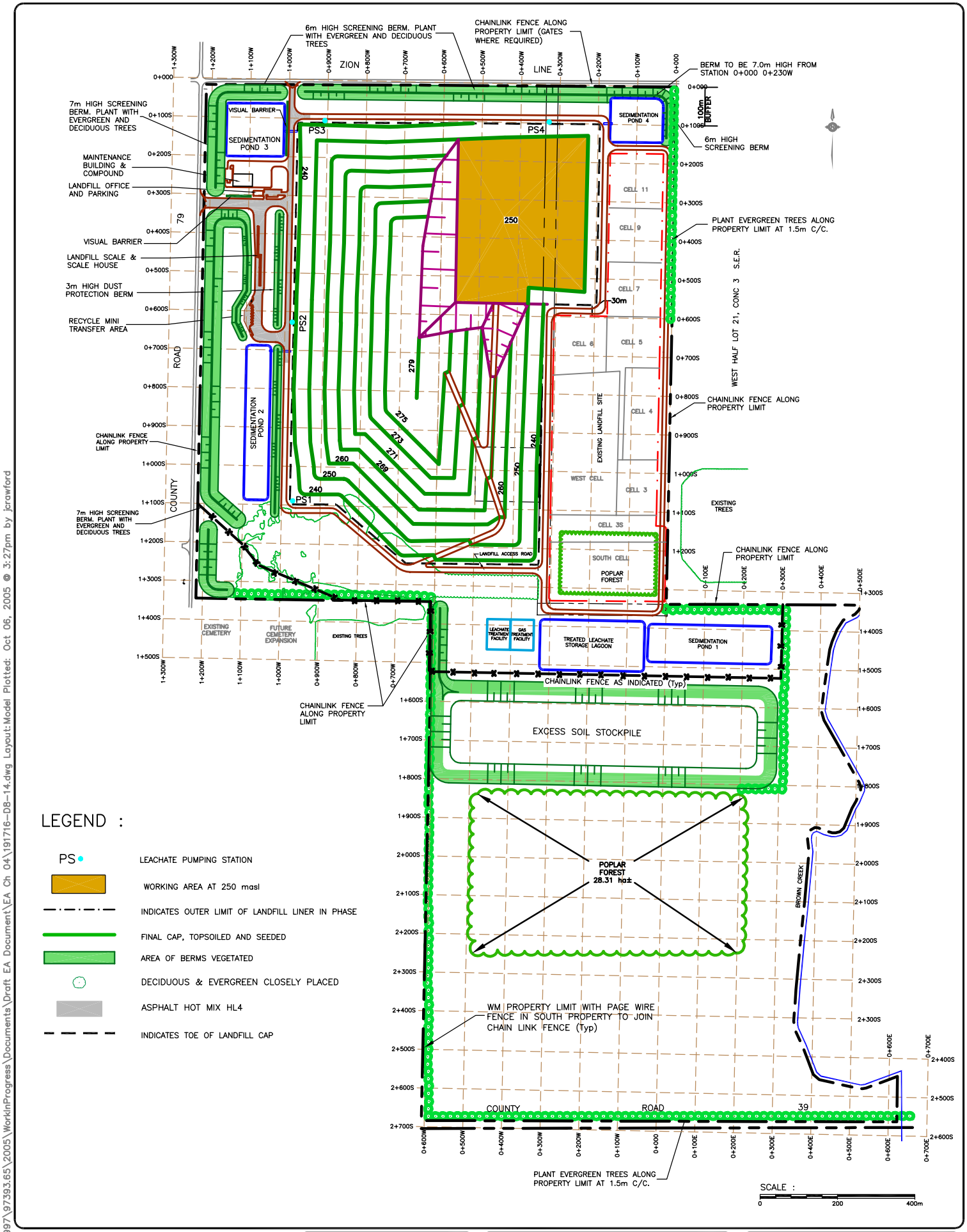

LEGEND :

- PS● — LEACHATE PUMPING STATION
- WORKING AREA AT 250 masl
- INDICATES OUTER LIMIT OF LANDFILL LINER IN PHASE
- FINAL CAP, TOPSOILED AND SEEDED
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- DECIDUOUS & EVERGREEN CLOSELY PLACED
- ASPHALT HOT MIX HL4
- INDICATES TOE OF LANDFILL CAP

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EXHIBIT 4-14

DWN BY: T C G
CHK BY: F C F
DATE: 12/07/05
SCALE: 1:12,500

WASTE MANAGEMENT OF CANADA CORP.

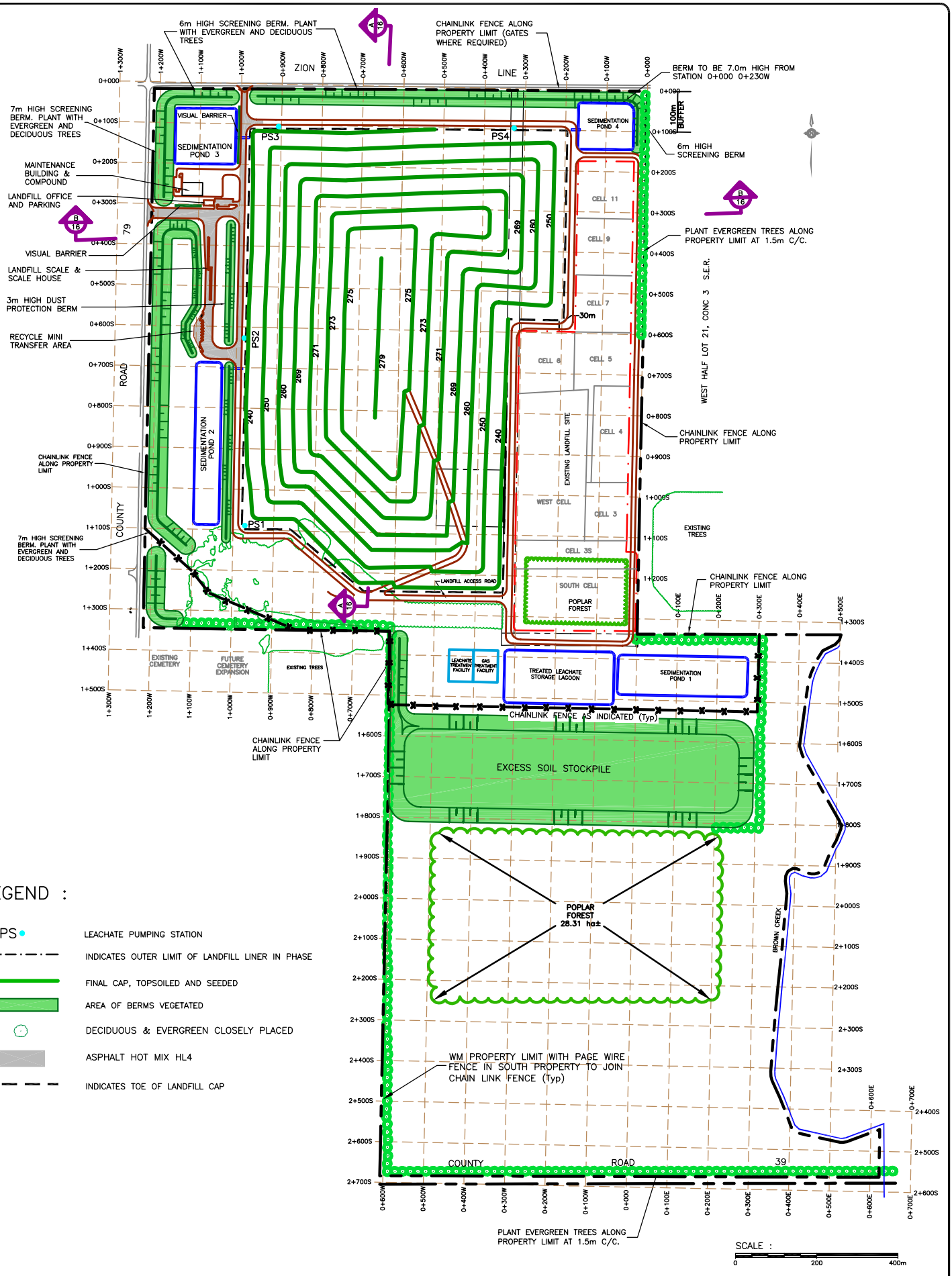
DRAWING NO. 197716-D8-14

PHASE 10
LANDFILL DEVELOPMENT

WARWICK LANDFILL

WASTE MANAGEMENT

HENDERSON, PADDON & ASSOCIATES LIMITED
CONSULTING ENGINEERS
OWEN SOUND • THE BLUE MOUNTAINS • GRIMSBY
Tele (519)376-7612 Fax (519)376-8008



LEGEND :

- PS● — LEACHATE PUMPING STATION
- INDICATES OUTER LIMIT OF LANDFILL LINER IN PHASE
- FINAL CAP, TOPSOILED AND SEEDED
- AREA OF BERMS VEGETATED
- DECIDUOUS & EVERGREEN CLOSELY PLACED
- ASPHALT HOT MIX HL4
- INDICATES TOE OF LANDFILL CAP

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EXHIBIT 4-15

DWN BY: T C G
CHK BY: F C F
DATE: 12/07/05
SCALE: 1:12,500

WASTE MANAGEMENT OF CANADA CORP.

DRAWING NO. 197716-D8-15

PHASE 11 CLOSEOUT
LANDFILL DEVELOPMENT

WARWICK LANDFILL

WASTE MANAGEMENT

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WASTE MANAGEMENT

PROPOSED LINER SCHEMATIC

WARWICK LANDFILL

DWN BY: T C G
CHK BY: F C F
DATE: 14/04/04
SCALE: NTS

WASTE MANAGEMENT OF CANADA CORP.

DRAWING NO. 197716-D8-18C

EXHIBIT 4-16

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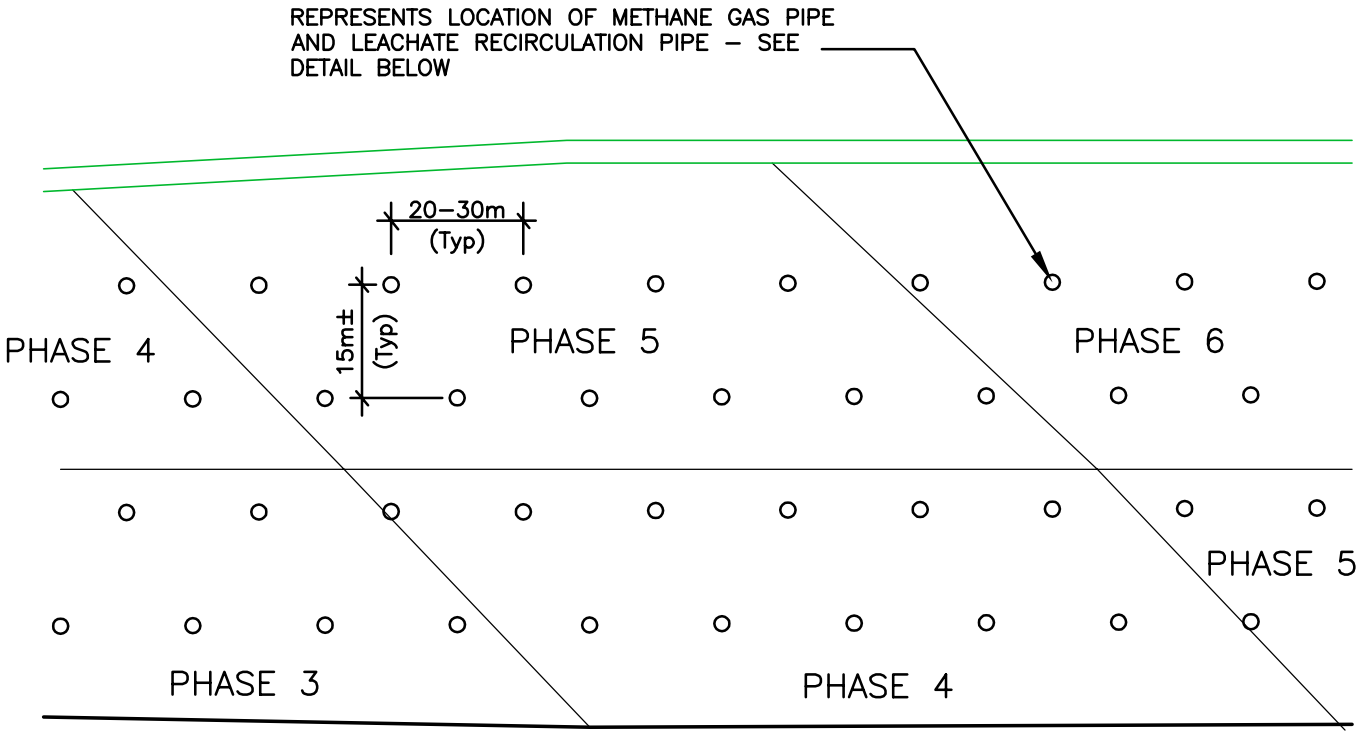
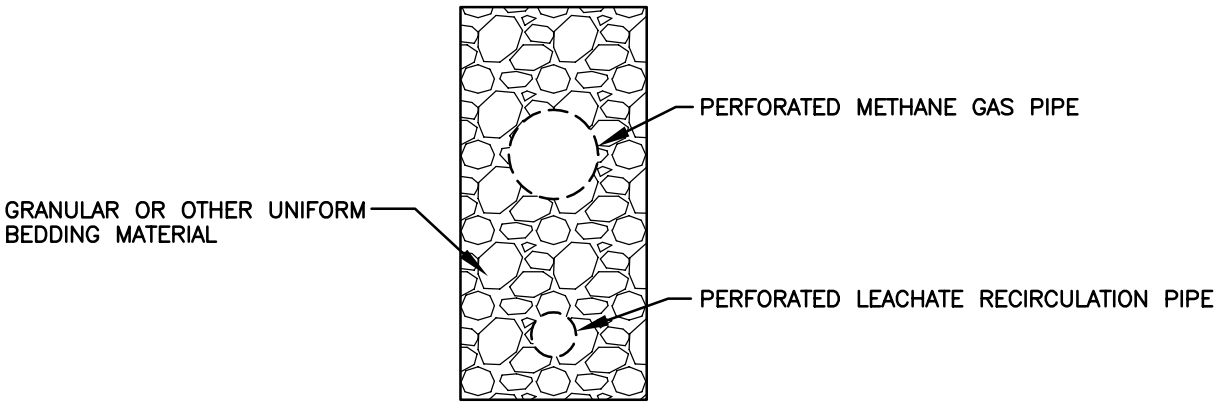


METHANE GAS AND LEACHATE RECIRCULATION PIPE LAYOUT (Typ)

NTS



PIPE SEPARATION DETAIL

NTS

EXHIBIT 4-17

DWN BY: T C G CHK BY: F C F DATE: 14/04/04 SCALE: 1:12,500

WASTE MANAGEMENT OF CANADA CORP.

DRAWING NO. 197716-D8-19

RECIRCULATION PIPING SCHEMATIC

WARWICK LANDFILL

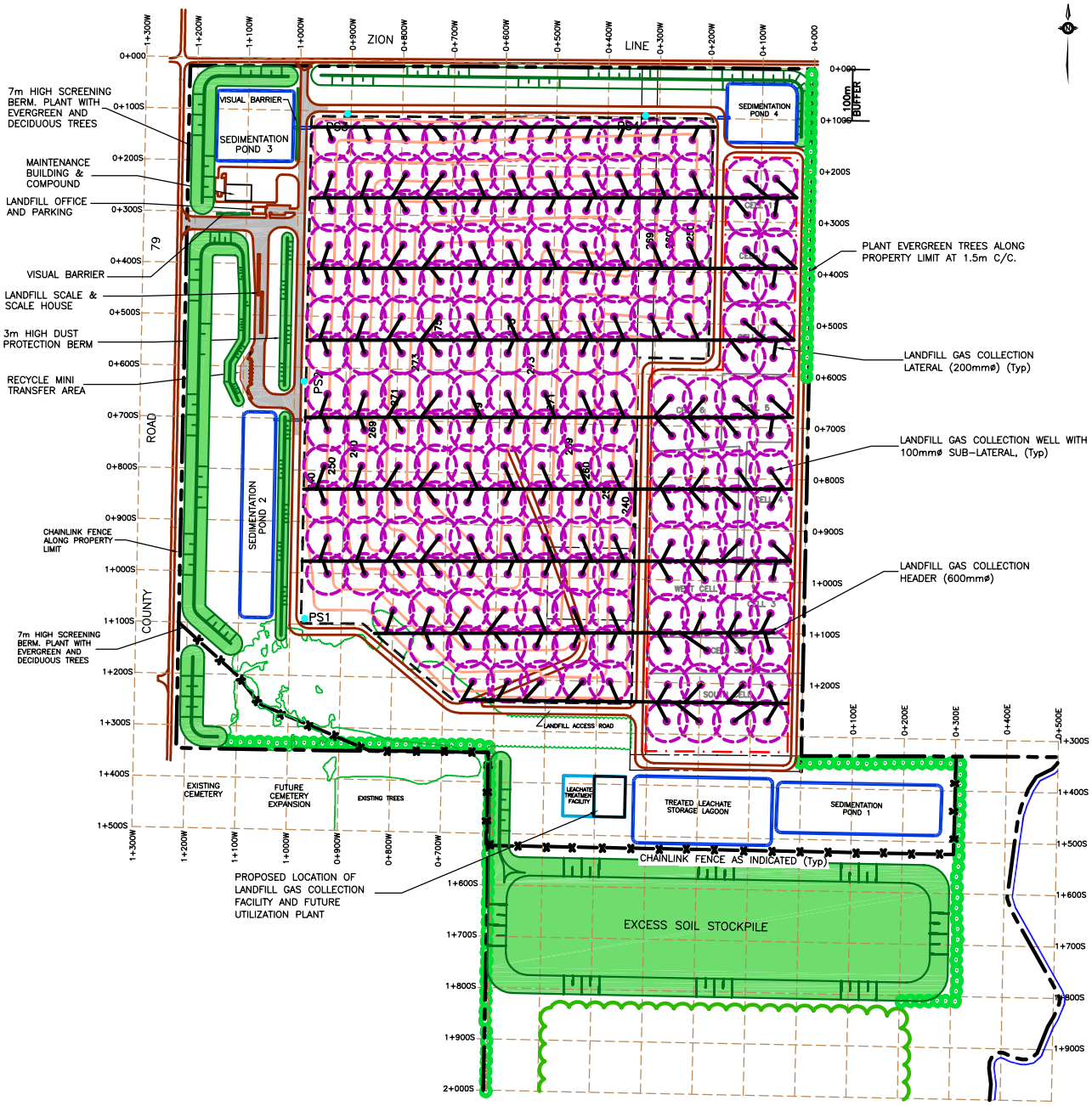
WASTE MANAGEMENT

HENDERSON, PADDON & ASSOCIATES LIMITED
CONSULTING ENGINEERS
OWEN SOUND • THE BLUE MOUNTAINS • GRIMSBY
Tele (519)376-7612 Fax (519)376-8008

Exhibit 4-18
PEAK LEACHATE STRENGTHS
WM - WARWICK LANDFILL EXPANSION

Parameter	Peak Concentration (mg/L)	Average Concentration (mg/L) (1993 Data - Keele Valley)
Chloride	2,500	
Conductivity (S/cm)		17,300
pH (-)		6.5
DOC	5,400	
Sulphate	150	
COD	22,000	
Phenols		3.06
Alkalinity (CaC03)		6,478
Calcium	1,650	
Magnesium		436
Sodium	1,485	
Potassium		725
Iron	500	
Ammonia (N)		487
Nitrate (N)		25.6
Nitrite (N)	<0.06	
Kjeldahl Nitrogen		600
BOD	12,000	
Arsenic		<0.009
Cadmium	0.05	
Chromium	0.4	
Copper		0.016
Cyanide		<0.1
Lead	0.6	
Nickel		0.26
Manganese		9.9
Selenium		<0.002
Silver		<0.006
Zinc	4	
Barium		0.42
Aluminum	1.18	
Beryllium	<0.002	
Cobalt		0.03
Mercury	0.003	
Molybdenum	<0.005	
Titanium		<0.05
Vanadium		<0.028
Fluoride	0.37	
Phosphorus		1.43
Sulphide		0.52
Benzene (µg/L)	20	
Methylbenzene (µg/L)	170	
Dichloromethane (µg/L)	3,300	
Toluene (µg/L)	960	
M and P-Xylene (µg/L)	565	
O-Xylene (µg/L)	230	
Vinyl Chloride (µg/L)	55	
1,1 Dichloroethylene (µg/L)	20	
1,2 Dichloroethylene (µg/L)	480	
Trichloroethylene (µg/L)	55	
Tetrachloroethylene (µg/L)	20	
1,4 Dichlorobenzene (µg/L)	10	
1,2 Dichloroethane (µg/L)	15	

Note: Table values do not include Recirculation.



LEGEND:

- LIMIT OF LANDFILL CAP
- FINAL CAP, TOPSOILED AND HYDROSEEDED
- ASPHALT ACCESS ROAD
- AREA OF BERMS VEGETATED

NOTES :

1. SITE PLAN BASED ON INFORMATION PROVIDED BY HENDERSON, PADDON AND ASSOCIATES, FROM THEIR PROJECT 197716-D6-15 DATED MARCH, 2002.

SCALE : 0 200 400m

EXHIBIT 4-19

DWN BY: T C G
CHK BY: F C F
DATE: 12/07/05
SCALE: 1:12,500

WASTE MANAGEMENT OF CANADA CORP.

DRAWING NO. 197716-D8-26B

CONCEPTUAL WELLFIELD LAYOUT

WARWICK LANDFILL

WASTE MANAGEMENT

HENDERSON, PADDON & ASSOCIATES LIMITED
CONSULTING ENGINEERS
OWEN SOUND • THE BLUE MOUNTAINS • GRIMSBY
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5. DESCRIPTION OF THE ENVIRONMENT POTENTIALLY AFFECTED BY THE UNDERTAKING ON THE ALTERNATIVES

The description of the baseline conditions for the Warwick Landfill is structured by impact assessment discipline. Within each description where appropriate, the existing environment is described based on a regional/community setting, by on-site and in the site vicinity and along the haul route. The existing baseline conditions data represent the environment generally over the period of 1998 to 2001. The Landuse Planning projections for the County of Lambton, the Township of Warwick and the Village of Watford are then used to predict the future baseline conditions over the proposed life of the landfill expansion (25 years).

The baseline conditions are used in the impact assessment process as a starting point to measure changes in the environment that results from the incremental undertaking.

A list of each of the disciplines and the consultant responsible for preparing the baseline conditions background report is as follows:

Topic	Sub-Section
The Existing Landfill Characteristics	5.1.1
Agriculture	5.1.2
Air Quality	5.1.3
Archaeological	5.1.4
Economics	5.1.5
Hydrogeology	5.1.6
Natural Environment and Resources	5.1.7
Noise	5.1.8
Social	5.1.9
Surface Water	5.1.10
Transportation	5.1.11
Visual	5.1.12

This chapter is a synopsis of detailed baseline conditions reports by each discipline found in **Appendix C.**

5.1 Study Areas

For the purposes of the EA, each technical specialist defined study areas to apply the criteria and indicators appropriate to their discipline. The study area for each discipline varies in size from one another in order to predict a range of potential effects. They based each study area on their professional experience, industry standards, and met the requirements set out by the Ministry of the Environment or other applicable regulatory bodies.

As identified in the approved Terms of Reference, the study areas are organized into four sub areas:

- On-site;
- Site Vicinity;
- Along the Haul Routes; and
- Regional Setting

For the purposes of applying the criteria and indicators, the term "Site" was typically defined as referring to the landfill footprint (working area) plus the buffer zones (usually 100 m wide around the perimeter of the footprint). The Land Use study area is larger at 1 km around the landfill.

"Site Vicinity" is a variable distance from the site as determined for each discipline. The Land Use discipline chose a slightly larger site vicinity study area of 3 km.

The term "Haul Route" is the portion of the access route to the site between the Highway 402 interchange along County Road 79 and to the site entrance(s). The regional study area varies from discipline to discipline, described below.

5.1.1 Introduction

This Section of the EA Report provides the following information:

- **Existing Conditions –** A description of existing baseline environmental conditions in and around the Warwick Landfill Site in the year 2001.
- a on-site description of the existing Warwick landfill site reflecting the current Certificate of Approval, as amended in July 2004
- **Land Use Planning Projections –** The land use projections for Lambton County (over a 25 year period), including the Township of Warwick and Village of Watford.
- **Future Baseline Conditions –** A statement of the potential future baseline environmental conditions in and around the Warwick Landfill Site in the year 2026.
- This information will be used in conjunction with the facility characteristics of the proposed landfill expansion contained in Section 6 to perform the detailed impact assessment of the proposed landfill expansion described in Section 7.

5.1.2 Existing Baseline Conditions

This section describes the existing baseline conditions for the Warwick Landfill Site in the year 2001 and is structured as follows:

Topic/Discipline	Consultant
The Existing Landfill Characteristics	Henderson Paddon Environmental Inc.
Land Use	Weston Consultants
Agriculture	Stantec Consulting Ltd.
Air Quality	RWDI
Archaeological	Archaeological Services Limited
Economics	Urban Metrics Inc.
Hydrogeology	Jagger Hims Associates Ltd.
Natural Environment and Resources	Gartner Lee Limited
Noise	Aercoustics Engineering Limited
Social	IER Planning, Research and Management Services Inc.
Surface Water	Gartner Lee Limited
Transportation	Cansult Limited
Visual	Baker Turner Inc.

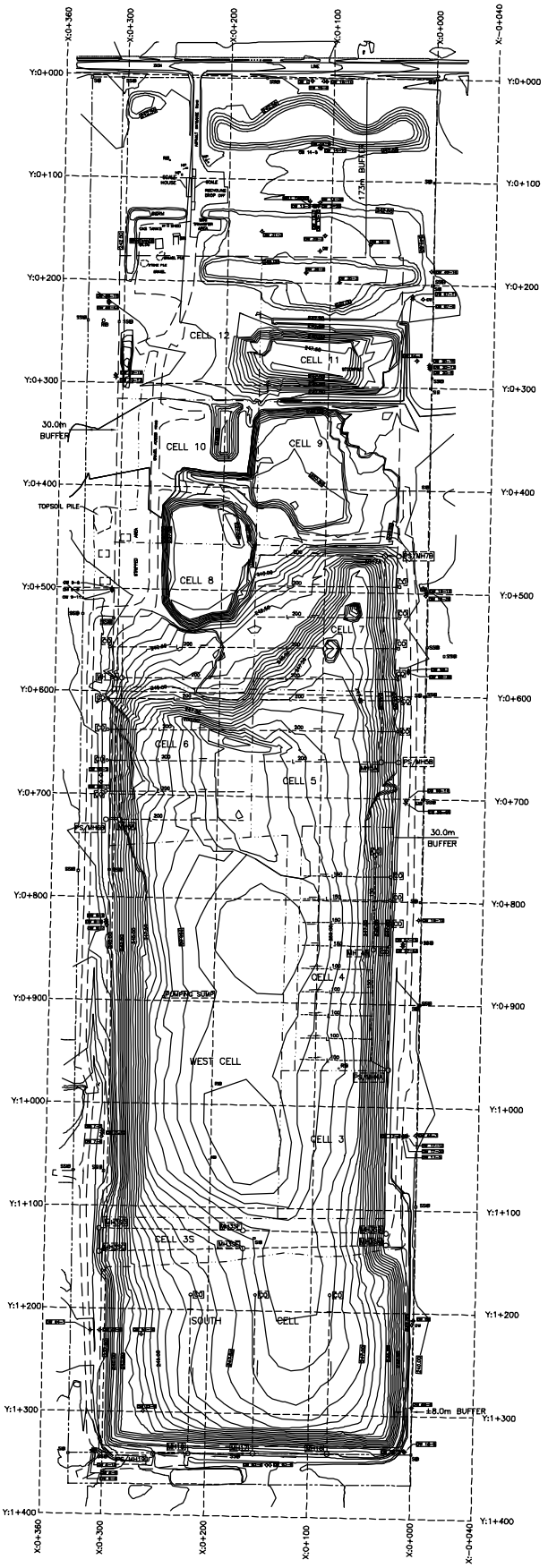
Each of the specialists carrying out these investigations have defined study areas that are appropriate to the potential effects of the project on the environment associated with their discipline. Therefore, within each sub-section, the existing environment is described based on the following basic study areas as applicable:

- Regional Setting
- On-site
- Site Vicinity
- Along the Haul Route

The study areas for each criterion may vary in size from one another in order to incorporate a comprehensive range of potential effects. Each study area is based on the professional experience of the technical disciplines, industry standards, and meets the requirements set out by the Ministry of the Environment or other applicable regulatory bodies.

5.2 The Existing Landfill Site

The Warwick Landfill is located on part of Lot 20, Concession III South of Egremont Road (SER), Township of Warwick in the County of Lambton. The existing landfill site is relatively long and narrow, with frontage on the northern end of the property at Zion Line (see **Exhibit 5-1**). The site occupies approximately 48 ha with the licensed site for landfilling being 32 ha. Based on current fill rates and the remaining capacity the site is expected to close in 2010.



LEGEND :

MH23	DENOTES EXISTING LEACHATE COLLECTOR MANHOLE
PS/MH23A	DENOTES EXISTING LEACHATE WITHDRAWAL MANHOLE WITH SUMP
	PROPERTY LINE
	APPROVED LIMIT OF LANDFILL
	EXISTING DITCH, SWALE
	EXISTING PERFORATED LEACHATE COLLECTOR PIPE
	EXISTING SOLID LEACHATE COLLECTOR PIPE
	EXISTING TREELINE
240.00	EXISTING GROUND CONTOURS AT 2.5m INTERVALS
	EXISTING GROUND CONTOURS AT 0.5m INTERVALS
	EDGE OF ROAD
GW 19-12	EXISTING OBSERVATION WELL OR STANDPIPE

NOTES :

1. TOPOGRAPHIC FEATURES SHOWN ON THIS PLAN ARE BASED ON 1997 AERIAL SURVEY BY BASE MAPPING CO. LTD AND FIELD SURVEY DATA BY HENDERSON PADDON AND ASSOCIATES LTD. TO JUNE 9, 2005

B.M.#1 ELEV. 241.643 (GEODETIC)
TOP OF 1" SQUARE STANDARD IRON BAR LOCATED AT GRID POINT X:0+001, Y:0+600

B.M.#2 ELEV. 239.927 (GEODETIC)
TOP OF 1" SQUARE STANDARD IRON BAR LOCATED AT GRID POINT X:0+001, Y:0+900

B.M.#3 ELEV. 241.823 (GEODETIC)
TOP OF 1" SQUARE STANDARD IRON BAR LOCATED AT GRID POINT X:0+001, Y:0+700

B.M.#4 ELEV. 241.555 (GEODETIC)
TOP OF 1" SQUARE STANDARD IRON BAR LOCATED AT GRID POINT X:0+001, Y:0+200

SCALE : 0 50 100m

EXHIBIT 5-1

DWN BY: R I F DATE: 09/29/05
CHK BY: J E A SCALE: -

WASTE MANAGEMENT OF CANADA CORP.

DRAWING NO. 91730L - 2005

EXISTING CONDITIONS
JUNE 9, 2005

WARWICK LANDFILL
WARWICK TOWNSHIP

WASTE MANAGEMENT

HENDERSON PADDON
& ASSOCIATES LIMITED
CIVIL & ENVIRONMENTAL ENGINEERING CONSULTANTS
OWEN SOUND • THE BLUE MOUNTAINS • GRIMSBY
Tele (519)376-7012 Fax (519)376-8008

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The landfill was opened in 1972 by North American Sanitation Company Ltd. and has had a number of owners. WM is operating the site under Certificate of Approval (CoA) No. A032203 dated October 21, 1991, last amended in July 2004 to allow the monofilling of contaminated soil.

The landfill is accessible from County Road 79 by Zion Line. The distance from County Road 79 to the site entrance is about 1 km. The landfill is screened from the north by berms. To the east, west and south there is agricultural use. The Village of Watford is located approximately 1.5 km from the south limit of the landfill footprint

The existing landfill site is on the surface water drainage divide for Bear Creek and Brown Creek. The majority of the existing site footprint originally drained to Bear Creek. The existing drainage flows westerly through intermittent streams west of the landfill, to Bear Creek.

The geology consists of approximately 30m of overburden overlying shale bedrock. The overburden consists of two till sheets separated by an interstadial glaciolacustrine unit of clays, silts, and a thin layer of sand.

The landfill is permitted to receive waste from municipalities within a 50 km radius of the site, as specified in the CoA. Refuse delivered to the site is domestic, commercial, and non-hazardous solid industrial waste. The existing site can receive 62,000 tonnes per year of waste. The existing landfill site also receives contaminated soil for use as daily cover material and monofill.

A modern scale and scale house exit at the site to weigh all incoming waste, monitor site access, and provide office facilities for the site staff. Approximately 35 packer type vehicles enter the site each day and up to 15 trucks per day carry landfill construction material (i.e. stone, cement, pipe, etc.).

Approximately up to 40 smaller vehicles from the surrounding areas enter the site each day to deposit waste in the transfer bins. On occasional special cleanup days, up to 150 small vehicles may enter the site. Approximately 5 personal vehicles per day from outside Warwick use the site to deposit waste.

The landfill traffic distribution at the intersection of County Road 79 and Zion Line consists of 83% of the traffic coming to the landfill site from the north, while 17% of the traffic arrives from the south.

The stormwater drainage system controls suspended solids prior to discharge to the existing drainage courses. Stormwater is collected by perimeter ditching and by diversion ditches near the working face of the landfill. Run-off drains into the sedimentation pond which has an outlet to an intermittent ditch. Following completion of the landfill the sedimentation pond will be dismantled.

Leachate from the existing landfill is disposed of at the Greenway Sewage Treatment Plant in London. It is transported to the plant by tanker truck. A pilot project has commenced at the site involving the phyto-remediation of leachate. A poplar tree forest is located on the south cell. Leachate is being irrigated in this area in order to determine if this is an effective way of treating leachate. Leachate treatment on the poplar pilot area commenced in spring 2004.

Monitoring has shown that surface water or groundwater quality at the existing landfill site boundaries has been acceptable.

5.2.1 *Future Characteristics*

The existing landfill is expected to be closed for 10 years by the year 2026; based on the current remaining capacity and fill rates.

The services rendered to the community by the landfill will have ceased. The drop off bins for recyclables and white goods will be gone from the site. An alternative location for waste disposal will have to be arranged.

The site will have been capped, and then vegetated. Access to the site will likely be controlled by a fence, and would not be open to the public. Facilities dealing with long-term leachate management will continue to exist until they are no longer needed.

Traffic associated with the closed landfill will be miniscule. It will consist of service vehicles dealing with the long-term maintenance and monitoring of the closed landfill.

5.3 Land Use

The following section sets out the baseline land use and development pattern within the study area without the landfill expansion. The baseline documents the current land use context of the Village of Watford and the rural area surrounding the existing landfill site. The baselines are required to determine the rate of growth and evaluate future trends without the landfill expansion. It is through the use of these baselines that forecasting and analysis can be used to determine the potential effects the expansion may have for future land use patterns and compatibility (for greater detail of the baseline conditions refer to Discussion Paper 5 Baseline Conditions).

5.3.1 *Statutory Planning Framework*

County of Lambton Official Plan

The Official Plan for the County of Lambton was approved December 12, 1997. The Plan designates the current landfill, the proposed expansion area and the majority of the surrounding area “Rural/Agriculture”.

The County Plan designates Brown Creek as a “Primary Natural Heritage Corridor”, and the lands at the Highway 402 interchange with County Road 79 as “Hwy. 402 Service Centre Lands”.

The Town of Watford is designated “Urban Centre” by the County of Lambton Official Plan.

Township of Warwick Official Plan

The Township of Warwick Official Plan came into force on January 12, 1999. The existing WM Warwick landfill is designated as "Landfill Site". The surrounding rural area is designated "Agriculture", with "Woodlot" and "Significant Woodlots" to the south-west, and "Hazard & Environmental Protection" to the south-east.

The northeast and southwest corners of the Highway 402 / County Road 79 interchange, are identified as "Service Centre Commercial."

The Village of Watford (lands designated as Urban Centre in the County Official Plan) is designated "Residential", "Industrial", "Commercial", "Mixed Commercial/Industrial", "Agricultural", "Open Space", "Hazard & Environmental Protection", "Significant Woodlots" and "Woodlot". The Plan recognizes that Watford's commercial areas are predominately located on the east and west sides of County Road 79 (Nauvoo Road) in the Village 'core'. The industrial areas are primarily located towards the Village's northern and southern boundaries. The largest portion of the Village is utilized for residential purposes. While most of the Village is already developed, there remains sizable vacant parcels available for future industrial, commercial, residential, and institutional development. These include large areas of land on the edges of the Village, as well as infill lots and vacant parcels of land scattered throughout the Village.

Township of Warwick Zoning By-law

The Township of Warwick Zoning By-law, which was passed by Council on October 11, 2000, zones the existing landfill site as "M3 Industrial Waste Disposal". The surrounding rural lands are zoned "A1 Agriculture", "A2 Restricted Agriculture", "C2 Commercial", "EP-WD Environmental Protection – Woodlot", and "EP-H Environmental Protection – Hazard".

The north-east and south-west corners of the Highway 402 and County Road 79 interchange are zoned "C4 (H) Service Centre Commercial with Holding symbol". There is a "C3 Rural Commercial" zone on the west side of County Road 79, midway between the Town of Watford and Highway 402.

The Village of Watford is specifically zoned for urban uses and contains a wide array of general and site-specific zones that largely recognize existing commercial, industrial, institutional, open space, and residential uses. Future lands for development are also designated for residential, industrial, and commercial uses with a Holding provision. Details of the Township's Zoning By-law are included in Appendix C.

5.3.2 Existing and Future Land Use and Development Patterns

Population Growth

According to County of Lambton data, the population of the County was projected to total 142,000 in 2016, representing an increase of approximately 522.2 persons per annum over the entire County. There will be an increase of 13,055 persons throughout the entire County over the 25 year estimated operating life of the proposed landfill expansion operation (2005 to 2030).

The County of Lambton's Issue Paper No. 2 for the Official Plan reveals that historic County growth (based upon the period 1961 to 1991) for the Township of Warwick on average represents 1.5% of the County's growth, while the Village of Watford alone represents 0.85% of the County's average growth. Based upon these percentages the Township of Warwick can be estimated to have a population growth of 7.8 persons per annum (1.5% of County), and the Village of Watford 4.4 persons per annum (0.85% of County). Exhibit 5-2 uses these estimates to project population numbers over a 25 year period, covering the operating life of the proposed Warwick landfill expansion.

Exhibit 5-2. Projected Populations

YR.	County of Lambton	Township of Warwick	Village of Watford
2005	136,255	4,154	1,586
2010	138,866	4,193	1,608
2015	141,477	4,232	1,630
2020	144,088	4,271	1,652
2025	146,699	4,310	1,674
2030	149,310	4,349	1,696

5.3.3 Residential Growth and Housing Demand

Issue Paper No. 4 of the County of Lambton Official Plan projects that there will be a demand for approximately 397 new dwellings units per annum over the County. This forecast has been based upon variables such as projected population, projected household age and size characteristics, projected vacancy rates and future demand for different housing forms. Using the same ratios as population growth, the Township of Warwick represents 1.5% of Lambton demand, while Watford alone represents 0.85% of the County's demand. Based upon these figures we have estimated the per annum housing growth as found in the Exhibit 5-3.

Exhibit 5-3. Projected Housing Growth

Area	Projected 2005-2030 Growth	Per Annum
County of Lambton	9,925	397
Warwick (1.5% of Lambton)	147.5	5.9
Watford (0.85% of Lambton)	84.25	**3.37**

Anticipated Household and Land Requirements

Using the per annum growth rates for population and housing found in the above tables, it is possible to estimate housing demand at several intervals prior to the year 2030. Applying the maximum permitted density for low-density housing development within the Township of Warwick (20 units per hectare – singles, semis, duplexes, triplexes), we can also estimate the amount of residential land that will be needed to satisfy this future housing demand. The existing residential land supply was determined through an analysis of Warwick Official Plan land use designations, air photography and assessment mapping. The estimated net residential area was calculated by multiplying the gross land area by 0.65. This is a common gross-to-net ratio that is used to account for community features such as roads, parks, schools and utilities. Exhibit 5-4 displays the results of these forecasts:

Exhibit 5-4. Village of Watford – Future Residential Land Requirements

YR.	Extrapolated from County Issue Papers			Existing Net Residential Land Supply (Warwick OP)	Surplus/ Deficiency
	*Pop. Increase * (base = 1991)*	*Household Increase** (base = 1996)*	*Net Land Required (20 uph)*		
2005	61.6	30.33	1.52 ha	23.1 ha	+21.58 ha
2010	83.6	47.18	2.36 ha	23.1 ha	+20.74 ha
2015	105.6	64.03	3.20 ha	23.1 ha	+19.90 ha
2020	127.6	80.88	4.04 ha	23.1 ha	+19.06 ha
2025	149.6	97.73	4.89 ha	23.1 ha	+18.21 ha
2030	171.6	114.58	5.73 ha	23.1 ha	+17.37 ha

*Notes: * Population increase represents total expected population increase from the base year, 1991; it is cumulative*
*** Household increase represents total expected household increase from the base year, 1996; it is cumulative*

On the basis of information that has been provided by the County, the Village of Watford has a sufficient supply of land designated for residential uses to accommodate growth to and well beyond the anticipated lifespan of the proposed landfill expansion (2030). Given the historic slow growth of Watford, its relationship to the agricultural industry and the aging population, we feel that the predictions generated from the County Official Plan Issue Papers data and the Warwick Official Plan are a reasonable estimation of future residential growth.

Statistics Canada's 2001 census information reveals that between 1991 and 2001, the County of Lambton's population decreased from 128,945 to 126,971 (-1.6%). The Township of Warwick also saw a decrease in population over this period from 4,045 in 1991 to 4,025 in 2001 (-0.5%). There are no statistics available for the Village of Watford due to its recent amalgamation with the Township of Warwick in 1997.

The statistical information which exists for Watford shows an average of three residential units per year between 1992 and 1997, which is similar to the 3.37 new residential units per year that is projected in the above charts. In 1991 there were 41 new residential units built. Most (34

units) were part of a single development of government assisted housing, comprising apartment and townhouse units. This development represents an anomaly from the typical growth trends experienced by the Village of Watford.

Between 1996 and 2000, an average of 5.8 residential units were built in Warwick, including the Village of Watford, which closely matches the forecasted housing growth of 5.9 units per year.

The above data indicates that the County's population growth projections for Lambton County have so far exceeded actual growth rates. As population changes sometimes occur as relatively sudden surges (e.g. concurrent with periods of strong economic growth), it is too early to evaluate whether County-wide growth forecasts for 2016 are too high. Although the Warwick population has decreased slightly between 1991 and 2001, housing starts in the latter part of the decade are very close to those predicted. The Village of Watford's current population is most likely higher than would be predicted using the above forecasting methodology (4.4 persons per year), due to the uncharacteristically high number of residential units built in 1991. This situation is consistent with County and Township Official Plan policies that direct new residential growth to urban settlement areas such at Watford.

Subsequent to the occupancy of those residential units built in 1991, Watford's population has likely experienced slow growth as evidenced by the limited number of new residential units. This is consistent with the forecasted model of slow population and housing growth outlined in the above charts. Should future growth in Watford accelerate and ultimately exceed the levels forecasted above, it is anticipated that a portion of the 60 hectare "reserve" block of land in east Watford that is now part of the settlement area boundary could be available for development up to and well beyond 2030.

Industrial Growth

The County's labour force is predicted to increase by 6,832 persons over the years 1991-2016. According to employment statistics contained within County issue papers, the industrial labour force represents 39.3% of all those employed. As a result, the industrial labour force within the County will have increased by 2,685 persons by the year 2016 (107.4 per annum).

If we assume that the industrial workforce will steadily increase by 107.4 persons per annum, by the year 2030, the County's industrial workforce will increase by a total of 4,189 persons.

The Township of Warwick accounts for 1.9% of the industry within Lambton, while the Village of Watford accounts for 0.7% of the County's developed industrial land. Using these figures, we have estimated the per annum industrial growth based on recent proportions of industrial development within Lambton. Exhibit 5-5 compares these future industrial growth projections:

Exhibit 5-5. Projected Workforce Growth

Area	County Issue Papers	
	Projected 2005-2030 Growth	Per Annum
County of Lambton	2,685	107.4
Warwick (1.9% of Lambton)	52.5	2.1
Watford (0.7% of Lambton)	18.25	**0.73**

Anticipated Industrial Requirements

Using the per annum growth rates for employment found in the above table, it is possible to estimate demand for industrial land several intervals prior to the year 2030. Applying the average employees per hectare ratio for the industrial labour force within the County (6.5 employees per hectare), we can also estimate the amount of industrial land that will be needed to satisfy this future demand. The existing industrial land supply was determined through an analysis of Warwick Official Plan land use designations, air photography and assessment mapping. The estimated net industrial area was calculated by multiplying the gross land area by 0.80. This is a common gross-to-net ratio that is used to account for roads, utilities and other public features within industrial areas. Exhibit 5-6 displays the results of these forecasts:

Exhibit 5-6. Village of Watford – Future Industrial Land Requirements

YR.	Extrapolated from County Issue Papers		Existing Net Industrial Land Supply (Warwick OP)	Surplus/ Deficiency
	Workforce Increase (base = 1991)*	*Net Land Required (6.5 empl. per ha)*		
2005	10.2	1.57 ha	50.2 ha	+48.63 ha
2010	13.9	2.13 ha	50.2 ha	+48.07 ha
2015	17.5	2.70 ha	50.2 ha	+47.50 ha
2020	21.2	3.26 ha	50.2 ha	+46.94 ha
2025	24.8	3.82 ha	50.2 ha	+46.38 ha
2030	28.5	4.38 ha	50.2 ha	+45.82 ha

*Notes: * Workforce increase represents total expected workforce increase from the base year, 1991; it is cumulative*

Based on information provided by the County, the Village of Watford has a sufficient supply of land designated for industrial uses to accommodate growth to and well beyond the anticipated lifespan of the proposed landfill expansion (2030). For reasons outlined above regarding the historic slow growth of Watford, it again appears that the industrial growth scenarios produced from the County background information are reasonable.

It should be recognized that industrial land demand will not grow in a uniformly consistent manner from year to year but will likely experience periods of rapid growth. For example, a large industrial user may require a significant portion of the industrial land base in a single year. This could be followed by years of static industrial demand. Over the long term, the trend would still average out to reflect modest industrial growth.

The exiting land uses for the Village of Watford and Study Area surrounding the proposed WM Warwick landfill expansion can be found within the mapping in Schedule C.

Residential Land Use Pattern

The residential land use pattern within the study area is predominantly concentrated within the Village of Watford in single family dwellings. There are no lands designated "Residential" in the Official Plan or Zoning By-law outside the Village of Watford. There are, however, a number of residences which exist outside of Watford, as can be seen within the land use mapping in Schedule C.

Within the 1 km study area of the landfill there are 22 existing residences. These are either rural residences associated with agricultural uses, or rural severances. It is estimated that there are approximately 66 people residing within this 1 km area. The majority of the residences are severances concentrated along the east side of County Road 79, between Highway 402 and Zion Line (directly north-west of the proposed landfill expansion).

There are approximately 98 residences (not including the Village of Watford) within the 1 to 3.5 km study area, within which there are an estimated 323 people residing. Again, these residences are comprised of rural severances and dwellings associated with agricultural uses. The highest concentration of residences occurs along the east side of Underpass Road, south of Zion Line (west of the proposed landfill expansion area). The remainder of these residences are scattered throughout the rural area which surrounds the proposed landfill. The Village of Watford contains all of the remaining residences within the 3.5 km study area.

In 1986, the settlement area of Watford was expanded to the east to incorporate approximately 60 hectares (~148 acres) of agricultural land within the settlement area boundary. The majority of these lands maintain an agricultural designation in the Warwick Official Plan and can be considered an "urban" land reserve for Watford. In 1992, the majority owner of these lands submitted development applications seeking residential land use permissions. These applications were never pursued and have since been withdrawn.

There has recently been an Official Plan and Zoning By-law amendment application submitted for part of these lands to permit a senior-oriented land lease community. The applicant is currently working on a proposal regarding the number of units and means of servicing them. If approved, there may be upwards of 500 units upon completion, which would represent a significant increase in housing growth, and far exceed growth projections for the Village of Watford. The area comprises part of the residentially designated lands to the east of Watford, as well as agricultural lands to the east and south, all within the expanded urban boundary to the

east. The lands face the southern boundary of Waste Management's lands on the north side of County Road 39. The proposal, if approved, would in all likelihood develop on a phased basis at a relatively slow pace.

There was a Zoning By-law amendment passed on May 29, 2002 to rezone lands located on the south side of County Road 39 (Confederation Line), west of Nauvoo Road between Warwick Street and John Street, from "R1 Residential" to "R3 Residential" to permit the construction of a multiple dwelling for seniors (an "assisted living" model) with approximately 52 units at the front of the property and the possible future construction of approximately 8 townhouse units at the rear of the property. This development was approved, and has recently been constructed, minus the townhouse units.

Industrial Land Use Pattern

There currently exist no industrial uses within the 1 km study area. All of the existing industrial uses within the study area are located within the Village of Watford in the 1 to 3.5 km study area. The industrial uses within Watford are largely concentrated on the lands to the south along the Canadian National Railway line. Approximately 97.13 hectares (240 acres) of land north of County Road 39, along County Road 79 (Nauvoo Road), are designated Mixed Commercial Industrial and are to be the site of the future Warwick Industrial Park. The municipality owns 16.2 hectares (40 acres) of commercial/industrial land on the east side of County Road 79, for which servicing is provided. This future business industrial park is located south-west of the proposed landfill. A woodlot and Watford cemetery separate the two uses.

Commercial Land Use Pattern

There exist 4 businesses within the 1 km study area of the proposed landfill. The majority of commercial land uses are located within the Village of Watford in the 1 to 3.5 km study area. The area north of County Road 39, along County Road 79 will also contain the future mixed commercial industrial park.

Other Land Uses

There are recreational land uses located within the north-east of the Village of Watford in the form of sports fields, an arena and park, located south of County Road 39, along Centennial Street. These uses are within the 1 to 3.5 km study area.

The institutional land uses within the study area include the Roman Catholic Cemetery, the Watford Cemetery, and the Evangelical Baptist Church (currently not in use), all located within the 1 km study area. The remainder of institutional uses are concentrated within the Village of Watford.

Agricultural uses constitute the remainder of land uses within the study area and occupy a significant amount of the land.

5.4 Agriculture

5.4.1 Existing Baseline Regional Setting

The majority of the regional study area is characterized with having Perth Clay. The northwest portion of the study area has a combination of Brisbane, Lambton, and Bottomland soils.

Soil Type	Drainage	Crops
Perth	Clay, imperfectly drained	Hay, pasture
Brisbane	Sandy loam, imperfectly drained	Beans, tomatoes
Lambton	Silty loam, imperfectly drained	Wheat, corn
Bottomland	Subject to flooding	Grass, grazing

Within the study area, there are Class 1 and 2 agricultural soils. Class 1 soils dominate the study area. Most of the lands in the area are associated with crop production that is in frequent rotation. Crop production includes corn, alfalfa, wheat, and soybeans. Very little of the land is uncultivated.

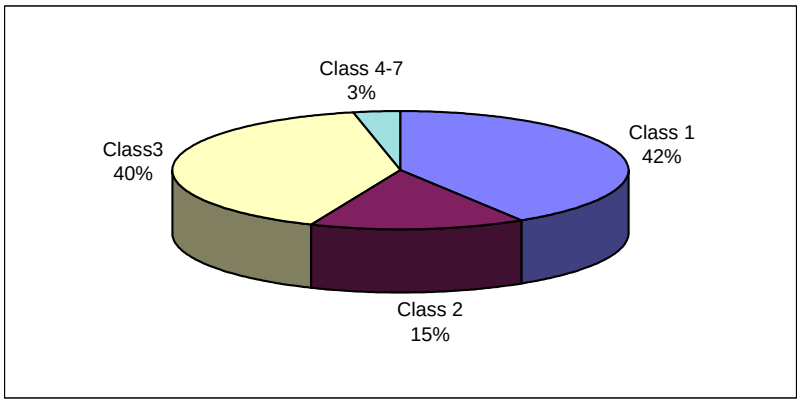
There are several livestock operations associated with swine and poultry, with the greatest concentration found west of County Road 79. Larger livestock operations that house beef and dairy cattle and horses are concentrated to the area in and around the intersection of County Road 39 and the southern portion of Underpass Road.

On-Site

A soil survey of the On-Site study area was conducted in the fall of 1998. 50 soil profiles were examined and they identified soils that have developed from watershed till and recent Alluvium.

Soil Type	Study Area Characteristics				
	Drainage	Stoniness	Topographic	Area (ha)	%
Brookston clay	Poor	Stone free	Level - slight slope	23.5	19.27
Perth	Imperfect	Slight stoniness	Slight slope	49.26	40.38
Alluvial	Poor	Stone free	Near level	2.39	1.96
All Others	N/A	N/A	N/A	46.83	38.39
Total				121.98	100

Approximately 96.6% of On-Site study area, excluding the existing landfill, are considered to be prime agricultural land (i.e. Class 1-3)



Most of the lands owned by WM are currently in existing agricultural production.

Beyond field crop production, there are no other agricultural operations and there are no significant investments in agricultural infrastructure on-site.

Site Vicinity

There are six commercial farms within the 1 km study area and four properties with retired agricultural facilities, all on Zion Line.

Immediately north of the site on Zion Line is a swine operation. The swine operations lands at the time of survey grew soybeans and wheat. Northeast of the site entrance is a beef operation and its associated lands were cultivated at time of survey.

Adjacent to the existing landfill on the east is a retired agricultural facility (structure no longer in agricultural use), with a land use of cash crops. At the southwest corner of Zion Line and Power Road, there is a swine operation.

West of the site, on the south-side of Zion Line there is a beef farm and on the north-side there is a swine facility. Along County Road 79, north of Zion Line there is a retired facility to the west and a poultry operation to the east.

Along the Haul Route

The haul route, on the west side of County Road 79, along Highway 402, is surrounded by Class 2 soils, limited by excess water. The east side of County Road 79, and Zion Line along Highway 402 is bounded by soils that are Class 1.

There are 4 farm and/or field entrances along the haul route. There are 2 farm operations with direct facility access off the haul route. They include a chicken farm operation and a swine operation.

5.4.2 Future Baseline

Regional Setting

Soil resources and climatic conditions characterizing the study area will remain largely unchanged over time. The area is set apart from urban and recreational uses that might alter agricultural land use within a 25-year time frame.

It is not expected that future agricultural conditions will be substantially different from current conditions.

The agricultural soil resource base will not change over time resulting in consistent land resource capability.

Current trends in agriculture indicate increasing consolidation of production units into larger farm enterprises. This could result in a lower farm population density than presently exists.

In the Site Vicinity

There has been a new swine production that is associated with changes in the market, since 1998. Agriculture production types will continue to vary according to market influences from 2001 to 2026.

5.5 Air Quality

VOCs

Volatile Organic Compounds (VOCs) are often referred to as non-methane hydrocarbons (NMOCs). They include a large number of trace components associated with landfill gas. There have been no background VOC measurements in the vicinity of the existing landfill.

Other than the landfill, there are no other major man-made sources of VOC's in the vicinity of the landfill. It is not possible to determine what the localized impact of the VOC emissions is in terms of concentrations until an assessment has been completed. Based on studies at similar landfills the most critical component of the landfill gas is vinyl chloride. That is, vinyl chloride is present in the greatest concentration relative to its ambient air quality criteria.

A fence line measurement program has been done at the Eastview landfill site in Guelph for the past seven years. The Eastview site is larger than the Warwick site. The annual acceptance of waste at Eastview during the 7 years of monitoring has been approximately 100,000 tonnes. Warwick has historically had a lower rate than this, though in recent years the waste volumes are similar. Of the 135 samples that have been taken, comprised of differing sample durations, the maximum concentration of vinyl chloride has been 0.5 µg/m3, while the average concentration was 0.05 µg/m3. The 24- hour ambient air quality criteria for vinyl chloride is 1 µg/m3. The 30-minute point of impingement standard for vinyl chloride is 3 µg/m3. We would anticipate that the VOC impact in the area around the Warwick landfill would not be more than that which has been measured at Eastview landfill in Guelph.

Odour

The Township of Warwick is typical of rural areas with regard to odour backgrounds. There are no large odorous industrial sources in the landfill vicinity that have been identified. There will be some odour impact in the vicinity related to current landfilling activities. The odour impact will be quantified in the impact assessment portion of the study.

There are numerous background odours associated with agricultural activity in the vicinity, particularly as associated with bio-solids management. Currently, there are cattle and pork operations in the area.

The landfill staff have indicated that there have been no odour complaints and the Ministry of the Environment has not supplied any indication that there is an odour complaint history at the site.

Blowing Litter

Blowing litter impacts in the Township of Warwick related to non-landfill activities are commonly associated with motorist littering and fugitive litter from households.

No current complaints indicating that blowing litter levels in the Township are problematic were identified.

Along the Haul Route

The air quality impact along the existing haul routes will be quantified as part of the impact assessment study. Background levels are assumed to be similar to what is found throughout Southwestern Ontario.

5.5.1 Future Baseline

VOCs

The future VOC background levels in the Township will likely decrease in the period from 2001 to 2026.

While industrial activity in the chemical valley and the United States will increase slightly during that period, regulatory and economic controls on VOC emissions during the period will equate to a net decrease in overall VOC emissions related to industrial activity.

Regulatory and economic forces will likewise decrease VOC emissions associated with roadways beyond the increase in traffic volume.

Odours

It is likely that the odour impact from existing farm operations may be reduced during that period. Other jurisdictions have regulated more efficient and less odourous methods of applying manure to agricultural lands. Similar regulations are likely to be adopted in Ontario at some point in the future.

It is not possible to speculate as to whether these operations will intensify in the period between 2001 and 2026.

Blowing Litter

Blowing litter from non-landfill sources will likely decrease in the period between 2001 and 2026.

While the number of residences and traffic volumes will increase, excess packaging and newsprint advertising is likely to decrease in that period.

It would be fair to speculate that societal pressures on individuals to decrease litter will also increase in that period.

- The findspots – P3, P8, and P9 – do not require a further archaeological assessment;
- Except for the sites the balance of the study area can be cleared of any further archaeological assessment;
- Should deeply buried archaeological remains be found on the property, the Ministry Consumer and Commercial Relations should be notified immediately.

5.6 Archaeological and Heritage Resources

5.6.1 Archaeological Resources

Regional Setting

There are no registered archaeological sites within 2 km of the proposed site. However, four sites are listed in the general vicinity, and they are located within the Sydenham River drainage area further to the southeast.

The Ministry of Consumer and Commercial Relations (MCCR) document entitled Primer on Archaeology, Land Use Planning and Development in Ontario (1997:12-13) stipulates that undisturbed lands, or those with minimal disturbance, such as cultivated fields, within 300 m of a primary water source are considered to have archaeological site potential.

The presence of favourable topographic features and soils, and the close proximity to a tertiary stream and associated wetlands attest to the overall potential for recovering Aboriginal resources within the study area and provide rationale for conducting an assessment.

On-Site

Based on the proximity of the study area to the Village of Watford, and its location between major transportation corridors such as the Great Western Railway and the London Road (Highway 7), there is significant potential for the recovery of historic archaeological resources associated with the 19th century settlement area.

A Stage 2 assessment has been conducted on the WM property. The results of the assessment are:

- 11 locations of pre-contact Aboriginal remains were discovered.

The archaeological make-up of the Warwick site will not change in the near future. If any future construction on the site were to take place in the timeframe stated then there are a series of activities that will take place.

Possible Future Activities

The eleven sites – AfH1-8 to AfH1-14 and AfH1-39 to AfH1-42 – constitute potentially significant archaeological resources.

A Stage 3 archaeological resource assessment is required to investigate site structure and size, cultural affiliation, and nature of archaeological deposits to determine if mitigation will be required:

- The findspots – P3, P8, and P9 – do not require a further archaeological assessment;
- Except for the sites the balance of the study area can be cleared of any further archaeological assessment;

Should deeply buried archaeological remains be found on the property, the Ministry Consumer and Commercial Relations should be notified immediately.

5.6.2 Heritage Resources

The following describes the existing baseline heritage resources conditions in and around the Warwick Landfill Site.

On-Site

The proposed footprint is characterized by two agricultural landscapes (CLU1, CLU3). Although part of the site has been compromised by the existing landfill activity and operations, their well preserved nature of make them of high heritage value. There are no built heritage features on-site.

Site Vicinity

The landscape around the site still exhibits a pattern of small farm complexes with a variety of farmhouses, barns and outbuildings. Most of the field patterns along with associated tree lines and fence lines are still visible. Immediately adjacent to the west of the proposed expansion site is the well preserved Watford Cemetery at 5606 County Rd. 79 (CLU2) which was established in.

Along the Haul Route

Two built heritage features are situated on County Road 79. (BHF5, BHF6)

The following provides a summary or the built heritage features and cultural landscape units.

5.7 Economics

5.7.1 Existing Baseline

The following describes the future baseline economic conditions in and around the Warwick Landfill Site.

Regional Setting

The Village of Watford serves as the main commercial and industrial service centre in Warwick Township. This small community has a diverse economic base, with a significant manufacturing component.

According to the 1996 Census the labour force within Warwick Township is largely employed in two main industry sectors; manufacturing and agriculture. Other significant sectors of employment include construction, retail trade and health and social services.

From the 1996 Census, residents from the Village of Watford were predominantly employed in manufacturing. Approximately 29.0% of the labour force was employed in this sector. Examining Place of Work data indicates more than half of the Village's labour force worked within the Township, primarily in Watford. More than a third of local residents were employed outside of the Township indicating a sizeable commuting labour force.

In the rural area of Warwick, the primary employment sector was agriculture, however a significant portion of the labour force was being employed in other employment sectors, including manufacturing and to a lesser extent construction. Place of Work data indicates a third of the local population from the rural portion of the Township works at home, primarily on farms. A more significant figure was that over half of the local residents were working outside the Township in which they resided.

Lambton County

From the recently released 2001 Census, the municipalities that form Lambton County have a population of 123,611. These figures do not include people residing within First Nation Reservations totalling some 3,360 persons. Sarnia, the largest municipality within Lambton County, has a population of 70,876 and accounts for approximately 57.3% of the County total. In contrast, Warwick Township with 4,025 people accounts for only 3.3% of the County's population. It is important to note that each municipality has declined in population since the last Census, with an overall decline of approximately 1.6% in Lambton County.

Municipal Finance

Municipal revenues for the year 2000 have been analyzed based on data taken from the 2000 Financial Information Returns (FIRs) for the Township of Warwick and Lambton County. The 2000 data has been benchmarked against the summary of the Province's 1997 FIRs in order to compare the Study Area with other municipalities throughout Ontario. The 2000 FIRs are the most current information available.

Forty-nine percent of operating revenues for Lambton County were derived from Provincial and Federal grants. Lambton County's reliance on Provincial and Federal Grants versus other forms of revenue generation is significantly higher than the average for other Counties in the Province. This is largely because of Lambton's dominant composition of agricultural land area and limited industrial/commercial property tax base versus other Counties in the Province. Agricultural land uses typically generate significantly less property tax revenue than other taxable property types (e.g. industrial, commercial, residential) because of lower property tax rates and lower assessment values.

Furthermore, with limited development pressure on rural lands over the past decade experienced throughout the County, there has been only a modest increase to the overall assessment base. The future opportunity to grow property tax revenue will come from increasing the employment base of the community particularly within the Village of Watford. The new industrial park established adjacent to the WM site, will likely influence this.

Warwick Township, which has a very limited commercial/industrial assessment base, also has an above average reliance on Ontario grants. This can also be attributed to the large share of agricultural land area. The Village of Watford, however, has a revenue base more closely reflecting the average for Towns and Villages in the County.

Watford, being a small local service centre comprised largely of a residential property tax base, will benefit from any industrial / commercial uses it can attract to the area. The Township has made significant capital investment servicing its new industrial park with water, sewage, storm sewers, telecommunications, gas and electricity, as well as having the appropriate zoning and land use designations in place. This provides an opportunity to capture potential new businesses in the future from which to generate new revenues.

Exhibit 5-7. Source of Municipal Revenues, 2000

	Property Taxes/PIL	Ontario & Federal Grants	Other Revenues	Total
Lambton County	$40,136,410	$33,672,024	$16,141,067	$89,949,501
% of Total	44.6%	37.4%	17.9%	100.0%
Warwick Township	$1,272,190	$931,298	$2,273,437	$4,476,925
% of Total	28.4%	20.8%	50.8%	100.0%

WM current economic contribution to the municipality includes property tax revenue form the landfill site, royalties from the existing operation and local waste disposal arrangements. When current landfill operation and related waste haulage operations result in the generation of increased sales for local buildings which are difficult to quantify in the Township of Warwick.

Business Activities

There are only four businesses located within the immediate vicinity of the proposed footprint on the WM property. This is largely because most of the area comprising the study area is rural and is occupied with either agricultural uses or is controlled by WM as part of their property.

Overall, within the Village of Watford there are some 88 businesses. The majority of businesses are located in Watford. Of these businesses a significant portion are comprised of a range of retail and service types, including financial, insurance and personal services, as well as various automotive repair, retail parts and vehicle sales establishments. There is also a significant manufacturing base within the Village.

The two largest employers identified are both from the manufacturing sector. The Androck Company, a hardware manufacturer, employs some 120 persons at their plant, while Watford Roof Truss Limited also employs over 150 persons. Other types of local manufacturers include firms involved in automotive parts, fabricated metal and construction product manufacturing.

Residences

There are 22 residences within the 1 km study area. There are two residential properties owned by WM located on the southern portion of the WM site along County Road 39. The combined properties account for 1.92 acres of the total WM site. A third residential dwelling is also located on a farm property fronting onto Zion Line.

Real Estate Market Conditions

Based on Provincial Assessment Data, which is the only comprehensive source of property value information in Ontario, the average 1996 market value derived from the 1998 Assessment for residential properties in the vicinity of the site was calculated for the Village of Watford and Township of Warwick. The average value of a fully detached home on a 0.1 hectare lot is approximately $85,000 in the Village of Watford. This value was based on a sampling of 20 residential properties ranging from 0.08 ha – 0.12 ha from throughout the community. A second sampling using other fully detached residential properties on larger 0.4 hectare lots from throughout the Study Area were also sampled using the same methodology and were valued at $103,200.

The assessment value of agricultural properties throughout the Township has experienced significant increases between the 1998 assessment (based on 1996 market value) and the 2002 assessment (based on 1999 market value). A review of property assessment data for 1998 and 2002 assessment years for all agricultural land in the Study Area was completed to determine an average value per hectare range. The average value of agricultural land (farm land only

excluding a residential component) within the Township from the 1998 assessment ranged between $700 - $800 per hectare. Increases in market value over the period have been in the magnitude of 35% or an average 2002 assessment value ranging between $950 - $1,100 per hectare. Discussions with local municipal assessment officials have confirmed these increases in the assessed value of agricultural land throughout the County.

A review of the change in assessment for the properties comprising the WM site indicates that one of the residential properties experienced a 5% increase in market value over the same period as studied above, while the other residential property experienced a 1% decline in its property value. The assessment of the five agricultural properties comprising the site experienced an average increase of 30% for year 2002 over their 1998 assessment value. This is consistent with the overall general increase of agricultural land assessment throughout the County.

Along the Haul Route

Thirty properties front onto the existing haul route. 22 of these properties front onto County Road 79.

Agriculture is the dominant land use comprising approximately 320 hectares. Six of the agricultural properties along the haul route also contain residential dwellings.

In total, residential (excluding those on agricultural lands), vacant residential, and industrial uses amount to 11.4 acres, or approximately 1.2% of the land fronting along the haul route.

There are two industrial properties along the route. One of the industrial properties is located adjacent to the Highway 402 off ramp and is vacant; the other is occupied with utility infrastructure.

WM owns three of the eight properties fronting Zion Line along the haul route.

Property Values

The current value of the properties along the haul route are difficult to determine because of the variety of land parcel sizes and land uses involved. The trends discussed from the assessment of land value completed for the 1 km and 3 km Study Areas would apply directly to these areas. A sampling of 30 vacant unserviced residential lots within the Township ranging in size from 7,000 – 10,000 square feet were valued at approximately $7,800 (1996 market value) using 1998 assessment data. The average assessment of these same parcels using 2002 assessment data (1999 market value) is $8,200, an increase of some 5.0%, which is consistent with the increase seen throughout the market. Based on consultation with a local real estate broker, this value is reasonable for the area for an unserviced residential lot.

5.7.2 Future Baseline

Regional Settings

Recommendations from the Lambton County Planning Department in 1996 called for the adoption of modest population forecasts through the year 2016, projected to reach a total of 142,000 residents in the County. It is also important to note that recently published 2001 Census numbers indicate a decline in population of approximately 1.6% between 1996 and 2001, therefore the County's projections may have to be re-evaluated.

Agricultural planning policies intend to direct non-farm development to serviced urban areas to reduce rural development pressures, and decrease farm fragmentation and rural use conflict. The County also intends to direct non-farm uses such as institutional, commercial, industrial and recreational uses to urban settlement areas and identify areas where limited growth is permitted. It appears that agricultural land base will be maintained so that crop production will continue to be the predominant sector in the local economy.

Business Activities

Agriculture and manufacturing sectors will continue to play a defining role for the community. Specific emerging sectors identified in Lambton are the call centre industry, high technology and tourism sectors.

Employment directly on site of the Existing Warwick Landfill will be maintained over the short term as operations are expected to continue until the Existing Landfill reaches its permitted capacity. However, over the longer term as the capacity of the site diminishes, hauled waste will be diverted to other alternative locations, therefore employing fewer FTE staff for the continued operation of the facility. The final phase of operation will require the site be decommissioned as a landfill, generating a one-time need for employment specializing in this capacity. However, the eventual outcome will result in the loss of any existing or future fulltime employment associated with the operation of the Existing Warwick Landfill in the Community. A significant decline in most of the localized economic spinoffs generated by traffic and visitation to the Warwick Landfill is expected to occur. This impact will most strongly be encountered by businesses located in the Village of Watford.

Municipal Finance

Significant changes in overall assessment and property tax bases are not anticipated.

5.8 Hydrogeology

5.8.1 Existing Baseline

Regional Setting

The regional study area is located within the southwestern portion of the Horseshoe Moraines physiographic region and within the St. Clair Clay Plain physiographic region.

The site and vicinity are located within till plains, with the remnants of a shoreline scarp located to the west near County Road 79.

The topographic relief of the region varies from flat to slightly rolling.

The site and vicinity are located on a topographical divide that separates the Brown Creek and Bear Creek watersheds.

East of the divide the topography has a natural relief of about 8 m toward Brown Creek to the southeast, while to the west the topographic relief is about 12 m toward County Road 79.

Within the Warwick Landfill Site the waste areas increase the local topographic relief.

Geologic Setting

The regional stratigraphy consists of about 10 m to 45 m of dominantly clayey silt to silty clay soil overlying bedrock. This overburden is generally thinner within the western portion of the study area, near Bear Creek, and thicker in the east.

The shallow soil varies within the regional study area. The Seaforth Moraine extends across most of the regional study area and is typified by shallow clayey silt textured till (Southern Till). Localized deposits of surficial sand and gravel, as well as modern alluvial also occur over the till. Where sufficient surficial sand and gravel resources occur, sand and gravel pits have been developed.

Lacustrine deep-water deposits of sand, silt, and clay occur within the western portion of the regional study area. Thin discontinuous deposits of clay, silt, and sand (interstadial deposits) occur between the Southern Till and the underlying Rannoch Till, which is a silt till with discontinuous occurrences of silt and sand lenses. A discontinuous sand to gravel deposit underlies the Rannoch Till and overlies the shale bedrock of the Kettle Point Formation and the alternating grey shale and argillaceous limestone of the Widder Formation. The bedrock topography ranges between about 195 mASL and 220 mASL, with a general slope toward the southeast and the southwest.

The stratigraphy below the site and vicinity includes the clayey silt to silty clay till (southern Till) and lacustrine deep-water deposits to depths of up to 12.5 m (see Exhibit 5-8). The upper 2 m to 5 m is brown and weathered with soil fractures, and grades into the underlying soil, which is grey and unweathered with infrequent soil fractures. Near Brown Creek shallow alluvial deposits also occur.

SCHEMATIC SECTION

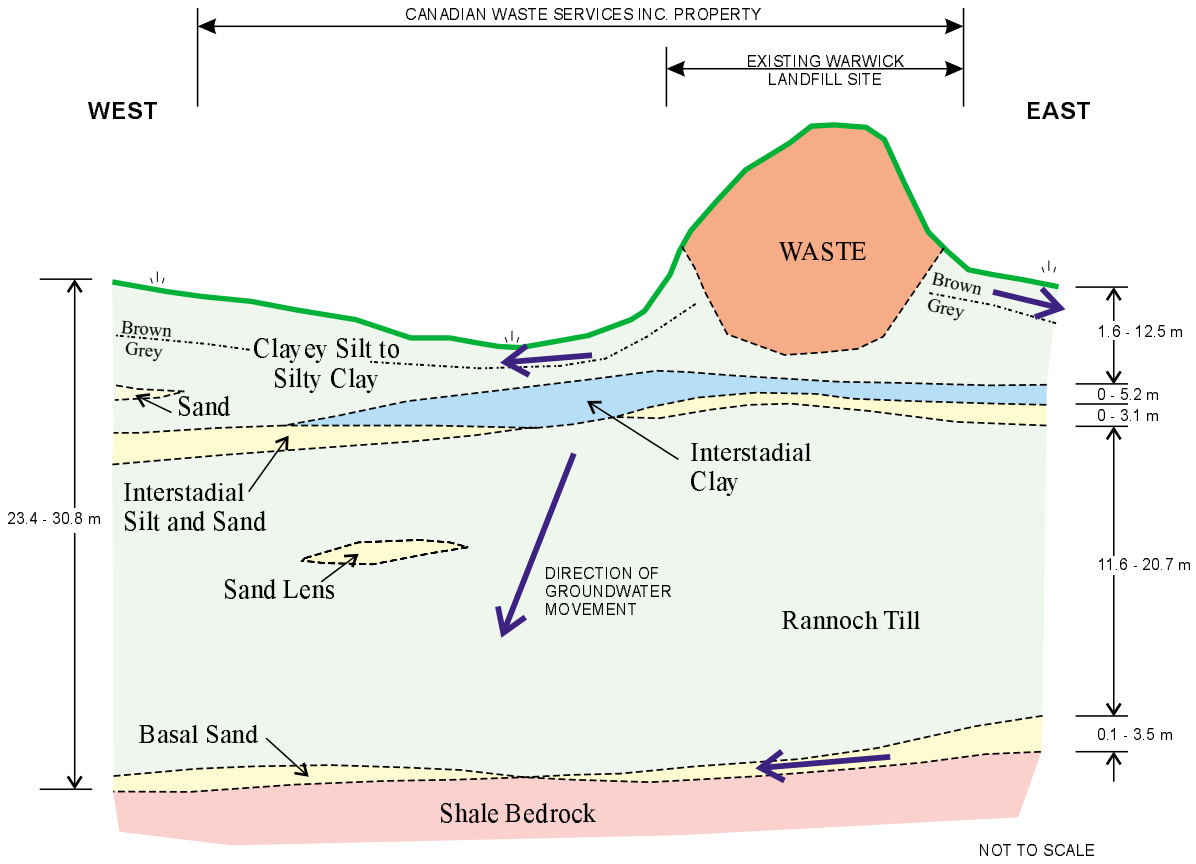


EXHIBIT 5-8	M.J.S DATE: Apr. 5, 2002 CANADIAN WASTE SERVICES, INC. DRAWING FILENAME: 97393-65\2005\Work In Progress\Documents\ Draft EA Document\EA ch 05\97393-65-EX5-8.cdr	WARWICK LANDFILL EXPANSION SOIL CROSS SECTION WARWICK LANDFILL TOWNSHIP OF WARWICK, ONTARIO	WM WASTE MANAGEMENT

The existing landfill waste is located within this till and typically extends into the unweathered till. Clay, silt, and sand occur within an interstadial unit below the Southern Till that ranges in thickness between millimetres and about 4 m. The clay and sand occurrences within this interstadial unit are identified as the interstadial clay and the interstadial sand, respectively. Subsurface investigations indicate that the texture of these two interstadial layers changes across the site, and in some instances the two interstadial layers do not occur. The underlying Rannoch Till is a clayey silt till, with discontinuous lenses of silt and sand, which extends to depths of about 23 m to 29 m below ground surface. The basal sand and gravel deposit is not continuous below the site. Similarly, the upper weathered and fractured portion of the underlying shale bedrock was not detected consistently below the site.

The economic geology within the study area relates to sand and gravel resources, as well as oil and gas resources.

Most sand and gravel pits were developed within localized features that were mined out and closed. Active licenses exist for sand and gravel pit operations northeast of Wisbeach and north of the regional study area.

There are a number of oil well licenses in the regional study area that tend to show three groupings around the Village of Watford. One grouping is to the southwest, one to the southeast, and one to the northeast. Scattered oil wells also occur throughout the regional study area, although none are documented within the site or site vicinity. Most of the oil wells are developed within the reef structures of the Guelph Formation, which is separated from the regional aquifer by low permeability formations.

Groundwater Setting

Groundwater movement is generally controlled by the low permeability lacustrine deep-water deposits, Southern Till, and Rannoch Till, which represent aquitards[5] within the regional study area.

The groundwater flow velocities are slow and typically in a downward direction. Lateral shallow groundwater movement occurs within the upper weathered and fractured portion of the aquitard, as well as within the surficial sand, gravel, and alluvial deposits.

The local drains, ditches, and creeks influence the direction of this shallow groundwater movement. The regional aquifer occurs at the interface of the discontinuous sand and gravel deposits at the base of the Rannoch Till and within the underlying weathered and fractured portion of the bedrock (interface aquifer).

Groundwater flow for the interface aquifer is toward the west, although historic domestic use of the interface aquifer likely influenced the direction of groundwater movement, especially in the vicinity of Watford to the southwest.

5. *Aquitard - A water-saturated sediment or rock whose permeability is so low it cannot transmit any useful amount of water.*

Groundwater use was historically for domestic and agricultural purposes. Water was obtained from wells typically developed within the interface aquifer. Shallower wells developed within the interstadial sand, as well as within the surficial sand and gravel deposits also occur. A piped municipal water supply from a surface water source that currently extends over portions of the regional study area, including Zion Line, County Road 79, and County Road 39, has resulted in a reduction in the use of the groundwater resources.

Similar to the regional study area, the unweathered, lacustrine deep-water deposits, Southern Till, and Rannoch Till represent aquitards with slow groundwater movement, typically in a downward direction. Lateral groundwater movement occurs within the upper weathered portion (active aquitard), the interstadial sand, and within the basal sand and gravel layer and underlying fractured bedrock (interface aquifer). Within the active aquitard, the direction of groundwater movement is influenced by the existing landfill leachate management systems, drains, ditches, as well as Bear Creek and Brown Creek.

Groundwater movement within the discontinuous interstadial sand is controlled by the surrounding low permeability soil. Within the interface aquifer, groundwater moves in a westerly direction below the existing landfill site, and moves in a southerly direction south of the existing landfill.

Groundwater is mineralized owing to the slow movement through the aquitards. Chemical characteristics within the overburden elude to a hard and bicarbonate groundwater quality. Within the interface aquifer, the water quality is also bicarbonate with sodium as the dominant cation. However, the groundwater chemical characteristics naturally vary within the interface aquifer with the occurrence of natural gas and hydrocarbons at some locations.

5.8.2 *Future Baseline*

Geologic Setting

The geologic setting will not be notably affected by the land use projections for the area. Potential exceptions relate to the economic geology. An increased demand for sand and gravel may encourage the mining of localized resources historically identified as not economical. As these resources are shallow and of limited area, effects on the site and site vicinity will not be detectable.

Additional mining of the oil resources in the area of Watford may occur with the economics of demand. Owing to the current distribution of oil wells, effects of the exploitation of existing oil resources will not be detectable on the site and vicinity.

Groundwater Setting

Groundwater use demands should reduce as the piped municipal water distribution system is expanded. It is predicted that a reduction in the use of groundwater will result in the slow repressurization of the interface aquifer, although the westerly groundwater flow direction should be maintained. However, the southerly groundwater flow direction within the southern portion of the site near the Village of Watford may be replaced by a more westerly flow direction.

Development within the Village of Watford should not notably affect the groundwater recharge to the interface aquifer as the recharge area extends beyond the regional study area. In addition, as most surface water and shallow groundwater will continue to be directed to ditches, drains, and natural water courses, recharge of the interface aquifer will continue to occur within the rural lowland areas and the watercourses.

Landfilling at the Warwick Landfill Site will continue until final contours are achieved and the landfill site is closed in approximately 2015. Based on the approved landfill design, the leachate management system will control leachate levels within the waste and reduce the potential for leachate movement into the surrounding groundwater and surface water.

It is predicted that groundwater and surface water quality at the landfill site boundaries will continue to be acceptable. Monitoring at compliance points around the landfill site will continue during the contaminating lifespan of the landfill.

5.9 Natural Environment and Resources

5.9.1 Existing Baseline

The following describes the baseline natural environmental conditions concerning the Warwick Landfill. It is divided into two subject areas; terrestrial and aquatic environment.

Vegetation

The vegetation community types found within the site vicinity are similar to those present on the site itself, consisting of small woodlots of deciduous forest or deciduous swamp forest. These woodlots are isolated from one another and mainly occur at the mid-point of the lots between concession lines. They are oriented in an east-west direction and may form functional wildlife corridors.

These bands of mid-lot woodlots are separated by several km's in a north-south direction. Most of the land area is intensively cultivated cropland. The urban land use associated with the Village of Watford accounts for about 3 % of the site vicinity study area.

There are no Areas of Natural or Scientific Interest (ANSIs), Environmentally Sensitive Areas (ESAs) or evaluated wetlands within the site or site vicinity.

The WM property consists primarily of cultivated fields with a mid-lot band of deciduous woodlots crossing the site in an east-west direction. Some meadow marsh occurs on the floodplain of the intermittent tributary west of the existing landfill.

The woodlot shows evidence of grazing by livestock because of the lack of understorey shrub layer. The soils are imperfectly drained, particularly in the portion of the woodlot on the east side of the property where a small Silver Maple – Green Ash swamp is present.

The majority of the WM Warwick property consists of areas where natural vegetation does not occur as a result of human land management practices. Much of the site is cultivated cropland. The ground cover of the active landfill portion of the site is mown or regularly disturbed, which also excludes any natural vegetation from occurring.

Wildlife

A total of 36 potential breeding bird species were observed on the site. Any birds exhibiting territorial behaviour in appropriate habitat during the breeding season were considered as "probable" breeding species.

The site is poorly represented with forest bird species that are typically considered "area-sensitive" or as indicative of forest interior habitat. Of the species recorded, only the Wood Thrush is considered to be an area-sensitive species that is adapted to forest habitat.

Other wildlife recorded include eight species of mammals, one species of reptile and three species of amphibians. None of these species are particularly significant in this part of Ontario.

No provincially vulnerable, threatened or endangered plant or animal species have been recorded on either the site or in the site vicinity.

Approximately 230 species of vascular plants were recorded on the WM Warwick property during the course of field investigations. Approximately 70 species (30%) are non-native.

No provincially significant plant species were recorded on the WM Warwick property. Four of the species encountered in the course of the 1998 and 1999 field investigations are considered rare within Lambton County. They are:

- Sprengel's Sedge – found in Woodlot
- Virginia Waterleaf – found in Woodlot
- False Mermaid-weed – found in Woodlot
- Spotted St. Johnswort - within Woodlot

Bear Creek

The main stem of Bear Creek is located approximately 8 km west of the existing landfill site. Aquatic habitat was observed as being intermittent for the majority of the year. Stream flow was only noted during the spring season or in correlation with water runoff in the form of snow melt or precipitation events. During the summer site visits, this channel was observed as having standing or pooled water areas (Exhibit 5-9).

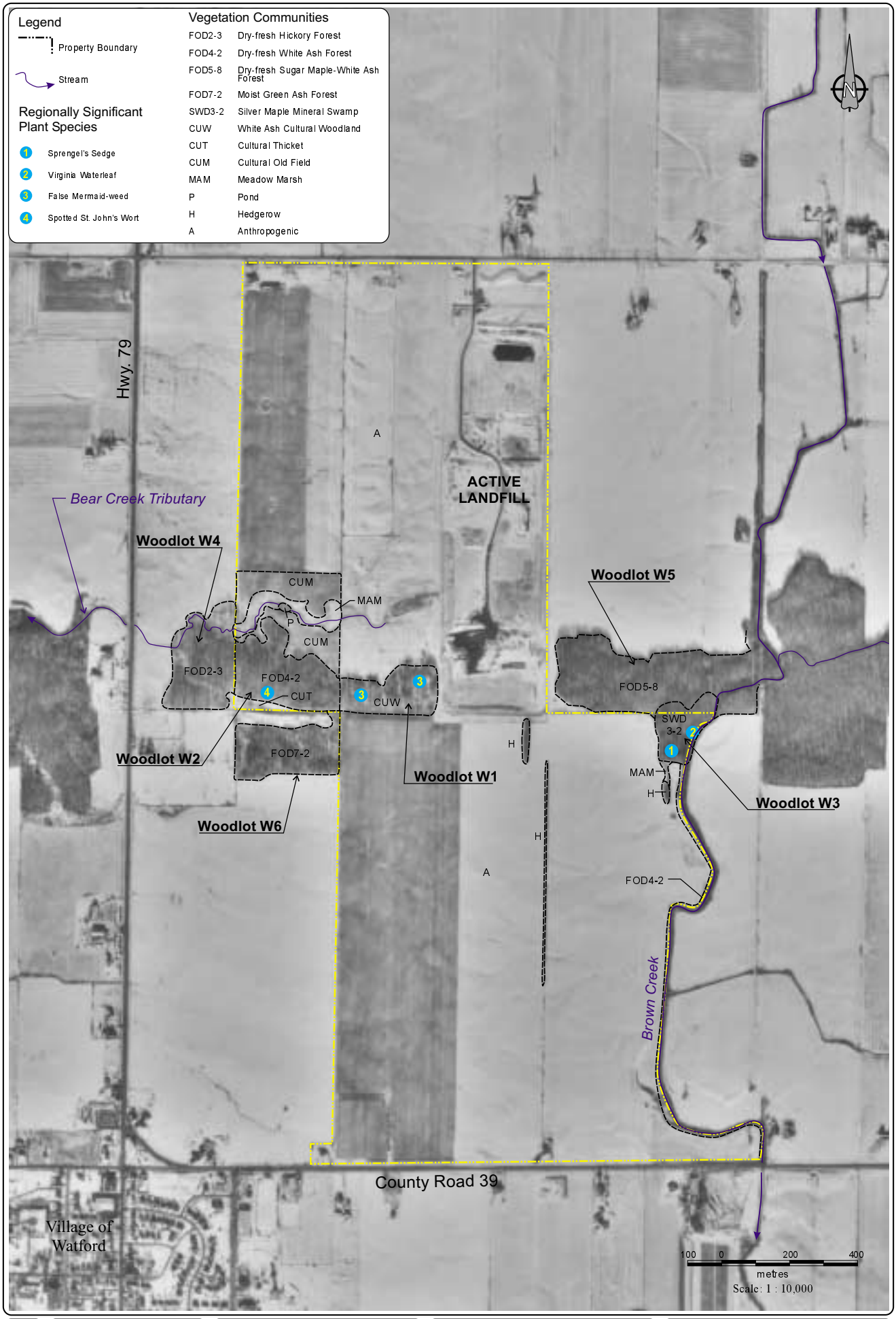


EXHIBIT 5-9

DRAWN BY: M.J.S. DATE: Feb. 2002

DRAWING FILENAME: 97393-65\2005\Work In Progress\Documents\Draft EA Document\EA ch 05\97393-65-EX5-8.cdr

NATURAL FEATURES

Warwick Landfill

WASTE MANAGEMENT

Gartner Lee

Four fish species were captured. These species include creek chub, mottled sculpin, pumpkinseed, and brook stickleback. Based on information provided by the OMNR, no other fish species have previously been documented in Bear Creek within the site vicinity study area.

On site, no fish species were found due to the intermittent nature of the tributaries.

Brown Creek

Habitat conditions are continuous. Stream flow was variable and appeared to be strongly correlated to precipitation.

Three creek chub were captured. Although other species have been noted to exist within Browns Creek, none were captured in the sample area during the aquatic field investigations.

5.9.2 Future Baseline

Terrestrial Resources

Minor residential and industrial growth will occur within the present limits of the Village of Watford. This development will not displace or encroach upon any terrestrial resources of significance in the site vicinity.

The present extent and distribution of woodlots within the site vicinity may undergo minor fluctuations over the next 25 years. Overall, forest cover could increase as lands are taken out of agricultural production and left to succeed to old fields and eventually to young, second-growth woodland.

5.10 Noise

5.10.1 Existing Baseline

The Village of Watford has moderate daytime noise levels produced by local traffic, localized commercial and industrial activity, community services, and people activity.

The noise monitoring program provided a sample of the noise environment at four example locations around the site (see Exhibit 5-10). Exhibit 5-11 shows the typical and lowest Leq's[6] Day and Night, at each of the four example receptors.

6. *The Leq is the steady sound pressure level that would have the same acoustic energy in a defined time period as the varying sound level that actually occurs in that period. It is widely used for noise impact assessment because it correlates well with human response to noise.*

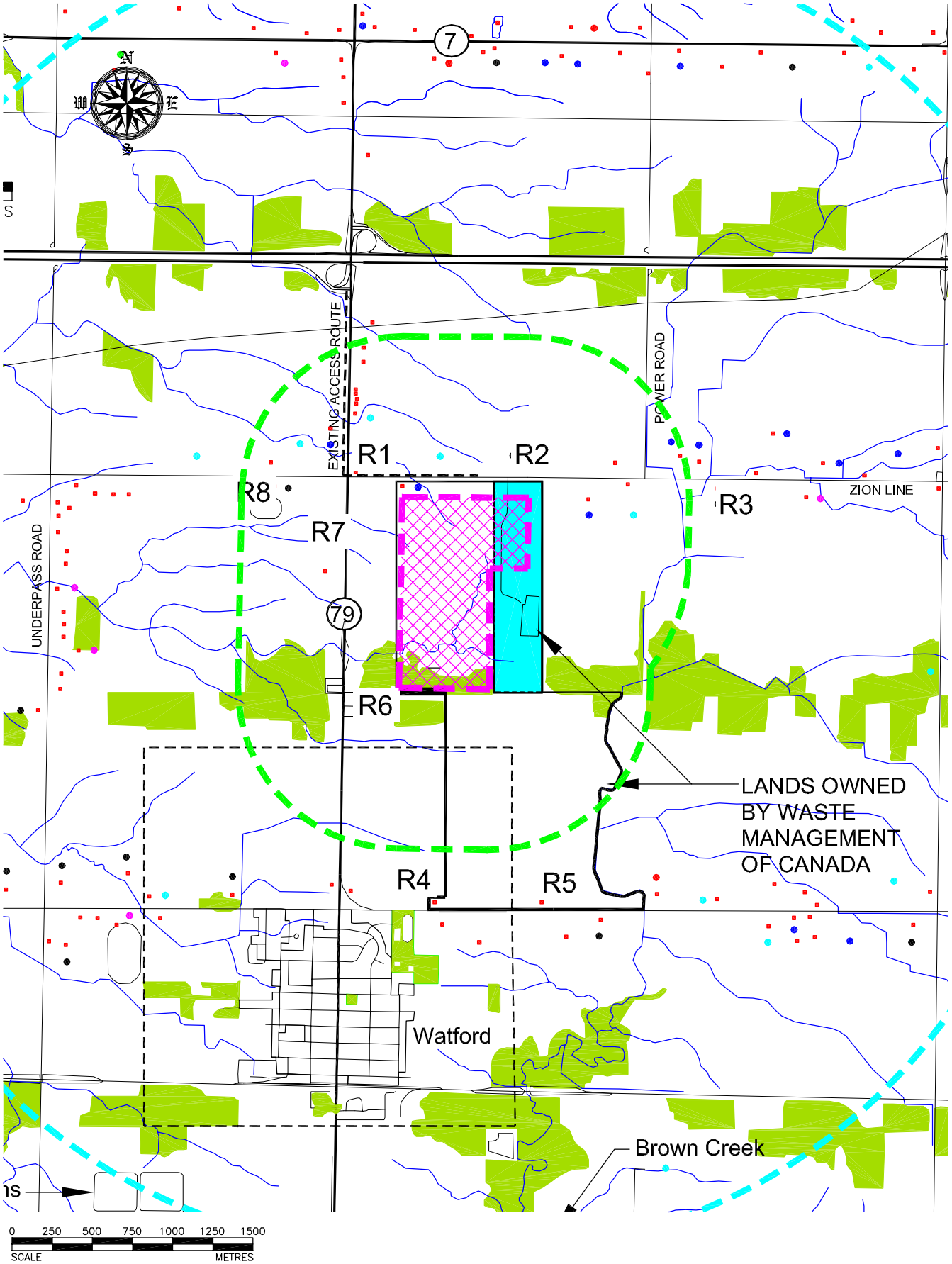


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EXHIBIT **5-10**

DWN BY: JEP DATE: 20/02/02
CHK BY: P.J.B. SCALE: N.T.S.

WASTE MANAGEMENT OF CANADA

DRAWING NO. 1

WARWICK LANDFILL EXPANSION
SITE LOCATION

LOCATIONS OF NOISE MONITORING STATIONS

LEGEND:

R1 EXAMPLE RECEPTOR

- RESIDENCE
- AGRICULTURAL – BEEF, DAIRY
- AGRICULTURAL – CASH CROP
- AGRICULTURAL – SWINE, POULTRY
- AGRICULTURAL – VEGETABLES
- AGRICULTURAL – HORSE
- AGRICULTURAL – RETIRED

Exhibit 5-11. Typical and Lowest Leq's Day and Night

Example Receptor	Lowest Hour Leq	Landfill Leq Limit	
		Day	Night
R1	54	55	NPC 205
R6	48	55	NPC 232
R7	56	56	NPC 205
R8	41	55	NPC 232

The table indicates that in areas represented by R4 the noise level exceeded the 55 dBa Day and 45 dBa Night criteria throughout the monitoring period. Landfill noise may therefore increase to the measured background levels. In the areas represented by example locations 2, 1, and 5, the background is always below the 55/45 criteria, which defines the landfill noise limits for these receptors.

5.10.2 Future Baseline

Regional Context

The net result of the anticipated baseline changes throughout the study area is a gradual increase in the background traffic noise levels on a scale that is approximately at the threshold of human perception, and the addition of a small number of potential noise sources and/or noise sensitive receptors. Any future development of noise sensitive receptors proposed should, under provincial policy, incorporate noise controls that would be compatible with the landfill.

Termination of the existing landfill operation would have no significant effect on background noise in the community.

Along the Route

The traffic noise computations in **Exhibit 5-12**, based on the lowest hour volumes in the traffic counts, produced noise levels at the example receptors where traffic is the dominant noise source.

Exhibit 5-12. Traffic Noise Computations

	1hr Leq 07:00 to 19:00		1hr Leq 19:00 to 07:00		Landfill Limit	
	Typical	*Lowest*	*Typical*	*Lowest*	*Day*	*Night*
R1	52-57	44	45-55	44	55	NPC 205
R5	57-62	53	40-55	<40	55	NPC 232
R2	45-55	34	40-55	<40	55	NPC 232
R4	57-62	57	52-57	52	57	NPC 205

5.11 Social

5.11.1 Existing Baseline

The community boundaries as defined by local residents generally encompassed the Township of Warwick (including the Village of Watford). Many residents also indicated that they felt that the community boundaries incorporated the northern portion of Brooke Township and smaller portions of the surrounding Townships including; Adelaide and Metcalfe in the County of Middlesex and the Townships of Enniskillen and Plympton in the County of Lambton.

Community Character

The community character was defined by residents at the small group meetings and personal interviews as rural agricultural with a growing industrial component. The community is striving to build upon this industrial component with the creation of the new industrial park. Some residents expressed that there was a mosaic of different people in the community and they all worked together to make the community a better place. Some residents indicated that the community was also close knit, social with each other and proud of their heritage. Residents had a lot of pride in the community and they feel that it is an active and caring community, concerned about local issues.

Important natural features of the community were reported to include the beaches in the community and the good quality farmland. Important social features of the community included local churches, proximity to the highway and other cities, heritage, neighbourly atmosphere and the agricultural base of community.

Churches and recreational areas were seen by residents as “hubs” of the community. Groups or organizations active in the community include church organizations, the Optimists, Rotarians, Knights of Columbus, Women’s Institute, recreational clubs and Scouts and Girl Guides.

Community Cohesion

In interviews and at community small group meetings residents indicated that many families have lived in the community for many generations, with everyone knowing everyone else and getting along well. The community was described as close-knit, neighbourly and supportive – people help each other. Residents expressed that they felt they were part of the community, with a strong sense of belonging in the community and a strong willingness to support each other. Residents indicated that there were families that have been here for many generations but recently there has been a decline in younger people staying and making roots in the community.

Data from Statistics Canada indicates that the percentage of movers in Warwick Township was 7.7% in 1996 (for 1-year residence), which was an increase from the 5.1% of movers in 1991. This represents a greater degree of residential stability than in the corresponding county as a whole and the province for those years. This trend of residential stability for Warwick Township compared to the Province and the County was also evident in the 5-year residence data from 1991 to 1996.

Population Growth

Between 1991 and 2001, the County of Lambton's population decreased from 128,943 to 126,971 or a decrease of 1.5%. The Township of Warwick's population (including the Village of Watford) decreased from 4,045 in 1991 to 4,025 in 2001 or a decrease of 0.5%. New population statistics are unavailable for the Village of Watford, because of its recent municipal amalgamation with the Township of Warwick.

Age Structure

The following table displays age structure for residents of Lambton, Warwick, and Watford.

Exhibit 5-13. Age Structure for Residents of Lambton, Warwick, and Watford

	Age 0 - 4		Age 5 - 19		Age 20 – 64		Age 65+	
	1996	*1991*	*1996*	*1991*	*1996*	*1991*	*1996*	*1991*
Township of Warwick	7.7%	8.7%	28.9%	28.2%	53.8%	53.8%	9.5%	9.3%
Village of Watford	5.9%	7.2%	27.9%	20.9%	47.6%	51.3%	18.6%	20.6%
Lambton County	6.4%	7.2%	22.2%	22.4%	57.0%	57.7%	14.5%	12.7%
Ontario	6.8%	7.0%	14.4%	20.1%	60.5%	61.2%	12.4%	11.7%

Level of Education

The number of people with a trades or non-university certificate or diploma in the Township of Warwick and the Village of Watford rose between 1991 and 1996, as it did in the County of Lambton and the Province of Ontario. Although the proportion of persons who have completed university has increased in the Township of Warwick it has decreased in the Village of Watford, the County of Lambton and the province.

Labour Force Characteristics

Exhibit 5-14 displays the Labour Force Characteristics for Lambton, Warwick and Watford.

Exhibit 5-14. Labour Force Characteristics for Lambton, Warwick and Watford

	Warwick	Watford		County of Lambton			Ontario	
	1996	*1991*	*1996*	*1991*	*1996*	*1991*	*1996*	*1991*
Total labour force 15 years and over (20% sample) – all applicable industries	1,430	1,435	770	680	62,545	66,115	5,586,975	5,435,850
Persons in agriculture and other resources based industries	495 (34.6%)	450 (31.3%)	45 (5.8%)	40 (5.9%)	4365 (6.8%)	4145 (6.3%)	170430 (3.0%)	155810 (2.9%)
Persons in manufacturing and construction industries	380 (26.6%)	325 (22.6%)	290 (37.7%)	185 (27.2%)	15600 (24.2%)	19520 (29.5%)	1213000 (21.7%)	1336240 (24.6%)
Person in service industries	535 (37.4%)	635 (44.2%)	410 (53.2%)	450 (66.2%)	42575 (66.1%)	42425 (64.2%)	4017970 (71.9%)	3943790 (72.5%)

On-Site

There are no residents or community of recreational facilities located on-site.

Site Vicinity

0 to 1 km

There are 22 residences located in the 0 to 1 km study area. Two of the residences have no residents at the time of writing: one is being rented as a business office for an engineering firm; the other is a newly constructed residence not yet inhabited at the time of writing. It is estimated that there are approximately 66 residents living in the 0 to 1 km study area.

1 to 3.5 km

The Township of Warwick and the Village of Watford amalgamated on January 1, 1998. This study area incorporates the Village of Watford and the surrounding lands in the Township of Warwick. The lands surrounding the Village of Watford are rural-agricultural based with a small non-farm related component.

Residences

Excluding the Village of Watford, there are approximately 98 residences in this portion of the 1 to 3.5 km study area. Approximately 323 residents live outside of the village in the 1 to 3.5 km study area. The Township of Warwick estimated that the population of the Village of Watford is currently 1700. The total estimated population in the 1-3.5 km study area is 2023.

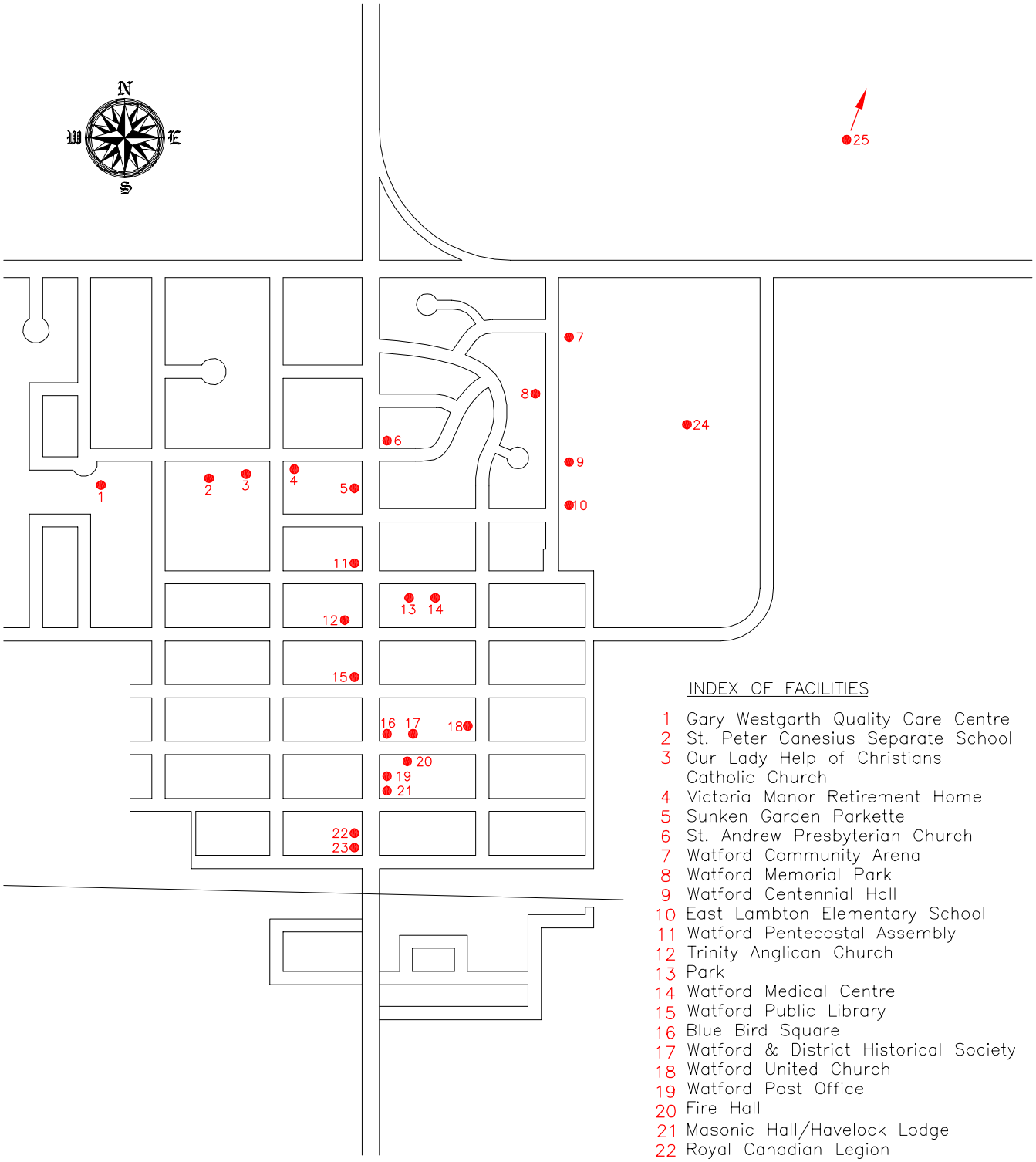
Community and Recreational Facilities

There are 26 community and recreational facilities located within the 1 to 3.5 km study area, the majority of them are located in the Village of Watford (see **Exhibit 5-15**).

Along the Haul Route

There are 16 residences located in the haul route study area, of which 14 are being used as residences. It is estimated that approximately 46 residents live in the haul route study area. Sixteen properties within the haul route study area have no residence.

A section of the mail-back survey that was distributed to residents within the 1 km study area contained questions related to haul route issues. Eight surveys (out of a possible 14) were completed by residents in the haul route study area.



INDEX OF FACILITIES

1 Gary Westgarth Quality Care Centre
2 St. Peter Canesius Separate School
3 Our Lady Help of Christians Catholic Church
4 Victoria Manor Retirement Home
5 Sunken Garden Parkette
6 St. Andrew Presbyterian Church
7 Watford Community Arena
8 Watford Memorial Park
9 Watford Centennial Hall
10 East Lambton Elementary School
11 Watford Pentecostal Assembly
12 Trinity Anglican Church
13 Park
14 Watford Medical Centre
15 Watford Public Library
16 Blue Bird Square
17 Watford & District Historical Society
18 Watford United Church
19 Watford Post Office
20 Fire Hall
21 Masonic Hall/Havelock Lodge
22 Royal Canadian Legion
23 Watford Friendship Centre
24 Baseball/Soccer Fields
25 Snowmobile Trail

EXHIBIT 5-15

DWN BY: JEP DATE: 08/04/02
CHK BY: P.J.B. SCALE: N.T.S.

WASTE MANAGEMENT OF CANADA

DRAWING NO. 1

VILLAGE OF WATFORD

COMMUNITY & RECREATION FACILITIES

LEGEND:
20 COMMUNITY FACILITIES

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5.11.2 Future Baseline

Regional Setting

The population in the County of Lambton will total approximately 142,000 in 25 years (1991-2016). This represents an increase of approximately 13,055 persons (522.2 per annum) over the entire County. By using 522.2 persons per annum as a growth figure, and assuming the average growth rate will remain constant, there will be an increase of 18,277 persons by the year 2026 over the entire County.

The County growth estimates indicate that the Township of Warwick represents 1.5% of the County's growth, while the Village of Watford alone represents 0.85% of the County's growth.

The Township of Warwick will increase by 274.1 people or 7.8 persons per annum from 1991 to the year 2026 and the Village of Watford will increase by 155.3 people or 4.4 persons per annum.

Housing Growth

Within the County of Lambton there will be a demand for approximately 7,941 (397 per annum) residences over the twenty-year period from 1996 to 2016. By 2026 there will be an additional 11,910 new residences within the County of Lambton. Using the same ratios as population growth, the Township of Warwick represents 1.5% of Lambton demand for new residences while the Village of Watford represents 0.85% of the County's demand. The projected growth in housing by 2026 would be 179 for the Township of Warwick (6 per annum) and 101 for the Village of Watford (3 per annum).

Based on these projections, the Township of Warwick and the Village of Watford will grow at a slow rate over 25 years and will likely maintain the same community characteristics as at present.

On-Site Site Vicinity and Haul Route

The Land Use Planning Projections indicate that while growth projections can be made for the Village of Watford and the Township of Warwick, it is impossible to predict with any degree of accuracy the location and frequency of land severances. Thus, data are not available to estimate the future baseline conditions for the on-site, site vicinity and haul route study areas.

5.12 Surface Water

5.12.1 Existing Baseline

Regional Setting

Surface water flow patterns in the study area are typically from northeast to southwest towards Lake St. Clair, which connects Lake Erie and Lake Huron at the Michigan-Ontario border. The low grade historically produced numerous wetlands in this area that were drained at the turn of the century to enhance agricultural practices.

The majority of the streams within Lambton County are impacted from land use practices. This, in combination with the loss of natural vegetation to buffer these watercourses, has lead to warmer waters that experience both nutrient enhancement and poor water clarity.

Bound to the suspended solids entering these water courses are trace metals including aluminium (Al), iron (Fe) and zinc (Zn). Nutrients including phosphorus and nitrogen typically abound in waters receiving inputs from manure runoff and fertilizers and suspended solids from erosion.

Thus, enriched waters are part of the environmental baseline of the area and any landfill influences must be interpreted against these reference conditions.

The WM property is part of the Sydenham River drainage system whose headwaters are found within the Bear, Black and Brown Creeks. A first order tributary of Bear Creek originates on the Warwick Landfill Site (Exhibit 5-16).

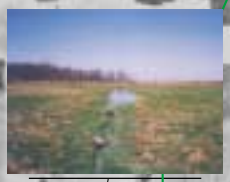
On-Site and Site Vicinity

Bear Creek

Bear Creek flows southwesterly from north of the Warwick Landfill property, for approximately 11 km to form the North Sydenham River at the confluence of Bear and Black Creek.

The landfill area is drained by the more southerly headwaters of Bear Creek, from within the Warwick Landfill to County Road 79, which runs adjacent to the western limit of the landfill. The northern branch of Bear Creek is used as a reference for the purposes of this study, while the southern branch is used to measure the potential impact of the landfill.

Downstream of the Warwick Landfill the channel size and definition of Bear Creek increases. Numerous small tributaries enter the creek along its 11 km path to the Sydenham River. The land use downstream consists mainly of agricultural lands used for crop harvesting and livestock.



SW4

Bear Creek Tributary

SW3

Bear Creek Tributary

SW2

SW1

Brown Creek

Village of Watford

Surface Water Divide

N

Legend

- Station Locations
- Background Fish Sampling Stations (MNR data)
- Permanent Watercourse
- Ephemeral Watercourse
- Boundary of Site Vicinity (3km surrounding site)
- Site Boundary

200 0 400 800
metres

EXHIBIT 5-16

DRAWN BY: M.J.S. DATE: Feb. 2002

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AQUATIC FEATURES OF SITE VICINITY

Warwick Landfill

WASTE MANAGEMENT

Gartner Lee

Bear Creek is ephemeral upstream of County Road 79, with visible flow only during the spring freshet and following intense storms. Of the four water sampling events conducted by in 1998 and 1999, flow was only measurable at surface water stations inside the landfill limits during the early spring.

Brown Creek

Brown Creek's headwaters originate northeast of the Warwick Landfill Site. Brown Creek runs in a southerly direction along the eastern border of the landfill.

Brown Creek runs for a distance of 37.5 km before joining the Sydenham River. Large portions of the first and second order tributaries connected to the creek appear to be channelized because the majority of this watershed is dedicated to agricultural uses. The section of Brown Creek paralleling the northeast corner of the landfill appears to experience continuous flow conditions.

Hydrology

Discharge data were summarized for the majority of the Bear Creek watershed from Environment Canada data. The hydrograph is fairly typical of southern Ontario: moderate winter flows are followed by a peak in the spring following freshet, very low flows in the summer and increases in flow during the fall rains.

As a result, illustrate that the flows are highly variable and can increase by four orders of magnitude between baseflow (minimum) and peak flow (maximum) in a given year. The variability within a year is larger than the 3x difference that occurs between dry years and wet years.

The catchment for Bear Creek that drains the site was determined by prorating the Bear Creek near Petrolia Environment Canada station as a function of the difference in catchment sizes, as the larger and smaller catchments have similar characteristics.

The prorated flows for the site overestimate discharge on account of the differences between headwater areas and entire watersheds, and also because the period of site investigations corresponded to drier years. The summer period from mid July to the end of September is a period of little to no surface water inputs into Bear Creek near the Warwick Landfill.

Water Quality Results

The interpretations of water quality are based on comparison between sites upstream and those within any potential landfill influence. The MOE's Provincial Water Quality Objectives is used as a reference to interpret water quality in the context of potential impacts to aquatic life. The benthic community is considered as a long-term indicator of water quality.

There is no evidence of any impact from the existing landfill on water quality in Bear Creek. The water quality in the two creeks draining this general area is characterized by nutrient enrichment, and the presence of trace metals such as Al and Fe, associated with Total Suspended Solids (soil particles), moved to the creek by erosion of soil. Water quality does not differ between upstream locations and locations downstream of the landfill.

Benthic Community

One of the advantages of using the benthic community as an indicator of water quality is that they respond to maximum and minimum values as the chemistry of the water shifts outside their range of tolerance. These values are often missed even in exhaustive water chemistry studies.

The results of the benthic surveys indicate that the invertebrate community has not been measurably affected by landfill activities. The benthic community data supports the water quality data and this provides further indication that the contribution of nutrients and sediment, and possibly trace metals, from agricultural land use practices results in degraded water quality throughout Bear and Brown Creeks.

Surface Drainage

The surficial drainage within the Brown Creek and Bear Creek watersheds has been enhanced with ditches and drains, which direct surface water toward Brown Creek and Bear Creek. Both creeks flow in a southerly direction toward the Sydenham River.

East of the Warwick Landfill Site is an artificial open drain identified as the Kersey Drain. This drain forms the eastern boundary of the southern portion of the site and flows in a southward direction where it connects with Brown Creek at County Road 39. Within historic documentation for the Warwick Landfill Site, the Kersey Drain was identified as Brown Creek. Bear Creek, which is located about 8.7 km west of the site, has its natural headwaters north of the site and vicinity.

Surface drainage on the Warwick Landfill Site is controlled through a network of internal ditches and ponds. Most surface water is directed through a perimeter ditch that drains into the Stormwater Management Pond located near the southwest corner of the landfill site.

Surface water from the Stormwater Management Pond discharges into a natural drainage swale that flows in a westerly direction and connects with the Van Kessel Drain between the site and County Road 79.

Within the northeast corner of the Warwick Landfill Site, surface water overland flow discharges into the southern ditch of Zion Line and drains in an easterly direction to the Collins Drain North Branch, which discharges into Kersey Drain (Brown Creek).

Ditches and drains within the site and vicinity are typically intermittent. Surface water flow occurs during periods of snowmelt and after intense or prolonged periods of precipitation. Historic information indicates that Brown Creek and Bear Creek are perennial watercourses, although during prolonged dry periods, portions of Kersey Drain (Brown Creek) are dry.

The surface water is naturally turbid as a result of soil erosion, overland flow, and agricultural drainage from the surrounding land. Metal and nutrient concentrations within the surface water are naturally elevated as a result of the sediment load within the surface water. After intense or prolonged precipitation events the water turbidity as well as metal and nutrient concentrations generally increases.

Surface water quality within the drainage swale located downstream of the Stormwater Management Pond has not shown a notable landfill leachate effect relative to natural surface water quality variability.

5.12.2 Future Baseline

Water Quality

The long-term trends for Brown Creek and Bear Creek will continue to reflect elevated nutrients, trace metals (Al, Fe, Cu) and suspended solids or turbidity which are typical of temporary flow conditions in stagnant waters influenced by channelization for agricultural purposes, fertilizer application and manure spreading in a landscape of clay soils.

The longer term baseline also assumes that the existing management practices, such as capture of runoff in on-site ponds, will continue to protect the creeks from solids, nutrients and metals that may be in the Warwick Landfill stormwater or leachate. It also assumes that any groundwater discharges to the creeks will not be affected by landfill activities.

Water quality and the benthic community in Bear and Brown Creeks can be expected to remain stable or even improve over the longer term. Increased awareness of agricultural impacts and implementation of best management practices along watercourses may lead to improvements in creek water quality, which can be measured chemically or using the aquatic benthic community as an indicator. Implementation of improved agricultural practices and habitat improvements would result in a baseline of slightly improved water quality.

The combination of more intense storms, longer dry periods and evaporation resulting from increases in temperature can be expected to lead to an increased number of days where no flow occurs in the headwaters of Bear Creek, both above and adjacent to the landfill. In addition, the subsequent wet weather events may result in poorer water quality owing to the accumulation of any pollutants that are resuspended and introduced to waters.

Surface Drainage

Based on the land use planning projections for the area, surface water flow rates will increase downstream of the Village of Watford as the area of low permeability surfaces, such as asphalt and houses, increases. In addition, the municipal water and sewer servicing for the increased development within urban areas will increase the volume of discharge from the sewage treatment plant into the watercourses.

The resultant increase in surface water flow rates may be detectable during baseflow conditions, but will not be evident during snowmelt or after intense or prolonged periods of precipitation.

Surface water quality changes may be detectable immediately downstream of the Village of Watford. However, owing to the contribution of surface water drainage and overland flow within the rural areas, these urban effects may not be detectable further downstream of the Village of Watford.

5.13 Transportation

5.13.1 Existing Baseline

Regional Setting

The Village of Watford is situated south of Provincial Highway 402 on County Road 79. The surrounding community is a grid of arterial roads, most of which are used for local traffic (including agricultural traffic)

On-Site and Site Vicinity

Permitted Landfill Operating Conditions

The Warwick Landfill Site is in operation from 07:30 a.m. to 5:00 p.m. Monday to Friday and 08:00 a.m. to 1:00 p.m. on Saturdays.

The landfill site entrance is located approximately 1,000 m east of County Road 79 on Zion Line. The entrance has approximately 100 m available for the storage of waste vehicles prior to them entering the weigh scale.

Traffic activity is well segregated; waste trucks travel to the active face, contaminated soil trucks travel to contaminated soil stockpile and monofill locations, and residential vehicles travel to the mini-transfer area.

The site access road is paved from Zion Line to the weigh scale area. The site access road is largely granular construction. Dust from the gravel road is controlled by application of water. A sweeper is employed to clean any excess debris from the site roads and Zion Line.

Site Generated Traffic

Manual traffic counts were conducted at the site entrance. Counts were conducted on two weekday and two Saturday periods from approximately 07:00 to 19:00 to ensure representative data.

The following peak hour distribution was observed:

Exhibit 5-17. Peak Hour Distribution Traffic

Period	% Automobile	% Truck
AM Peak	10	10
Mid-day Peak	15	22
PM peak	6	15
Saturday Peak	50	22

The following table displays daily traffic counts for site generated traffic.

Exhibit 5-18. Site Generated Traffic – Daily

Period		Auto	Auto & Trailer	Short Heavy	Long Heavy	TOTAL	
						Trips	*Loads*
Weekday 1 (4 June 1998)	Counted	121	0	25	18	165	83
	Factored	145	0	32	22	205	103
Weekday 2 (20 Aug 1999)	Counted	89	10	10	12	121	61
	Factored	120	13	13	15	161	81
Saturday 1 (20 Aug 1999)	Counted	74	6	3	2	85	43
	Factored	98	8	4	2	112	66
Saturday 2 (18 Sept 1999)	Counted	107	5	2	0	114	57
	Factored	144	8	3	0	155	78

The greatest total volumes generated by the landfill occurred during the Saturday peak hour, heavily weighted by automobile travel. Recalling that each load destined to the landfill results in two trips, approximately 12 loads were received during the AM peak hour, 16 during the mid-day peak hour, 12 during the PM peak hour, and 23 during the Saturday peak hour.

In considering all of the traffic data collected at the landfill site entrance, heavy trucks (short heavy and long heavy) comprised 23% (65 of 285) of the total weekday landfill traffic but only 4% (7 of 166 vehicles) of the total Saturday traffic.

Exhibit 5-19. Site Generated Traffic – Peak Hour

Peak Hour Period	Direction	Auto	Auto & Trailer	Short Heavy	Long Heavy	TOTAL
Weekday AM 08:30-09:30	Entering	9	0	2	0	11
	Exiting	9	0	2	1	12
Weekday mid-day 11:30-12:30	Entering	9	0	4	3	16
	Exiting	10	0	3	3	16
Weekday PM 15:30-16:30	Entering	9	0	2	2	13
	Exiting	7	0	2	2	11
Saturday 08:30-09:30	Entering	18	1	1	1	21
	Exiting	21	1	1	1	24

Along the Haul Route

Agricultural Traffic

During the intersection traffic counts instances of agricultural related vehicles or farm implements on the roadway were recorded. The number of occurrences on the survey dates was minimal. During the weekday count program (10.5 hours counted from 06:30 a.m. to 7:00 p.m.), the number of daily observations ranged from 0 to 8, whereas during the weekend, the daily observations ranged from 0 to 12.

It is recognized that although agricultural traffic will utilize the road network throughout the year, it is primarily dependent on the time of season with it being greatest during planting and harvesting times. As the dates of the traffic counts (June, August and September) correspond somewhat to the typical peak agricultural activity, the observed farm activity is considered representative of average agricultural traffic.

As agricultural traffic rarely operates at speeds above 30 or 40 km/h, other vehicles regularly need to pass them. Based on observations the operations of agricultural traffic along County Road 79 and Zion Line and the relative infrequency in which it occurs suggests that at present, agricultural traffic does not significantly conflict with other traffic.

Exhibit 5-20. Traffic Trip Distribution

Period	Type	Percent Distribution to/from							
		Highway 402		CR 79		CR 39		Zion Line	
		West	*East*	*North*	*South*	*West*	*East*	*West*	*East*
Weekday	*auto*	3	3	15	38	5	5	11	20
	truck	6	8	41	15	0	0	10	20
Saturday	*auto*	3	3	17	32	4	4	10	27

School Bus Traffic

The two local school boards currently operate school bus routes through the study area. Bus stops along these routes are located at or near each student's home, based on arrangements between the student's parents and the bus drivers. Not all of the routes serve local residences; some are simply travelling en-route to their ultimate destinations.

A high number of buses were observed at the Highway 402 ramp junctions yet only a few observed at the adjacent intersection of County Road 79 and Zion Line. It appears that buses use the interchange to change travel directions. Alternatively, buses traveled north on County Road 79, and thus did not pass through the study area.

It is our understanding that no collisions involving school buses from any of the respective school boards have been recorded within the study area in the past five years.

Operating Conditions

Based on the existing peak hour volumes, operational analyses were conducted for the haul route study area intersections.

All of the intersections are currently operating at excellent levels of service with minimal delays to the minor street traffic; no predisposed operating deficiencies exist. The delays are consistent across all time-periods, as they are more so dependent upon the intersection type and configuration as opposed to volumes. The delays are a function of having to slow down to come to a stop or make a turn, as opposed to having to wait for a suitable gap in conflicting traffic (i.e., volumes are relatively low, so very few conflicts are present). In case the Highway 402 interchange at County Road 79 is unavailable, a contingency route along Zion Line could be used (see **Exhibit 5-21**).

Road Maintenance Assessment

Based on a visual examination, the haul route roads are adequate to accommodate existing truck volumes and axle loadings. At present, there are no load restrictions on County Road 79 or Zion Line, the main access roads.

Collision Analysis and Safety Issues

Accident records were obtained from the Ministry of Transportation for Highway 402, County Road 79, and Zion Line. For the period from 1993 to 1997 inclusive, the Ministry reported the occurrence of nine accidents at intersections and road sections along the haul route.

Further discussions with Lambton County staff have confirmed that as of February 2000, no collisions have been reported along the Zion Line or County Road 79 sections of the existing haul route since 1997. Of the 9 collisions reported, two occurred at the Zion Line / County Road 79 intersection, while 7 occurred at, or near the Highway 402 ramp terminals at County Road 79. The two incidents at the County Road 79 / Zion Line intersection were single vehicle accidents; one failed to remain; and one was the result of the driver's medical or physical disability.

The seven other incidents reported (at the Highway ramp terminals) included three turning movement collisions (turning vehicles crossing the paths of County Road 79 through vehicles), two rear-end collisions, one sideswipe, and one single vehicle accident.

No specific references to accidents involving waste vehicles or agricultural vehicles were reported, nor was any of the reported injuries life threatening.

There were four other collisions reported to MTO between 1993 and 1997 near the site (but not along the actual haul route) involving three single vehicle collisions (one with wildlife), and one two-vehicle incident. The primary cause for the single vehicle collisions was excessive speed for the road conditions, while one of the driver's of the two-vehicle collision was under the influence of alcohol. None of these incidents involved waste trucks or agricultural vehicles of any sort.

EXHIBIT
5-21

DRAWING NO. 197716-D8-3

DWN BY: T C G
CHK BY: F C F

DATE: 12/07/05
SCALE: 1 : 100,000

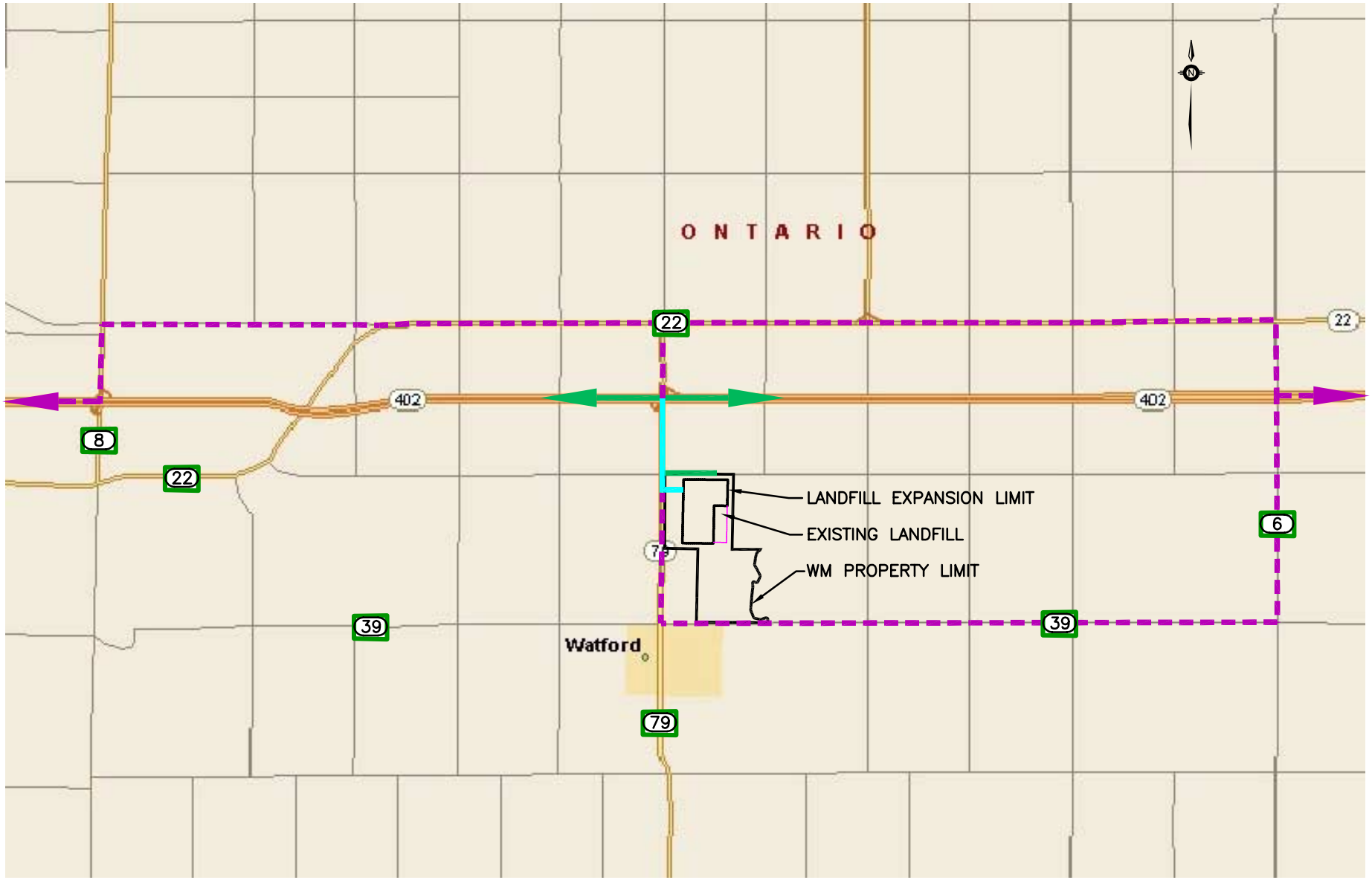
WASTE MANAGEMENT OF CANADA CORP.

WARWICK LANDFILL

ALTERNATE EMERGENCY HAUL ROUTES

WASTE MANAGEMENT

HENDERSON, PADDON & ASSOCIATES LIMITED
CONSULTING ENGINEERS
OWEN SOUND • THE BLUE MOUNTAINS • ORMSBY
Tel: (519)376-7812 Fax: (519)376-8008



SCALE :
0 1600 3200m

PRIMARY EXISTING HAUL ROUTE

PROPOSED PRIMARY HAUL ROUTE

POSSIBLE ALTERNATIVE EMERGENCY HAUL ROUTES
(DEPENDENT ON LOAD LIMITS AND DESIGN)

Apart from collisions, the existing road configuration and profile through the study area was also addressed from a safety perspective. The sight lines provided at the existing Highway 402 ramp terminals with County Road 79 do not satisfy the requirements of a design speed of 100 km/h (20 km/h over the posted speed of 80 km/h through this section).

5.13.2 Future Baseline

2015 On-Site and in the Site Vicinity

Sites Operations

The site is expected to maintain its current operating level through to 2015 with only minimal changes.

One change pertains to the need for daily and intermediate cover material. A shortfall of material for daily and intermediate cover is anticipated and as such, these materials will have to be imported from off-site sources.

The maximum input rate for a single day, determined by the requirement to accommodate site clean-ups, which generate a large number of trucks over a short period, will be in the order of 2,000 tonnes (1,135 m^3).

This translates to approximately 50 additional truckloads per day (assuming a 40 tonne truck capacity) as compared to the current operating levels (a stockpile of cover material currently exists and no importation is required).

Based on the existing peak hour distribution of truck trips, the number of additional truck loads of cover material during the AM, mid-day, and PM peak hours will be approximately 5, 11, and 8 respectively (each inbound load will have a corresponding outbound trip from the landfill).

Site Generated Traffic

The volume of site-generated traffic is related to the amount of waste, recyclable materials and contaminated soil that the landfill receives. In 2015, the volume of waste and recyclable materials is expected to be comparable to that received at present and hence the associated traffic volumes will remain virtually unchanged. The recorded volume of waste-related traffic (from counts performed in 1998/99 at the site access) has been assumed for the 2015 future baseline scenario.

Distribution of Site Traffic

Based on the continuance of existing operations through to 2015, the existing distribution of site traffic (both auto and truck traffic) was maintained for the future baseline scenario.

2015 Along the Haul Route

Road Network

As there are no additional haul routes to be considered beyond the previously defined haul route study area, the road network adopted for the existing baseline scenario is assumed for the future 2015 baseline scenario.

Traffic Volumes

In addition to the site-generated traffic, another integral component of the future baseline is the background traffic that will exist on the 2015 road network. Future background traffic volumes are often estimated by applying a growth factor to existing traffic to account for changes unrelated to the development site. Growth factors can be determined from historic traffic volumes on the subject road (or in the immediate vicinity), or based on local engineering experience and judgement (typically, input from local road authorities).

Consultations with Lambton County staff and a comparison of the recently observed volumes to historical data (1992 data obtained from the County) revealed the following growth rates on roadways along the haul route.

Future Growth Estimates

Roadway Section	Annual Increase
County Rd 79	2.5 %
Zion Line	1.5 %
County Rd 39	0.7 %

Although this extent of growth might be considered somewhat aggressive (high) particularly given the rural character of the area, the current activities, and the projected population growth surrounding the landfill, it is conducive to investigating a worse case traffic impact scenario.

Other Traffic Sources

As there are no significant land use developments planned within the haul route study area, traffic volumes attributed to agricultural activities and school bus routings are expected to maintain their current, rather minimal, levels. No significant future land use plans are expected within the haul route study area that may have a more significant and direct impact on the traffic volumes.

Operating Conditions

The operational analyses for the intersections within the haul route study area were repeated based on the increased traffic volumes expected in 2015 (from the estimated increases in background traffic levels and additional cover material needed for the site).

All of the intersections and critical turning movements are expected to operate at good levels of service with only minor delays, and thus can easily accommodate the background traffic growth while still supporting the continued landfill operations through to its closing.

Road Maintenance Assessment

Given the minor growth expected in background traffic volumes (and the continuation of the current landfill traffic levels), the roads along the haul routes should continue to provide adequate service for all vehicles until the potential closure of the facility in 2015.

Accident Analysis and Safety Issues

As the historic accident data did not reveal any significant underlying safety issues or concerns with respect to waste haulage, an increase in accidents involving waste vehicles given the operating levels of the landfill expected in 2015 is not foreseen.

Consideration should be given to reducing the speed limit along County Road 79 through the section where it passes over the Highway 402 and intersects with its eastbound and westbound ramp terminals. Given appropriate enforcement, this speed limit reduction will enhance the operational safety of these intersections by providing increased sight distance for approaching vehicles and those performing critical turning movements.

2026 On-Site and in the Site Vicinity

No traffic is attributed to the landfill expansion in this future baseline scenario as the landfill will be closed.

2026 Along the Haul Route

Road Network

Beyond their 10-year programs, within which no improvements to the study area road network have been scheduled, the Ministry of Transportation nor Lambton County have identified any significant road improvement plans (other than regular resurfacing programs). However, given the uncertainty in predicting future activities beyond a 10-year period, this is not to suggest that improvements cannot and will not be implemented beyond 10 years.

Traffic Volumes

The traffic volumes in the 2026 future baseline scenario are limited to the background traffic growth (i.e., traffic on the road network that is not attributed to the landfill). Forecasts of the 2026 traffic volumes are based on the annual growth rates provided by Lambton County.

Future school bus operations and routes are dependent upon the need to serve the local places of residence. Barring a significant increase in the student population within the study area, no significant increases in school bus traffic is foreseen.

Other Traffic Sources

As in the case of the 2015 baseline condition, no significant developments are expected to occur in the immediate vicinity of the landfill that would otherwise increase the traffic volumes beyond that which has been accounted for in the background growth estimates.

Operating Conditions

Given the background traffic volumes expected in 2026, the operational analysis for the haul route study area intersections was repeated.

All of the intersections are expected to continue to operate at good to excellent levels of service and should easily accommodate the future background growth through to the year 2026. In other words, should the landfill expansion not proceed, and background traffic volumes continue to grow at the rates employed, no operational difficulties are expected for intersections along the haul route.

Road Maintenance Assessment

All of the intersections are expected to continue to operate at good to excellent levels of service and should easily accommodate the future background growth through to the year 2026. In other words, should the landfill expansion not proceed, and background traffic volumes continue to grow at the rates employed, no operational difficulties are expected for intersections along the haul route examined herein.

Accident Analysis and Safety Issues

As indicated in the previous baseline condition (2015) historic accident data suggests that an increase in collisions involving waste vehicles given no increase in the operating levels of the landfill is not foreseen. This is not to say that collisions may not occur; merely that there will continue to be no precipitating factor that would cause additional accidents, over and above the rather low levels currently experienced.

Again, with respect to the sight distances provided at the Highway 402 interchange, consideration should be given to reducing the speed limit along County Road 79 through the section where it passes over the Highway 402 and intersects with its eastbound and westbound ramp terminals. With appropriate enforcement, this suggested speed limit reduction will enhance the operational safety of these intersections by providing increased sight distance for approaching vehicles and critical turning movements.

5.14 Visual

5.14.1 Existing Baseline

Regional Context

In the Community

Southwest of the Warwick Landfill Site is a woodlot. It is the dominant visual feature driving in and out of the Village of Watford on County Road 79. Agricultural imagery encapsulates the rest of the landscape for areas east, north, west and immediately south of the lands owned by WM. The Village of Watford is situated immediately southwest of the Warwick Landfill Site.

A variety of structures define the Watford fringe adjacent to the WM lands. These include a small nursery, town arena and residential structures.

On-Site and Site Vicinity

The lands owned by WM consist of landfilled property (active and closed), flat agricultural lands and a significant woodland area which partially bisects the property at mid-point.

Existing visual / landscape conditions for the currently controlled property are listed as follows (see Exhibit 5-22):

- The landfilled portion of the WM property is a long, narrow rectangle of approximately 48.08 ha of which approximately 21 ha have been used. This landfilled component is comprised of a number of cells ranging in height from ± 3.0 m at the north cell to ± 9.0 m at the south cell. Approximately 1.35 ha are currently active and the balance of the cells are closed, capped and vegetated. A screening berm (approximately 3.0 m height) defines the north end of this 48 ha parcel and provides visual mitigation for immediate views into the site from Zion Line.
- The existing active landfill operation is visible from portions of Zion Line and County Road 79. Closed cells and existing vegetation provide screening from other surrounding locations.
- All other WM property and beyond is relatively flat with poor natural drainage. The predominant land use is agriculture, interspersed with limited non-farming activities.
- The dominant visual feature is an extensive woodland. This rear lot preservation of trees is commonly found in this region and represents a very traditional rural Ontario landscape feature.
- Other vegetation within and around the site consists of scrub hedgerows and mature roadside trees.
- Built form within the WM property consists of landfill service buildings, farm related structures and two residential buildings along the south property limits.

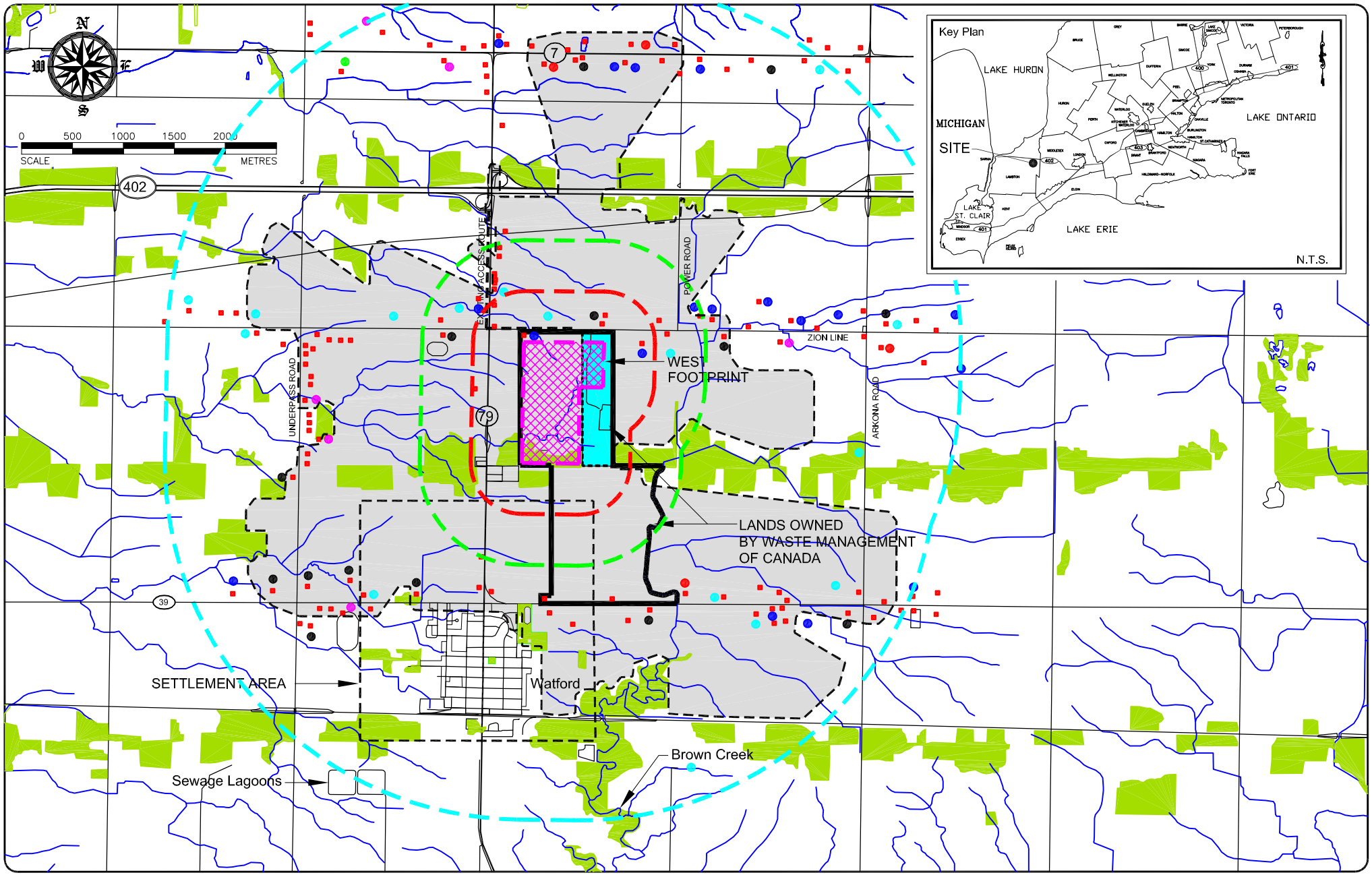


EXHIBIT 5-22

DWN BY: JEP DATE: 1/08/02
CHK BY: P.J.B. SCALE: 1: 50,000

WASTE MANAGEMENT OF CANADA

DRAWING NO. 1

WARWICK LANDFILL EXPANSION
SITE LOCATION

VIEWSHED FOR EXISTING CONDITIONS
WASTE SERVICES PROPERTY

LEGEND:

- OUTLINE OF WEST FOOTPRINT
- LIMIT OF 1000m STUDY AREA
- LIMIT OF 3500m STUDY AREA
- VIEWSHED BOUNDARY
- RESIDENCE
- AGRICULTURAL – BEEF, DAIRY
- AGRICULTURAL – CASH CROP
- AGRICULTURAL – SWINE, POULTRY
- AGRICULTURAL – VEGETABLES
- AGRICULTURAL – HORSE
- AGRICULTURAL – RETIRED

REV	DATE	DWN BY	APP BY	DESCRIPTION

Oct 06, 2005 – 7:39pm N:\Projects\1997\97393.65\2005\WorkInProgress\Documents\Draft EA Document\EA Ch 05\97393-65-EX5-14.dwg

Built form beyond the property limits consists of a variety of residential farm, community and institutional structures. The Village of Watford represents the dominant built form visual feature outside of the WM lands.

5.14.2 Future Baseline

Regional Context

In the Community

It is not anticipated that there will be any significant change to the visual conditions within the community.

Minor residential / industrial growth is predicted along the northern fringe of Watford at Highway 39. This would be compatible with existing visual conditions.

On-Site and in the Site Vicinity

Only minor changes to visual conditions will occur within the site and in the site vicinity.

The landfill cells will be closed, capped, topsoiled and vegetated, thereby eliminating the visibility of the active face. A poplar forest is proposed on the south cell as part of the leachate management plan, and tree and shrub vegetation may be part of the final landscaping plan.

Along the Haul Route

It is not anticipated that there will be any significant change to visual conditions along the haul routes.

6. ASSESSMENT OF POTENTIAL EFFECTS TO THE ENVIRONMENT

6.1 Effects Assessment Methodology

The effects assessment predicts what effects (positive, neutral or negative) could result if the proposed design of the landfill expansion were added to the environmental baseline conditions. Wherever they identify negative effects, the effects assessment team investigated and recommended mitigation measures to reduce or eliminate the effects. The design team considered the recommendations for mitigation and integrated them into the design and operation plan of the landfill expansion. The effects assessment team then documented the environmental effects that are likely to remain after WM builds all recommended mitigation measures into the design and operations plans for the landfill expansion (these are the "net effects").

In line with the Terms of Reference requirement to consider what expansion capacities, land footprints, heights and landfill designs would be environmentally appropriate for the Warwick site, WM, with its consulting team, developed an assessment methodology, which they outlined in Discussion Paper No. 4 **(Appendix B)**. It provides a detailed assessment of the entire facility impacts on a cumulative basis, including the impacts associated with the proposed landfill development and required ancillary facilities. Briefly, the approach includes:

- Impact assessment of base case scenario;
- Comparison of site entrance options;
- Comparison of leachate management alternatives; and
- Net Impact Assessment of preferred undertaking.

The analysis began with discipline-by-discipline examination of the potential impacts of the base case. The base case assumes use of the Zion Line access option and landfill leachate treatment through on-site incineration. Mitigation measures were recommended to reduce or eliminate potential impacts and the effect of these measures was included in the net effect analysis.

The base case scenario was then modified to include site entrance options and leachate treatment alternatives. In some cases, mitigation recommendations were revised to reflect the new scenarios. An impact comparison then determined where differences in net impact might occur with each of the new options and alternatives. This was followed by an identification of preference for site access and leachate treatment.

The preferred undertaking includes the selected site access and leachate treatment approach. The detailed impact assessment of the undertaking starts with consideration of impacts from each discipline study as documented in the individual reports. This information is then

integrated into an analysis of impact from a cumulative perspective in the criteria based assessment.

The technical consultants used various tools for conducting the impact assessment. Where standards or regulations are in place, the impacts are stated as in compliance or not in compliance. Where standards or regulations do not exist, the consultants develop their opinions based on detailed modelling, past experience and professional judgment. They used quantitative analysis where data was available. The analysis was based on design assumptions and available information (as detailed in Discussion Papers No. #6 and #8, Appendix B). In addition, where possible, modeling of predicted effects was also carried out assuming the adoption of key impact mitigation measures. Where mitigation measures were recommended, each discipline has provided a professional assessment of the effect of these measures. The various disciplines also worked together to contribute to the landfill design taking into account their own requirements for mitigation, resulting in the final design configuration.

The overall effect assessment considered both the baseline conditions and the effects of landfill expansion over a range of operating conditions, including, construction, operation, closure, and post closure. It also recognizes existing and future (planned) uses in the vicinity of the undertaking. Planned uses and the anticipated impact they will have on the community, natural environment and resources are incorporated into the future baseline conditions as far as possible (as described in Discussion Paper No. 5, Appendix B). The predicted impacts of landfill expansion therefore, are in addition to, or cumulative to, anticipated effects of other major undertakings. In particular, the impact on future traffic anticipated as a result of the planned Warwick Industrial Park has been incorporated.

For the technical background report for the effects assessment by each discipline, refer to **Appendix D**.

6.1.1 Effects Assessment Criteria and Indicators

Indicators are facts that can be looked at to measure changes or potential impacts for each of the criteria. Wherever possible, they are based on regulations, industry standards and guidelines, as well as the experience of the professionals applying them. They are broken down in the following sections into Public Health & Safety, Natural Environment and Resources, Social and Cultural, and Economics, in the same manner that they are shown in the ToR. Discussion Paper No. 4 (**Appendix B**) provides a complete list of all of the criteria and indicators, including definitions and rationale for each.

6.1.2 Study Areas and Methods

Breakdown by Consultant

Exhibit 6-1 identifies the members of the WM study team that were responsible the assessment of the net effects for their individual discipline.

Exhibit 6-1. Consultants by Discipline

Area of Expertise	Consultant
Agricultural Assessment	Stantec Consulting Limited
Air Quality Assessment	RWDI
Archaeology	Archaeological Services Inc.
Cultural Heritage	Archaeological Services Inc.
Economic Assessment	urbanMetrics Inc.
Hydrogeology Assessment	Jagger Hims Limited
Human Health Risk Assessment	Cantox
Land Use Assessment	Weston Consulting
Natural Environment Assessment	Gartner Lee Limited
Noise Assessment	Aercoustics Engineering Limited
Social Impact Assessment	IER Planning, Research and Management Services
Transportation Assessment	Cansult Limited
Visual and Aesthetic Assessment	BAKERTurner Inc.
Landfill Design & Engineering	*Henderson Paddon Environmental Inc.
Landfill Gas Control Design	*Comcor Environmental
Landfill Gas Assessment	Cantox Environmental
Diversion Impact Assessment	Environmental Strategies Limited

**Note: The main role for these consultants was in the development of the landfill design and operating plan, rather than the impact assessment. Thus, impact assessment work plans have not been developed for this area of expertise.*

Study Areas

Discussion Paper No. 4 included a work plan synopsis for each study discipline that indicates the corresponding study areas for each group of criteria. In general, the following three study areas were defined for the consideration of impacts from the proposed landfill expansion:

- **On-site:** includes all property owned by WM which will form part of the expansion proposal. This includes the existing landfill, the expanded landfill footprint and areas available for ancillary facilities and services such as stormwater management ponds, soil stockpiles and entrance/scale house areas. It also includes a parcel of land recently acquired by WM bringing the western site boundary to County Road 79.
- **In Site Vicinity and Along Haul Routes:** includes a radius defined by study disciplines of up to 3.5 km from the facility footprint and 0.5 km on either side of the haul route.
- **In the Community:** includes the Township of Warwick as the host municipality, the County of Lambton, as well as the Province of Ontario and Federal government as appropriate.

However, each of the specialists further defined study areas for applying the criteria and indicators that are appropriate to the potential effects associated with their discipline. The study areas for each criterion may vary in size from one another in order to incorporate a comprehensive range of potential effects. Each study area is based on the professional experience of the technical disciplines, industry standards, and meets the requirements set out by the Ministry of the Environment or other applicable regulatory bodies.

Methods for Evaluation

A synopsis of the work plan or methodology to be used for each discipline area was provided in Discussion Paper No. 4.

6.1.3 Significance of Net Effects

In the Background Reports to the effects assessment (refer to **Appendix D**) each discipline assessed net environmental effect using the following criteria to evaluate its significance:

- **Magnitude** – the size or degree of the impact compared against baseline conditions;
- **Extent** – the area over, or throughout which, the effects are likely to occur;
- **Duration** – the time period for which the effect will last;
- **Frequency/Timing** – the rate of reoccurrence of the effect (or conditions causing the effect);
- **Ecological Importance** – the value or sensitivity of the environmental attribute affected;
- **Societal Value** – the importance of the environmental attribute or resources to society;
- **Reversibility** – the degree to which the effect can be or will be reversed (typically as measured by the time it will take to restore the environmental attribute or resource); and
- **Probability** – the likelihood of occurrence of the effect.

WM recognized that certain effects criteria are more important than others are, and the importance is criteria-dependent. For this reason, WM did not assign numerical weights to the individual criteria, nor was there any attempt to calculate significance levels mathematically. Rather, with consideration for the individual criteria levels in an appropriate balance, a professional judgement was made of the overall significance of the residual effect.

Additionally, the cumulative nature of impacts was also considered from an inter-disciplinary perspective. For example, individual nuisance effects may include noise, dust, odour and litter. Individually any one impact may be considered minor; however, the simultaneous impact on residents from a number of effects may necessitate further mitigation.

The conclusion of the significance of the net effect was that:

- The residual adverse effect is minor or insignificant; or
- The residual adverse effect is significant and further or effective mitigation is not possible to reduce the impact of the effect; or
- The residual effect is an improvement to existing (baseline) conditions.

6.2 Potential Effects by Discipline

This section is a synopsis of the major findings as well as summary and conclusions by each study discipline. Full information on the analysis by each discipline is included in the Effects Assessment Background Reports (**Appendix D**). A criterion-by-criterion analysis is included in a summary form in Section 6.3. Section 6.4 integrates the findings of each discipline to describe overall impacts in relation to the categories of criteria in the Terms of Reference.

6.2.1 Agricultural

Major Findings

The proposed landfill expansion will result in a loss of approximately **218.5 ha of agricultural lands, 95.6% of this or 208.8 ha is prime agricultural lands (Canadian Land Inventory (CLI) Classes 1, 2 and 3).**

There are no agricultural buildings or other forms of investment in agricultural infrastructure that would be retired or displaced due to the proposed landfill expansion.

Air Quality

The Air Quality assessment identified no significant net environmental impacts relevant to agriculture considering that:

- Dust deposition, causing soiling of conventional and specialty crops, is not a concern;
- Emissions of all other compounds were found to be below guidelines

Economics

No significant economic impacts on agricultural businesses are anticipated.

Human Health Risk

The Human Health Risk Assessment (HHRA) incorporated the consumption of locally grown produce as a large part of the modeled dietary intake and determined that there is no significant net impact to human health.

Land Use

The Land Use Assessment concludes that the proposed expansion does not constitute an incompatible use with agriculture as both require separation from residential areas due to use of machinery and the potential for nuisance

effects from dust, noise and odour. Furthermore, compatibility becomes less relevant with expansion of an existing landfill, where compatibility with surrounding agricultural uses has been established.

Nuisance Impacts

Nuisance impacts on adjacent farm operations will be minimal due to the:

- Ability to control impacts, such as litter or gull and rodent populations, at source;
- Limited occurrence of specialized agricultural production in the vicinity of the proposed expansion; and,
- Low level of noise sensitivity of livestock production.

Traffic

The Traffic Assessment determined there is no significant net traffic impact affecting movement of agricultural equipment along the haul route due to the:

- Short extent of the haul route; and
- Provision of appropriate design upgrades and road alterations.

Water Quality and Quantity

The results of groundwater and surface water investigations undertaken by Jagger Hims and Gartner Lee Limited indicate no predicted impact to agriculture associated with water quantity or quality changes resulting from the proposed facility.

The proposed landfill will not impact groundwater quality of area farms because:

- The landfill will not have a detrimental impact on the regional or interface aquifer groundwater resources;
- Groundwater protection is built into the design of the facility; and,
- Leachate collection and treatment systems are proposed for the landfill.

Groundwater base flow to Brown Creek and Bear Creek Watersheds will not be notably affected by the landfill proposal resulting in minimal impact on the quantity of surface water available to agricultural operations;

- The groundwater table in the immediate area of landfill expansion is expected to fluctuate less than:
- 0.5 m at the north, south and east site boundaries; and,
- 1 m at the west site boundary.
- The landfill proposal will not create a flood hazard.

Off-site water quality impacts from site operations and on-site erosion will be controlled by:

- On-site stormwater management facilities; and,
- Leachate management, litter control, and proper fuel storage.

The Agricultural Impact Assessment observes that most of the agricultural soils in the area are clay soils and tile drained to move water away from saturated soils. It concludes that any impacts from the disruption of tile drains would be easily mitigated by installation of new drainage works.

Summary and Conclusion

The proposed landfill expansion will result in some limited and unavoidable loss of agricultural land on WM property. However, the agricultural impact of the proposed landfill expansion will be managed to a low and acceptable level after consideration of the recommended landfill design, operations and impact mitigation programs. Overall, there will be a minimal net operational effects on area agricultural operations, however, **no significant net impacts on agriculture are predicted.**

6.2.2 Air Quality

Major Findings

Dust

Dust emissions were predicted for on-site and haul route landfill activity combined with future predicted background traffic. The analysis includes emissions generated by:

- Vehicles traveling on
- Haul routes; and,
- Paved and unpaved roads inside the landfill;
- Landfill operations such as bulldozing, excavation of soil stockpiles and turning of compost; and,
- Wind erosion of stockpiles and unvegetated areas.

The study undertook air dispersion modeling for:

- Smaller size PM10 and PM2.5 dust particles that could have a potential human health effect from entering the respiratory tract; and,
- TSP (Total Suspended Particulate) and Dustfall that could cause visibility and nuisance effects, i.e. soiling of cars, buildings or vegetation.

PM $_{2.5}$ and PM$_{10}$

Air emissions modeling, indicates that:

- On occasion, concentrations of PM10 dust particles exceed applicable air quality guidelines at some residences at various times in the landfill development.
- No exceedances of the PM 2.5 criteria are predicted throughout the landfill life.
- The dominant source of dust emissions is the external haul route movements

With the recommended mitigation, the estimated concentration levels are significantly reduced.

TSP

Air emissions modeling, with inclusion of mitigation measures to the extent possible in the model framework, indicated that:

- Emissions of TSP are estimated to exceed the AAQC at distances of up to 1 km from the site from time to time
- Exceedances are not anticipated in all years but are associated with periods of active landfill construction activity;
- Seasonally higher during drier summer months:
- Background traffic and landfill traffic on CR 79 is a significant contributor to dust levels.

The results indicate some potential for nuisance impacts on residences located along the haul route and in proximity to the site.

Significant reductions in TSP and Dustfall concentrations are predicted with the implementation of the recommended Dust Management Strategy.

Dustfall

No exceedances of dustfall air quality limits are predicted throughout the landfill life.

Summary and Conclusion

The air quality impacts of the proposed landfill expansion are minimal with the recommended mitigation of potential operational and construction effects and appropriate impact management.

Predictive modeling of the emissions indicates that landfill operations will meet Federal and Provincial air quality guidelines and regulations for:

- Vehicle exhaust;
- Landfill gas flaring; and
- Leachate management activities.

Predictive modeling of emissions from passive landfill gas release will meet all applicable guidelines.

Standard mitigation methods will be used by landfill operators to meet Provincial air quality requirements and to control occasional air quality impacts in worst case operating and weather conditions from:

- Odour; and,
- Blowing litter.

Predictive modeling of dust emissions indicates that without further mitigation, Provincial Air quality guidelines for dust would be exceeded on occasion. A comprehensive Dust Management Strategy is recommended to reduce potential dust impacts at residences and to minimize effects associated with construction activity during dry and windy conditions. With these measures in place, limited exceedances of Provincial guidelines are anticipated.

Estimated human health risk associated with exposure to predicted air emissions is provided in the Air Health Risk Assessment.

6.2.3 Archaeology

For the purposes of this assessment, the term archaeological resource refers to any site or locale containing the remains of past human activity. These remains are:

- Prehistoric (i.e. pre-contact) or historic in age;
- Have a context that is usually below ground; and,
- Include a range of types such as:
- Isolated artifacts (or findspot);
- A limited activity campsite for processing resources;
- A large village occupied for many decades and housing hundreds of people; or,
- A 19th century pioneer homestead.

Major Findings

Eleven pre-contact sites were identified and require a Stage 3 assessment to determine the nature and extent of potential impacts to the sites and their archaeological value. There is potential adverse impact to ten of these sites as a result of landfill expansion. The eleventh site, AfH1-14, will also be subject to Stage 3 assessment but will not be impacted by expansion, as it is not on the expansion site.

Although archaeological resources were identified in the immediate site vicinity, no adverse impacts are anticipated.

Summary and Conclusion

The archaeological impact of the proposed landfill expansion has been determined to be insignificant recognizing that mitigation measures will be implemented for the 11 identified archaeological sites, including a commitment to a Stage 3 Archaeological Resource Assessment for each site.

6.2.4 Cultural Heritage

This assessment evaluated the potential impacts to cultural heritage resources from the operation of the proposed Warwick landfill expansion.

Major Findings

- There are two kinds of cultural resources which may be impacted by development; built heritage resources such as an historic residence or church, and cultural landscapes which are perceived as a collection of features that together form environmental features, such as roadscapes, farm complexes or human settlements.
- No on-site built heritage impacts are anticipated as there are no on-site features.
- There is little potential for adverse changes to built heritage features and cultural landscapes (habitable and non-habitable) along the haul route and in the site vicinity as a result of noise, dust and odour impacts.
- On-site impacts are anticipated for two identified agricultural landscapes (CLU 1, CLU 3). This is due to the well-preserved nature of the agricultural lands to be developed, the high heritage value of these landscapes, and the anticipated disruptions and displacements.

Summary and Conclusion

The proposed landfill expansion will have no impact on built heritage resources of the community as no buildings of heritage interest were

identified on-site and there is little potential for impact to heritage structures due to nuisance effects in the study area. Some impact will occur to cultural landscape resources, recognizing that landfill development will result in loss/disruption to two high value agricultural landscape units.

6.2.5 Economic

The study assessed economic impacts on the following:

- Business operations;
- Dwelling units, including residential property values;
- Local employment and income; and,
- Fiscal impacts to affected communities.

Major Findings

Business Impacts

While approximately 208.8 ha of prime agricultural lands will be displaced, no significant impacts on the operation of agricultural businesses in the area are expected.

Non-agricultural businesses are not expected to experience any significant negative economic impacts due to nuisance dust, dustfall, odour or visual effects. Local customer base is not expected to be significantly impacted.

The expansion is not expected to be a significant factor distracting business investment in the area.

Property Values

The majority of residential properties in the study area are not expected to experience any property value impacts as a result of landfill expansion.

Nuisance impacts may affect the use and enjoyment of a limited number of residential properties particularly along the haul route and in closest proximity to the site, and thereby affect property values. The degree of property value impact cannot be determined in advance but is anticipated to be limited to those residences with the highest predicted frequency of nuisance impact.

Impacts on property value may also occur as a result of perception of negative effects from landfill operations; in some cases perception may be based on incomplete or inaccurate information. It is recommended that WM reduce this effect through provision of accurate and timely information concerning the facility.

A Property Value Protection Plan is recommended to address potential impacts.

Economic Impacts in the Community

The proposed expansion will have a significant, ongoing positive economic impact in the local economy and the Province of Ontario.

Estimated economic impacts associated with the WM 25-year capital expenditure of over $112 million include:

- $125.4 million in value added in the Province including, $68 million of new activity in the Sarnia/Lambton area.
- 1,720 person years of employment generated, including 748 person years in the Sarnia/Lambton area.
- Total tax revenue of $40.3 million, including $23.6 million to Sarnia/Lambton municipalities.

Operating expenditures over 25 years of $119 million generates a further 2,805 person years of employment in the Sarnia/Lambton area and associated labour income, economic value added and tax revenue.

Expansion presents a significant economic development opportunities to the local economy through:

- Enhanced business for existing suppliers, local suppliers will be used to support construction and operations as far as possible;
- New businesses attracted to supply the landfill operation with goods and services;
- New business attracted that can benefit from proximity to a landfill; and,
- New opportunities created by availability of landfill gas as a power source.

No adverse impact on community infrastructure is anticipated. Road improvement and maintenance costs attributable to the facility would be the responsibility of WM.

Positive fiscal impacts to the Township of Warwick and County of Lambton include:

- Estimated Host Community fees of an estimated $1/tonne, amounting to $750,000/yr;
- Estimated property taxes of $55,000/yr, an increase almost 110-percent over current revenue from the facility; and,
- Waste disposal at no charge to Warwick residents at an estimated value of $21,000/year.

Summary and Conclusion

Expansion of Warwick Landfill will have a significant positive impact on the local and Provincial economies recognizing that capital and operating expenditures will have significant value added and employment impacts for the Sarnia/Lambton areas and the Province of Ontario.

Tax revenue and community benefit payments will have a positive fiscal impact on local and Provincial finances, particularly for the Township of Warwick

6.2.6 Air Health Risk

The purpose of the HHRA was to evaluate the potential human health impacts, on nearby residential communities that could arise from expected airborne emissions associated with the proposed landfill expansion. The HHRA was carried out in compliance with the risk assessment procedures endorsed by applicable regulatory agencies.

Major Findings

The Human Health exposure analysis was originally based on the October 2004 Air Quality modeling results. The following detail is based on that analysis.

The main findings of the human health risk assessment are as follows:

Exposure to Combustion Gases

Chronic Human Health Impacts

- Long-term non-cancer human health risks as a result of exposures to landfill gases were considered minimal at the maximum discrete receptor location. Landfill gas exposure ratios were less than the target value of 1.0.
- Incremental lifetime cancer risk (ILCR) estimates for the chemicals of potential concern (COPC) were below one-in-one million (1.0e-06). The upper 95th percentile ILCR estimate for total chlorinated VOCs was also less than one-in-one million (1.0e-06).
- Specifically, for both the landfill flare only and the landfill flare plus evaporation/incineration scenarios, chronic human health risks associated with exposure to products of incomplete combustion (i.e., dioxin/furans, benzo(a)pyrene, lead, cadmium, arsenic, nickel and mercury) were not considered significant. For many non-carcinogenic compounds, these emissions produced human health risks several orders of magnitude lower than those associated with

background and/or existing levels. Compounds considered carcinogenic were associated with ILCR levels several orders of magnitude below one-in-one million, the level considered to be acceptable.

- No significant health effects were predicted from long term exposure to combustion gases, generally classified as respiratory irritants and asphyxiants. Specifically, annual concentration ratio (CR) values predicted for all combustion gases (e.g., CO2, CO, SO2, NOx and HCl) as a result of chronic exposures at the maximum discrete receptor location were determined to be within acceptable levels (i.e., all CR values were less than a value of one). This suggests no measurable long-term adverse health impacts would result from either leachate management scenario.

Short-term Human Health Impacts

- No short-term adverse health effects would be expected to occur as a result of exposure to products of incomplete combustion at the maximum receptor location under either the landfill flare only or landfill flare plus evaporation/incineration scenario.
- No significant health effect would be expected from short term exposure to combustion gases. All ½-hour and 1-hour CR values calculated at the maximum fence-line location were less than a value of 1.0 under both the *landfill flare only and landfill flare plus evaporation/incineration* scenarios, with a single exception. The CR value for SO_2 estimated for the operational year 2030 (or Year 26) was estimated as 1.1. Given the conservative World Health Organisation, (WHO), SO_2 air quality criterion and the exposure assumptions employed, the CR value observed for SO_2 was considered to be of minimal significance.

Particulate Matter

No adverse health effects would be expected to occur as a result of exposure to PM_{10} or $PM_{2.5}$.

This conclusion is based on the following:

- Air concentrations of PM10 and PM2.5 were modeled using very conservative assumptions and as a result are likely to be overestimated;
- The PM health effects guidelines used in this study are based on exposure to combustion-related PM and as such, are highly conservative for this site. The dominant source of PM associated with this landfill expansion is predicted to be crustal, as opposed to combustion related, which has a markedly lower toxicity;

- No annual exceedances over the health effects guidelines were predicted for either PM10 or PM2.5;
- The degree and frequency of exceedances over the PM guidelines for 24-hour time frames for PM2.5 were extremely small (less than 2-fold above guidelines for less than 2 days per year) and would be restricted to a very small area near the facility; and,
- The degree and frequency of exceedances over the PM guidelines for 24-hour time frames for PM10 is slightly greater than for PM2.5 but still is not considered to represent a human health concern due to the characteristics of the PM present at the site.

Summary and Conclusion

The likelihood of adverse health impacts arising from exposure to landfill emissions, including landfill gases, products of incomplete combustion and particulate matter, is negligible.

6.2.7 Hydrogeology

Major Findings

Landfill Design

The proposed landfill site is located in an area that consists of more than 20 m of clay/silt type soil over bedrock. Slow groundwater movement through the soil at millimetres to centimetres per year naturally protects groundwater resources from local land uses. An existing landfill is located adjacent to the proposed site.

The proposed landfill design enhances the natural soil and groundwater setting by providing an additional layer of protection for water resources. An engineered liner system that consists of a layer of recompacted clay sandwiched between two granular drainage layers will be constructed to contain landfill leachate within the waste. (Leachate is the term for fluids which have come in contact with the waste materials) This design will meet the regulatory landfill design standards.

Leachate

Leachate will be collected from the drainage layers through a system of pipes. Because leachate will be withdrawn from the drainage layers of the landfill, the level (or height) of the fluid leachate will be lower than the level (or height) of the surrounding groundwater. The landfill is designed with this “hydraulic trap” feature because it ensures that groundwater will move slowly inward toward the landfill (at

centimetres to millimetres per year) which will prevent the leachate from moving into the surrounding soil and groundwater.

A portion of the leachate collected from the waste will be recirculated back into the waste and the remaining portion will be treated. Recirculation of the leachate will increase the rate of contaminant removal from the waste. Therefore, as this recirculated leachate is removed from the landfill the potential for landfill effects on water resources is reduced. The benefit is a reduction in the contaminating lifespan of the landfill.

Leachate represents the source of potential effects on groundwater and surface water resources. Leachate is generated from the percolation of water through waste, which dissolves chemicals from the waste. Most of the leachate will originate as precipitation that infiltrates through the soil cover and into the waste. A small amount of groundwater will also slowly move into the drainage layers of the engineered liner system.

Leachate Quantity

Leachate generation for the completed landfill footprint is predicted to be between 72,000 to 145,000 cubic metres of leachate per year.

Leachate recirculation involves the reintroduction of leachate collected from the waste back into the landfill waste. Thus, leachate recirculation will not affect the overall volume of leachate generated at the landfill.

Leachate Quality

The concentrations of chemicals within the waste occur as a result of the breakdown of the waste with time and the percolation of water through the waste. As more water percolates through the waste, more chemicals are removed from the waste. Therefore, eventually chemical concentrations in the waste will be sufficiently low as not to represent a potential source of detrimental effects on local resources and the contaminating lifespan of the landfill will have been achieved.

The contaminating lifespan of the proposed landfill with no recirculation is about 410 years based on chloride concentrations and the minimum infiltration rate provided in the landfill standards (150 mm/a of precipitation infiltration). Recirculation of leachate will result in a notable decrease in the contaminating lifespan of the landfill. With recirculation of 230 mm/a of leachate and precipitation through the waste, the contaminating lifespan, based on chloride, is estimated to be 305 years.

Water Resources

Groundwater resources will be protected with the proposed landfill. On a regional basis the groundwater is used as a water supply for residents

and the shallow groundwater contributes to surface water flow. Thus, protection of both the quantity and quality of groundwater is required and was assessed.

There will be no detrimental effects on the quantity or quality of groundwater as it relates to:

- Operation of field tiles or agricultural activities;
- Baseflow to surface watercourses; or
- Water supply wells.

Summary and Conclusion

The proposed landfill will not have a detrimental impact on the regional groundwater resources, existing and potential sand and gravel resources, or potential oil and gas resources.

6.2.8 Land Use

The evaluation of land use impacts, with respect to the expansion of the Warwick landfill, was based upon the developed criteria that the expanded landfill has the potential to affect the compatibility of present and future land uses, which may have an effect upon planning decisions made within the community.

Major Findings

Compatibility with Planning Documents

County of Lambton Official Plan

- The proposed expansion of the Warwick landfill does not require amendment of the County of Lambton Official Plan. The proposed expansion requires only local Official Plan and zoning by-law amendments, which meet the policies of the County and the Province, and receive Provincial approval through an Environmental Assessment.
- The expansion of the Warwick landfill would not impact the development strategy of the County of Lambton Official Plan. Any new development in the 1 to 3.5 km vicinity of the landfill, can and will occur within the 'urban centre' of the Village of Watford, as designated within the County's Official Plan.

Township of Warwick Official Plan

- The proposed expansion of the Warwick landfill will require an amendment to the Township of Warwick Official Plan. The amendment would be to redesignate the entire site of the proposed facility to "Landfill Site".

- The amendment is required to include not only the fill area of the expansion but the uses associated with the operation of the landfill.
- This would include sedimentation ponds, the excess soil stockpile, leachate facilities, and maintenance buildings and compounds.
- This amendment would not impact the future land use pattern of the Township as the Warwick Official Plan contains a generous supply of lands already designated to accommodate future residential, commercial, and industrial lands within the Village of Watford.
- The expansion will be based upon a Site Plan Agreement under Section 41 of the Provincial Planning Act.
- Due to the fact that landfill sites, like agricultural operations, produce potential nuisance effects and require rural locations separate from typical urban uses, compatibility exists, assuming that effects from each use do not exceed acceptable levels and impact the continued viability and operation of the other use.

Township of Warwick Zoning By-Law

- The proposed landfill expansion will require that the Zoning By-law of the Township of Warwick be amended to rezone the entire expansion area "M3 Industrial Waste Disposal". The lands requiring a re-zoning are the lands to the west and south of the existing landfill, which are currently zoned "A1 Agriculture"; and lands to the west zoned "EP-WD Environmental Protection – Woodlot".
- The "M3 Industrial Waste Disposal" zone would permit the expanded site area to be used for the following uses: Waste Disposal Site for Non Hazardous, Solid Wastes; and, Buildings, Structures and Uses Accessory to a Permitted Use.
- The By-law also requires that a 30 m wide buffer area be maintained between the Waste Disposal Site and the rear lot line along the full length of the southerly most limit of the property. This buffer area is not to be used for any purpose other than as a separation between the waste disposal site and surrounding uses, as required by the Ministry of the Environment.
- It is anticipated that approval of the Zoning By-law Amendment for the landfill will be based upon a Site Plan, with WM and the Township of Warwick entering into a Site Plan Agreement.

Summary and Background analysis of both the growth and development pattern within the study area, and the relevant planning documents and land use

Conclusion

policies, indicate a minimal impact upon the land uses on-site and in the site vicinity. The primary impact that would result from the proposed expansion is the redesignation of lands currently owned by WM to permit landfill uses. This redesignation would ultimately mean the loss of some of the agricultural uses and a portion of the woodlot.

Therefore, the Land Use impact of the proposed landfill expansion is insignificant because:

- The Township of Warwick has a substantial amount of vacant and designated land available within the Village of Watford to accommodate future growth.
- No future change to the land use pattern is expected outside of Watford, and therefore no land use compatibility issues are predicted.

However, Official Plan, Site Plan Agreement and Zoning By-law amendments will have to be obtained.

6.2.9 Natural Environment

The purpose of this assessment is to document net environmental impacts from the landfill expansion on the natural environment and resources, given recommended mitigation measures where necessary.

Major Findings

Flood Hazard

There is no flood hazard associated with the expansion.

Bear Creek and Brown Creek will be maintained at baseline flow characteristics.

Disease Transmission via Insects or Vermin

There is a negligible risk to human and domestic animal health and safety from vermin.

Aviation Effects due to Gull Interference

There are no airports located within an 8-km radius of the Warwick Landfill.

Terrestrial Ecosystems

The area of natural vegetation and terrestrial habitat loss on the site is quite small and some temporary losses can be recovered through mitigation.

No off-site loss or disturbance is predicted.

Aquatic Ecosystems

No aspect of the construction, operation or closure of the Warwick Landfill will result in the loss or significant disturbance of the aquatic ecosystem or any component of it.

Forestry Resources

There is no impact on commercial forestry resources. The woodland that will be removed includes a variety of woodland species including hickory, ash and maple but have not been identified as having commercial value.

Recreational Resources

Recreational resources are defined here as a sport fishery in Bear Creek downstream of the landfill and small game hunting in the east - west woodland both on-site and in the site vicinity study area.

- Landfill expansion is not expected to impact the sport fishery resource, as there will be no significant impact on the receiving waters downstream of the landfill.
- Small game hunting is not known to occur on or in the vicinity of the site.

Along the Haul Routes: Disturbance to Terrestrial Ecosystems

The transportation impact analysis recommended several road improvements related to each of the access alternatives that may involve road and/or intersection widening.

These improvements can largely be accommodated within existing rights-of-way and no significant impact on terrestrial ecosystems is anticipated.

Along the Haul Route: Disturbance to Aquatic Ecosystems

No significant impact to aquatic ecosystems is anticipated. The haul route between Highway 402 and the entrance on Zion Line crosses a total of 4 drainage features, all of which are intermittent headwater tributaries of Bear Creek. CR79 access crosses 5 drainage features, which are also minor headwater tributaries of Bear Creek. These features are all ephemeral in nature, running only during the spring freshet and in response to substantial rainfall.

- Any accidents or malfunctions (spills to surface water/vehicle upsets into a creek along the haul route) will be limited in their spatial/temporal extent.

Any spills during the summer months will occur to dry ditches, will be easily contained by conventional spills control procedures and so will not spread to nor threaten the aquatic environment.

Summary and Conclusion

The expanded Warwick Landfill will have no significant impacts on terrestrial or aquatic ecosystems with proposed landfill and leachate treatment design. Bird interference with aircraft is not anticipated and minor effects will be experienced on recreational resources.

6.2.10 Noise

The following noise sources were included in the analysis:

- Construction machinery and equipment required for site construction and cell preparation;
- Machinery and equipment engaged in landfilling;
- Vehicles on site and on the haul routes; and,
- Stationary sources including: leachate collection and treatment facilities; landfill gas collection and treatment facilities; service and maintenance facilities; and Construction and demolition and other waste processing.

Noise emission levels for identified equipment and other sources were taken from published sources and Aercoustics database. The noise prediction computations are based on procedures and codes prescribed by the MOE and incorporate downwind and other atmospheric conditions that could augment noise propagation. As such, the model results represent *maximum noise emissions* for the landfill development.

Major Findings

Model Results

- With recommended noise attenuation in place, noise levels from on-site activity will comply with MOE guidelines during all operational phases. No significant noise impact from the landfill site is anticipated.
- The predicted noise increase from traffic at receptor R7 on CR 79 south of Zion Line due to the predicted landfill vehicles is less than one dBA, an increment that is not detectable by the human ear.
- At residences along CR 79 north of Zion Line, ultimate traffic noise including peak landfill traffic noise at the front of houses less than 165m from the road may require windows to be closed to meet an indoor noise level that is acceptable as defined by the MOE Land Use Planning standards. It is noted that MOE does not impose limits on noise from landfill vehicles on public roadways; a noise control discussion is presented for illustration and comparison purposes.
- No noise impact from traffic on the haul route is anticipated on farm animals or wildlife.

The following predicted results include recommended on-site mitigation measures. The analysis utilized example receptors rather than specific residences or other facilities as receptor points.

Site Preparation and Cell Construction Noise

- The highest site preparation and construction noise levels are predicted to occur before the perimeter berm is in place.
- These activities are classified by the MOE as Construction and are not required to comply with MOE Landfill noise criterion.

Noise Levels from Landfilling

- Noise levels due to on-site landfill activity throughout all operational phases, are at or below the MOE criterion of 55 dBA at all receptors.
- Landfill noise is not expected to interfere with any at residences along CR79 south of the Zion Line, on CR39, or in the Village of Watford. In these areas, noise from the landfill will seldom if ever be heard.
- In some operational phases, the predicted maximum noise level at receptors at the north-east edge of the landfill R2 , as measured in Leq, is above the lowest hour background noise, but in all cases is within the background noise range. When landfill activity is closest to this receptor landfill noise may be intrusive at times.
- At R3 the predicted landfill Leq is above the rural range through most of the landfill life. With a predicted maximum hour Leq of 50 dBA during the phase when landfill activity is closest, noise from the landfill site may be intrusive at times.

Noise Levels at the Watford Cemetery

- During the early years of the expanded landfill operation, the maximum hour L_{eq} at R9, the closest corner of the extended Watford Cemetery, is up to 13 dBA above the Year 1 background traffic. However, at a maximum of 54 dBA, there would be minimal interference with speech intelligibility at normal voice levels.
- The predicted peak pass-by noise level from trucks on site during much of the life of the landfill, as they pass through the corner of the landfill closest to the cemetery is 48 dBA. This is not expected to be intrusive.
- The CR 79 daytime traffic Leqs in the existing Watford Cemetery would range from 50 dBA at the east side (R6) to about 60 dBA near the road. Maximum hour Leqs from the landfill site at those locations would be about 50 dBA and mid-40's respectively. The landfill noise may have some effect on services in the existing cemetery area, and some interruption by noise from traffic on CR 79, which has been reported in the past, would be expected to continue.

Noise from Stationary Sources

- Noise from the stationary sources, including the occasional processing of construction and industrial waste, will be within the MOE noise limits.

Stationary Sources

- No perceptible increase in landfill noise results from these sources. The predicted noise levels for both leachate and gas collection systems and crushing and chipping activity indicate that, with recommended acoustic shielding, levels will be well within the MOE limits.

Noise from Traffic on the Haul Route

- The highest noise exposure from landfill truck traffic on the haul route occurs at receptors along CR79 north of Zion Line. Receptors at this location will be exposed to noticeable traffic noise increases due to off site landfill truck traffic.
- Although MOE does not prescribe limits for noise from traffic on a public highway, the new-house standards provides a guide to potential impacts. On this basis, noise mitigation measures may be desirable at some residences along CR79 due to background traffic alone (e.g., forced air ventilation, and central air conditioning). Addition of landfill traffic extends the area and degree of impact.

Noise Impact on Farm Livestock and Wildlife

- Farm livestock of all species acclimatize rapidly to the noise environments to which they are exposed, including startle noises and more uniform noises. No noise impact from the proposed landfill, either in the vicinity of the site or along haul routes, is anticipated on agriculture, terrestrial or aquatic ecosystems.

Noise Impact on Other Receptors

- With the exception of the Watford Cemetery location, noise levels from the landfill site will be within or below the background range that currently prevail in the vicinity of the landfill. No noise impact on farms or other businesses, recreational, institutional or other public facilities are anticipated.

Summary and Conclusion

Noise from the proposed landfill expansion will not be significant taking into consideration implementation of the recommended mitigation and impact management measures. On-site landfill activity

will be within applicable MOE noise guidelines, however, construction noise may exceed background noise during peak construction periods. Increased traffic noise, though not subject to MOE regulation, may require consideration of impact management measures at residences in closest proximity to the haul route.

6.2.11 Social

The purpose of the study was to identify changes that would likely result from the proposed expansion and to determine the significance of the changes and their effects on individuals, their quality of life and day-to-day activities as well as on the operation of community facilities and the community a whole.

Major Findings

On-site

No recreational resources are displaced by the expansion.

No residences are located on the proposed site. One residence adjacent to the site and located on property currently owned by WM will be displaced. This property currently has tenants that will relocate.

There are no community facilities located on-site.

0 to 1 km Study Area

No significant impacts are expected on the recreational resources (i.e. the snowmobile trail).

A number of residences in the 0 to 1 km study area are expected to experience occasional dust, odour and litter exceedances, noise increases and visual impact during most of the life of the landfill:

- All 21 residences are expected to experience moderate to high levels of visual impact throughout the landfill expansion;
- Moderate to significant noise increases are predicted for 7 to 11 residences in all years of landfilling;
- Dust impacts are expected to be experienced by 12 to 18 residences, on occasion, in most years of landfill expansion;
- Thirteen to 21 residences are predicted to experience odour exceedance at times for most of the life of the landfill; and
- Low to moderate litter impacts may be expected, on occasion, for all residences during the years of landfill operations.

There are three community facilities in the 0 to 1 km study area: the Watford Cemetery, the Roman Catholic Cemetery and Faith

Evangelical Baptist Church. These facilities are expected to experience varying degrees of visual, noise dust and odour impacts.

1 to 3.5 km Study Area

Residences in the 1 to 3.5 km study area are not expected to experience dust, noise or litter impacts. Residences within the 1 to 3.5 km study area but outside of the Village of Watford are predicted to experience various levels of visual impacts.

In the 1 to 3.5 km study area, 25 to 50 residences outside of the Village of Watford are predicted to experience a moderate level of visual impact, and 1 to 12 residences some occasional odour impacts as well. In addition, some residences within the Village of Watford are also expected to experience odour impacts under worst-case conditions, particularly in later years.

There are 26 community facilities located in the 1 to 3.5 km study area, the majority of them in the Village of Watford. These facilities are expected to be subject to varying degrees of visual and odour impacts.

Primary Haul Route Study Area

In the haul route study area, all 13 residences are predicted to experience moderate to high visual impacts, low to medium levels of litter, and moderate level of noise increases for all years of landfill operation. Occasional dust exceedances are predicted to be experienced by 9 to 13 residences for most years of landfill operations, and occasional odour exceedances by 5 to 13 residences. Ten residences are expected to experience an increase in the volume of traffic due to landfill expansion.

These residences are included in the 0 to 1 km or the 1 to 3 km study areas and therefore impacts should not be added to the results described above.

Community Character

If the Warwick landfill is expanded, it will increase the visibility of the industrial activity on the northern entrance to the Watford Village part of Warwick Township, giving an increasingly industrial character to the urban settlement area, and, for many residents will result in a negative perception. On the other hand, the landfill will likely contribute to industrial expansion. The basic character of the area is likely to remain as rural agricultural and rural residential with growing industrial development during the 25 or so years of development of an expanded Warwick landfill.

Community Cohesion

It is expected that during the next 25 years, the cohesion of the community might diminish somewhat if younger people continue to leave in the search for employment, regardless of whether or not the landfill expansion is approved. However, if the industrial component increases in the area (i.e. in the Industrial Park), so that young people can stay and raise their families in the community, the cohesion should be maintained and possibly enhanced. Given that the mobility rates have been quite constant over the past 20 years, it is expected that there will not be a lot of new people moving into the community beyond what might be able to be absorbed into the existing economic structure. Therefore it is felt that the cohesion of the community can be maintained during this period

Summary and Conclusion

With the full range of mitigation measures identified by the technical disciplines, many of the effects will be within existing standards and, to a large degree, minimized. The remaining social impacts on a number of residents and on the community can be addressed with a regular monitoring program, implementation of identified impact management measures, and an open communication process between the company, residents and the Township. Based on our experience in other similar projects, such an approach will minimize the negative effects and enhance the positive effects and result in the overall impact of the project being low and manageable.

6.2.12 Transportation

The purpose of the transportation impact analysis is to examine and assess the future operating conditions of the haul routes and to identify any significant impacts associated with the operations of the Warwick landfill facility. Road improvements and other measures are recommended to address the potential effect of the landfill and net effects are determined following implementation of these measures. The analysis focuses primarily on specific intersections along the haul routes and turn lane requirements for each access alternative.

Major Findings

No new WM landfill-related heavy vehicle traffic will traverse through the Village of Watford. Only a small number of WM site related trips, (mostly cars), will be traveling to and from Watford.

Several road deficiencies will require mitigation to accommodate future trips generated by the proposed landfill and to accommodate background traffic increases. Some improvements are considered

WM's responsibility, as they are required as a result of the landfill expansion. All other recommended measures result from background traffic growth and are required without the landfill expansion.

Road Improvement Recommendations

The following improvements are required as a result of landfill related traffic, with the preferred CR79 entrance:

- An exclusive southbound left turn lane on County Road 79 at its intersection with the site access. This turn lane improves turning movements for landfill traffic and provides County Road 79 through-traffic with uninterrupted flow through the intersection;
- An exclusive northbound right turn lane on County Road 79 at its intersection with the site access; and
- An acceleration lane from the landfill site entrance.

Discussions with the Ministry of Transportation have confirmed the adequacy of the CR 79 and Highway 402 interchange design. WM, in consultation with the Ministry, Lambton County and Township is considering a number of road network improvements:

- "Lift" the County Road 79/Ramp Intersection Approaches to Provide Adequate Sight Lines.
- Protection for a future traffic signal and appropriate turn lanes at the north ramp terminal intersection with implementation at the discretion of MTO.
- provide a new Northbound County Road 79 to Eastbound Highway 402 Right-Turn Ramp and eliminate the northbound left turn movement currently required to access the interchange loop.

These improvements would enhance the safety and operations of the intersections and reduce potential conflicts between current road users and landfill trips.

Summary and Conclusion

The proposed landfill expansion will improve safety on area roads over current conditions based on the implementation of the recommended mitigation measures to accommodate increased landfill and background traffic. CR79 site access has been identified as the preferred alternative from a traffic perspective.

6.2.13 Visual

Major Findings

The significant changes to visual conditions and impact values occur between years 6 and 11, as the landfill height extends above the existing woodland. High levels of visual effects remain more or less consistent for each year modelled between years 11 and 25, and continue after landfill closure.

High Impact (40 receptors)

- Receptors for the visual impact analysis included residences, recreational facilities and commercial facilities.
- It is anticipated that 40 receptors will eventually fall within the high visual impact zone. Receptors in this zone would be exposed to dominating views of the facility with little foreground or middle ground elements to soften views.
- Of the three user groups, residents would experience the most significant implications of visual exposure due to the potential effect on use and enjoyment of the property.
- The next most sensitive viewers include users of recreational facilities and businesses.
- Receptors near the intersection of CR79 and Zion Line, would be the most adversely affected of all high impact zone receptors.
- Receptors near the landfill would benefit from screening berms for the early stages of landfill operations, however, their relative proximity to the berms would significantly alter their perception of the landscape character.

Moderate Impact (62 Receptors)

- An estimated 62 receptors would experience moderate visual impacts from landfill expansion.
- The number of receptors which would experience moderate effects would remain more or less consistent over the life of the site.
- For receptors experiencing moderate visual affects, the views of the landfill would be diminished in scale because of distance from the site or partially screened because of visual buffers such as woodlots and built form. Although the landfill would be noticeable, it would not dominate views. Overall shapes and patterns and some details would be discernible by the viewer.

Low Impact (27 Receptors)

- There is a significant increase in the number of low impact receptors between years 1 and 6. This is a result of the landfill becoming visible for distant receptors, which would not have been exposed to low level site related activities.
- 27 receptors are estimated to fall within the low visual impact zone.

Village of Watford

Built form within the Village of Watford results in effective screening for the majority of village residences. Receptors occupying the north and east fringe of the Village would experience varying degrees of visual exposure.

Summary and Conclusion

- The proposed landfill expansion will have a significant visual impact for some areas of the surrounding community, recognizing that changes to visual conditions and impact values particularly occur between years 6 and 11, as the landfill height begins to extend above the existing woodland;
- High levels of visual effects remain more or less consistent for years 11 and beyond within approximately the 3.5 km study area, moderate effects are experienced beyond this zone; and
- Built form within the Village of Watford effectively screens the majority of village residences.

6.2.14 Diversion Impact

Two technical studies were completed to address the potential impact of expansion of the Warwick landfill on waste diversion rates in Ontario. Waste Diversion Overview prepared by Environmental Strategies Limited (ESL 2004) provides an estimate of remaining disposal capacity in Ontario and considers the relationship between disposal capacity, tipping fees and other factors on waste diversion success. The Role of WM in Waste Services in Diversion (WM 2004) documents WM's involvement in local diversion efforts.

Major Findings

The study looked at two issues:

- Whether the proposed Richmond and Warwick landfill expansions would result in an excess of landfill capacity in Ontario: and
- If landfill tipping fees are a determining factor in recycling activities.

Ontario's Disposal Requirements

Annual waste generation in Ontario is estimated to rise from 13.6 million tonnes in 2003 to 17.8 million tonnes in 2028, based on:

- Ontario population increasing from 12.2 million in 2003 to 15.6 million by 2028.
- A conservative per capita waste generation rate of 1,170 kg/yr.

Despite an aggressive study assumption that Ontario will achieve up to 75% diversion for residential waste and 45% IC&I diversion by the year 2028, Southern Ontario will require waste disposal capacity of:

- 8.6 million tonnes/year; and
- 218 million tonnes over 2003- 2028.

It is recognised that no jurisdiction in Ontario is currently approaching 75% residential diversion and very aggressive diversion efforts would be required to achieve this level. If this rate is not achieved as assumed, landfill requirements will be higher than predicted in this analysis.

Ontario's Disposal Capacity

Excluding Richmond and Warwick expansions, but assuming approval of all proposals currently before the Ministry of Environment:

- Ontario will have 99.1 million tonnes of approved disposal capacity on hand by 2004.
- In Southern Ontario, 89.6 million tonnes disposal capacity will be available in 2004; the annual permitted fill rate will be approximately 5.8 million tonnes.

Southern Ontario's Supply Shortfall

Given available capacity in Southern Ontario (89.6 million tonnes) and estimated disposal demand (218 million tonnes), Southern Ontario is faced with a capacity shortfall of almost 130 million tonnes over the next 25 years.

Current fill rate and service area restrictions serve to exacerbate the shortfall. Lower annual receipts at Ontario landfills are estimated to extend remaining capacity to approximately 15 years but at the same time these restrictions create significant annual supply shortfalls.

- With current fill rate and service area restrictions, the annual shortfall in Southern Ontario capacity approaches 3 million tonnes/ year.
- Cumulative annual shortfalls over 10 years in Southern Ontario will be 29.6 million tonnes.
- The only immediate option to meet this shortfall is export out of the province.
    - Ontario's waste exports in 2003 were expected to reach almost 3 million tonnes.

Impact of Proposed Expansions

Proposed expansion of Warwick and Richmond Landfills would add 37 million tonnes of capacity, bringing the total available in Southern Ontario to 126.6 million tonnes. The two landfills will each have a proposed annual receipt rate of 750,000 tonnes per year. The net increase in annual permitted capacity, subtracting the current annual rate of landfilling, is approximately 1.3 million tonnes.

Given fill rate and service area restrictions, Southern Ontario's disposal capacity would still fall short of estimated demand by approximately 1.7 million tonnes/year for each of the next 25 years.

Richmond and Warwick landfills do not result in an oversupply of disposal capacity in the southern Ontario market place.

Other Factors Influencing Diversion Success

Available disposal capacity is only one factor that may influence diversion success in Ontario. The study considered several other factors:

Tip Fees

- Analysis of available data confirms that landfill tipping fees are not a significant factor influencing diversion rates in Ontario municipalities.
- Tipping fees in 2001 were found to vary from $0 to almost $100 per metric tonne across Ontario, largely reflecting different municipal policies on cost recovery pricing.
- The data showed no correlation between domestic tipping fees and diversion achievements in Ontario municipalities

US Disposal Options

- Despite available and inexpensive landfill capacity in the US, diversion rates in Ontario continue to grow. US disposal options are not restricting Ontario diversion efforts.

Economic and Social Influences

- Available US data suggest that stronger economic performance results in higher annual per capita waste generation.
- Countering the influence of a general upward trend in economic performance over the forecast period, is the potential influence of an ageing population and efforts to reduce packaging, both of which may lower per capita waste generation.
- The study concludes that constant per capita waste generation is a reasonable assumption for the forecast period.

Other Supporting Factors

Several factors have a strong positive influence in stimulating waste diversion rates, including:

- Active government promotion of targets;
- Diversion regulations;
- New funding incentives; and,
- Education and social factors.

Regardless of increased capacity for waste disposal through new landfill development, diversion efforts in Ontario are not likely to subside and public perception about recycling and participation in recycling will continue to be positive.

No impact on Ontario's waste diversion rates is anticipated as a result of the additional capacity provided by the Warwick expansion.

Summary and Conclusion

The Warwick Landfill expansion will have no adverse impact on Ontario's waste diversion programs recognizing that:

- Southern Ontario is faced with a capacity shortfall of approximately 130 million tonnes over the next 25 years, with an immediate annual shortfall approaching 3 million tonnes/ year;
- Numerous factors will continue to support Ontario's recycling initiatives; and
- The expanded facility will strengthen WM's ability to continue to support and provide local and Ontario based recycling services.

6.3 Potential Effects by Criteria from the Terms of Reference

This section summarizes the potential effects of the undertaking by each of the criteria from the approved Terms of Reference as detailed in Discussion Paper No. 4

Each technical discipline consultant identified overall effects of the landfill expansion (refer to the Effects Assessment Background Reports in **Appendix D**).

Exhibits 6-2 to **6-5** sum up the effects, mitigation measures, net effects and conclusions for the criteria in the Terms of Reference on Public Health and Safety (6-2), the Natural Environment and Resources (6-3), Social and Cultural Environment (6-4), and on the Economic Environment (6-5). The indicators for each criterion can be found in Discussion Paper No. 4.

Section 6.4 provides an overall summary of the conclusions or net effects.

6.4 Summary of Net Effects

6.4.1 Public Health and Safety

On-site and Site Vicinity

The likelihood of adverse health effects arising from exposure to the estimated concentrations of identified compounds in landfill emissions is low. With proper mitigation techniques, the risk of landfill gas (LFG) migrating off-site, accumulating in confined spaces, and presenting an explosive hazard is negligible.

The level and frequency of exceedances of total suspended particulate (TSP) and finer particulate matter (PM_{10}) will be below predicted levels given additional mitigation measures. The likelihood of health–related effects from particulate exposure is low.

The potential hydrogeologic effects of the proposed landfill on groundwater and surface water will be acceptable. It is predicted that groundwater quality within the subsurface, including the interface aquifer, will satisfy the Ministry of the Environment Guideline B-7 criteria for the reasonable use of groundwater at the site boundaries for the proposed landfill with and without leachate recirculation. The quantity and quality of groundwater that discharges into the Kersey Drain and Brown Creek, as well as Bear Creek will not be notably affected by the proposed landfill. Furthermore, surface water quality leaving the proposed landfill will be acceptable based on the proposed landfill design. Overall, the proposed landfill will not affect public health and safety in relation to contact with groundwater or surface water.

Landfill footprint does not encroach within regional floodlines of Bear or Brown Creek. Stormwater ponds will be designed to attenuate peak flow to predevelopment conditions for all storm events up to the 1:100 year storm. Discharge to both Bear and Brown Creeks therefore will be maintained at similar rates and quantities as compared to baseline conditions. Therefore, there is no downstream flood hazard.

Exhibit 6-2. Public Health and Safety

	Criterion	Definition / Rationale
	• **1(a) On-Site and in the Site Vicinity** • **Explosive Hazard** **Due to Gas Accumulation in Confined Spaces**	• Landfill gas (methane) can accumulate in confined spaces (e.g., basements, manholes etc.) on or immediately adjacent to the landfill. There is potential for an explosion to occur if the gas is exposed to an ignition source. •
Discussion / Assessment	• Landfill gas (LFG) has the **potential** to accumulate in confined spaces on-site as well as off-site, leading to potentially explosive conditions. Landfill gas typically consists of 50% methane which is explosive between 5% and 15% by volume in air. The expansion of the landfill will provide for a 100 m buffer to adjacent properties.	
Mitigation	• There are many mitigating factors with respect to LFG accumulation in confined spaces off-site. The LFG collection system acts as one of the primary methods of preventing subsurface LFG migration off-site. The LFG collection system was designed such that each extraction well has an overlapping horizontal zone of influence. Therefore, the majority of LFG produced will be actively collected and destroyed in the flaring system. The LFG that is not collected will very likely follow the path of least resistance and permeate through the landfill cover. Another primary method of mitigation (i.e. to prevent subsurface migration of LFG) will be the silty clay primary landfill liner as well as the native shallow clayey silt to silty clay. Both of these layers have low hydraulic conductivities and will restrict landfill gas from migrating through the subsurface above the water table. The LFG collection system, the engineered landfill liner, and the shallow clayey silt to silty clay restrict LFG from migrating off-site and accumulating in off-site confined spaces. If required based on methane monitoring, mitigation would initially include an inspection of the collection system to ensure proper operation. The vacuum in extraction wells in close proximity to the area of concern could be increased and/or additional extraction wells could be installed. Necessary methane detectors could be installed in off-site confined spaces (e.g. basements). Further mitigation could include the installation of a separate gas migration control system. This system may include a passive and/or active control system, and/or physical barriers. • Landfill gas also has the potential to accumulate in confined spaces on the landfill site. Mitigation could include installation of passive FLG venting systems near the foundations of buildings. Methane detectors would be used to evaluate the effectiveness of the mitigation. Methane gas also has the potential to accumulate in on-site manholes. On-site manholes should be equipped with appropriate signs warning of the possibility of explosive conditions.	
Net Effects	• With proper mitigation techniques (as described above) the risk of LFG migrating off-site, accumulating in confined spaces and presenting an explosive hazard is negligible.	
Conclusion	• Public health and safety will not be compromised.	

Exhibit 6-2. Public Health and Safety

	Criterion	Definition / Rationale
	• **1(a) On-Site and in the Site Vicinity** • **Effects Due to Exposure to Landfill Gas**	• Landfill gas is produced within landfills due to decomposition of waste. There is potential for some constituents of these gases to degrade air quality if emitted to the atmosphere. • Recirculation of leachate may increase the production of landfill gas. • On-site facilities associated with the landfill operation, including leachate treatment facilities may produce emissions that could degrade air quality in the vicinity of the site.
Discussion / Assessment	*Based on the more conservative air quality analysis presented in October 2005, the HHRA found the following:* *Risk to individuals from combustion gases* • With the exception of SO_2 at a single operational year, all short-term values for all combustion gases were less than the appropriate air quality standard or guideline. • The maximum predicted short term CR value of 1.07 for SO_2 (based on a one-hour air concentration) occurred at the fence line location in operational year (yr.26), this value is marginally above the 1.0 reference value • These marginal fence line exceedances are not considered significant, as it is more likely that a sensitive individual would be at the maximum discrete receptor during an exceedance "event". Maximum concentration of SO_2 at this location are well within acceptable limits. • All long term CR values, based on chronic exposures to combustion gases at the maximum discrete receptor location, were less than a value of 1.0, indicating no measurable adverse health effects *Risk to individuals from Particulate Matter* • Likelihood of adverse health effects from exposure to estimated concentrations of fine particulate matter $PM_{2.5}$ and PM_{10} is considered to be low *Chronic Human Health Risk* • Incremental lifetime cancer risk levels (ILCR) for all organic chemicals of potential concern (COPCs) were all below one-in-a-million. • For many non-carcinogenic compounds, the ILCR was several orders of magnitude below those of the background conditions • For carcinogenic compounds ILCRs were several orders of magnitude below an ILCR of one-in-a-million • Annual concentration ratios (CR) values predicted for all combustion gases were considered insignificant Consideration has been given to the revised air quality analysis of September 2005, the HHRA anticipates no significant change to these results should new data be modeled. The conclusions of the HHRA are unchanged.	
Mitigation	• Additional dust mitigation measures (as recommended by air quality discipline) will reduce potential impacts	
Net Effects	• No significant net health effects	
Conclusion	• Likelihood is low of adverse health effects arising from expose to the estimated concentrations of identified compounds in landfill emissions	

Exhibit 6-2. Public Health and Safety

	Criterion	Definition / Rationale
	• **1(a) On-Site and in the Site Vicinity** • **Effects Due to Fine Particulate Exposure**	Construction and operational activities at the landfill can lead to increased levels of dust around the landfill, which may effect the air quality. Airborne fine particulates are a health concern in certain size ranges and at certain exposure times.
Discussion/ Assessment	• Total suspended particulate (TSP, which includes particles >44micons in size) are predicted to exceed regulatory air quality guidelines for both 24 hour and annually periods at maximum discrete receptor location • These exceedances are not associated with health effects but can result in reduced visibility, a potential safety effect. • Finer particulate matter (PM10) is predicted to exceed health- based guidelines in certain 24-hour intervals but not on an annual basis; frequency of exceedance is low • Primary sources of dust are crustal (dirt particles) generated by trucks on paved and unpaved roads. Contribution from truck exhaust and other combustion related sources is inconsequential • Given the nature of the dust material, the likelihood of adverse health effects arising from exposure to the estimated concentrations of this material is low.	

Mitigation	• Additional mitigation measures as recommended by RWDI will reduce the impacts associated with particulate including:
	  • Aggressive measures to reduce off-site haul route dust
	  • Operational changes during peak construction periods
	  • Integration of weather condition information and monitoring of actual dust conditions into dust mitigation strategy	

Net Effects	• Level and frequency of exceedances will be below predicted levels given additional mitigation measures. • Health related effects not anticipated	
Conclusion	• Likelihood of health–related effects from particulate exposure is low.	

Exhibit 6-2. Public Health and Safety

	Criterion	Definition / Rationale
	• **1(a) On-Site and in the Site Vicinity** • **Effects Due to Contact with Leachate-Impacted Groundwater or Surface Water**	Landfill leachate has potential to seep into the groundwater or surface water. Leachate could pose a public health concern if it enters local drinking water supplies, or if leachate mixes with surface water.
Discussion/ Assessment	• Leachate generation for a completed waste footprint is predicted to be between less than 72,000 m^3/a to 145,000 m^3/a. The contribution of groundwater will be about 1,000 m^3/a when the liner system is completed and saturated over the entire footprint. It is predicted that under natural conditions, the saturation of the drainage layer over the predicted area will occur between 10 years to 50 years after closure of the landfill site. • Considering normal operating conditions with no recirculation, the future leachate characteristics within the proposed landfill site will be similar to leachate from Cells 4, 5, and 6 of the Warwick Landfill Site and the Keele Valley Landfill leachate. The contaminating lifespan of the proposed landfill with no recirculation is about 410 years with 150 mm/a of precipitation infiltration and based on chloride concentrations. • Recirculation of leachate will increase the leachate concentrations and increase the volume of liquid percolating through the waste. The percolation of 200 mm/a of leachate and precipitation through the waste will result in a contaminating lifespan of about 305 years based on chloride. • The proposed landfill will be constructed to induce the movement of groundwater into the waste, which will create a 'hydraulic trap'. This groundwater movement will prevent the advective movement of leachate from the waste into the surrounding soil. Low concentrations of some constituents of leachate will diffuse into the groundwater below the waste as a result of concentration gradients between the leachate and natural groundwater. • It is predicted that groundwater quality within the subsurface, including the interface aquifer, will satisfy the Ministry of the Environment Guideline B-7 criteria for the reasonable use of groundwater at the site boundaries for the proposed landfill with and without leachate recirculation. • The quantity and quality of groundwater that discharges into the Kersey Drain and Brown Creek, as well as Bear Creek will not be notably affected by the proposed landfill. Furthermore, surface water quality leaving the proposed landfill will be acceptable based on the proposed landfill design. • Groundwater and surface water at the site boundary will be acceptable in the vicinity of the poplar tree system with the proposed treated effluent quality to be applied to the system.	
Mitigation	• Site design mitigates potential impact • No further mitigation required	
Net Effects	• The potential hydrogeologic effects of the proposed landfill on groundwater and surface water will be acceptable.	
Conclusion	• The proposed landfill will not affect the public health and safety in relation to contact with groundwater or surface water.	

Exhibit 6-2. Public Health and Safety

	Criterion	Definition / Rationale
	• **1(a) On-Site and in the Site Vicinity** • **Effects Due to Contact with Non-Leachate Impacted Groundwater or Surface Water**	• Landfill operations, including salting of on-site roads and use of dust suppressants, may result in impacts to groundwater or surface water. This may pose a public health concern if significant contamination reaches drinking water supplies or mixes with surface water.
Discussion/ Assessment	• The water table divide will be maintained east of the Warwick Landfill Site and within the southern portion of the WM property. A component of groundwater flow will continue to be toward the Kersey Drain and Brown Creek to the east and a component will be toward the west. The proposed screening berms around the perimeter of the site will cause localized mounding in the water table, which will represent hydraulic barriers to lateral groundwater movement. Groundwater quality at the site boundaries should not be impacted by landfill operations. • The aquitards will continue to protect the groundwater quality in the interface aquifer from landfill operations. • Groundwater conditions adjacent to the Kersey Drain and Brown Creek, as well as Bear Creek will not be notably affected by the proposed landfill. As groundwater quality beyond the site boundaries will be acceptable, landfill operations will not affect offsite surface water quality via groundwater. • The sedimentation ponds will permit the periodic discharge to offsite watercourses. Therefore, potential effects to surface water runoff from site operations and soil erosion may impact offsite surface water quality.	
Mitigation	▪ Effects from site operations can be controlled through proper management procedures, such as litter removal and limited/controlled road salting, as well as proper fuel storage. ▪ Suspended solids will be controlled with vegetation of watercourses and with the four sedimentation ponds. ▪ Monitoring will confirm acceptable surface water discharge	
Net Effects	• The potential hydrogeologic effects of the proposed landfill operations on groundwater and surface water will be acceptable.	
Conclusion	• The proposed landfill operations will not affect the public health and safety in relation to contact with groundwater or surface water.	

Exhibit 6-2. Public Health and Safety

	Criterion	Definition / Rationale
	• **1(a) On-Site and in the Site Vicinity** • **Flood Hazard**	The disruption of natural surface water drainage patterns, due to the configuration of the landfill, has the potential to increase local flooding.
Discussion/ Assessment	• None. • Landfill footprint does not encroach within regional floodlines of Bear or Brown Creek • Stormwater ponds will be designed to attenuate peak flow to predevelopment conditions for all storm events up to the 1:100 year storm. Discharge to both Bear and Brown Creeks therefore will be maintained at similar rates and quantities as compared to baseline conditions	
Mitigation	• None required	
Net Effects	• No downstream flood hazard	
Conclusion	• No impact on health and safety as the landfill expansion introduces no downstream flood hazard	

Exhibit 6-2. Public Health and Safety

	Criterion	Definition / Rationale
	• **1(a) On-Site and in the Site Vicinity** • **Disease Transmission Via Insects or Vermin**	Insects and vermin drawn to landfills because of the potential food source may have the potential to transmit diseases.
Discussion/ Assessment	• No evidence of any impact from existing landfill vermin on human health • Impact from expansion would be an extremely rare occurrence.	
Mitigation	• None required beyond continuation of good operational procedures (including small working face, application of daily cover)	
Net Effects	• No risk to human health	
Conclusion	• No risk to human health	

Exhibit 6-2. Public Health and Safety

	Criterion	Definition / Rationale
	• **1(b) Along the Haul Routes** • **Risk of Contact with Spilled Hazardous or Dangerous Waste Materials**	• There is potential for waste to spill while being transported to the landfill. This may pose a health or safety risk. • There is potential for leachate to spill while being piped/ hauled from the landfill. This may pose a health or safety risk. There is potential for chemicals required in on-site treatment of leachate to be spilled while on route to the landfill. This may pose a health or safety risk.
Discussion/ Assessment	• No evidence of waste material spillage during transport to landfill associated with existing landfill • Occurrence of waste spillage on route considered a rare event • No hazardous materials accepted at the site, no transport of this material on haul route anticipated, risk due to contact with dangerous material low	
Mitigation	• Standard emergency response and contingency measures will be in place to minimize impact should spillage occur	
Net Effects	• Minimal risk of net effect	
Conclusion	• Risk of contact with spilled waste material is low and impact mitigatable with standard spill response measures.	

Exhibit 6-2. Public Health and Safety

	Criterion	Definition / Rationale
	• **1(b) Along the Haul Routes** • **Potential for Traffic Conflicts (including pedestrians and farm equipment)**	Because of the increased volumes associated with the haulage of waste and construction and other materials, the number of potential traffic conflicts may increase along the haul route.
Discussion/ Assessment	• Increased traffic will not make entering or exiting driveways along the haul route more difficult. Maximum additional delay of 1.5 seconds during peak afternoon WM traffic period for outbound left turns • There are no at grade rail crossing along the route. • Existing conditions for the Hwy 402 east bound ramp terminal do not satisfy the traditional stopping distance design requirements of the MTO; increased landfill traffic would add to this safety concern. • Historic collision data did not reveal any significant underlying safety issues or concerns with respect to waste haulage, that is, no precipitating factors that might lead to increased collisions rates have been identified. No increase in collision rate predicted. • Without mitigation, increase in total traffic volume due to landfill expansion would affect road operations and safety. • Mud tracking from outbound trucks during inclement weather can impact overall safety of the road network • Landfill traffic creates no impact on road network within the site vicinity other than along the direct haul routes.	
Mitigation	▪ Undertake road improvements as detailed in traffic impact assessment at Hwy 402 @CR79, and CR79 site entrance ▪ Reduce speed on CR79 to 70 km/h from Highway 402 overpass to Watford ▪ Implement measures to ensure all trucks /vehicles leaving facility are free of debris prior to accessing road network ▪ Provide illumination of site entrances and consider lighting requirements associated with intersection improvements ▪ Provide attention and timely response to road maintenance requirements ▪ Consider agricultural equipment movements in design of road upgrades	
Net Effects	• Overall safety and operations of road network maintained or improved with recommended intersection improvements	
Conclusion	• No negative impact on public health and safety due to traffic conflict is anticipated.	

Exhibit 6-2. Public Health and Safety

	Criterion	Definition / Rationale
	• **1(b) Along the Haul Routes** • **Effects Due to Fine Particulate Exposure**	Trucks hauling waste and materials to and from the site along the haul routes have the potential to increase dust exposure along the haul routes.
Discussion/ Assessment	• Total suspended particulate (TSP, which includes particles >44micons in size) are predicted to exceed regulatory air quality guidelines for both 24 hour and annually periods at maximum discrete receptor location • These exceedances are not associated with health effects but can result in soiling of buildings and outdoor surfaces. • Finer particulate matter ($PM_{2.5}$ and PM_{10})are predicted to exceed health- based guidelines in certain 24-hour intervals but not on an annual basis; frequency of exceedance is low, (less than 6.0% of the time along the external haul route) • Primary sources of dust are crustal (dirt particles) generated by trucks on paved and unpaved roads. Contribution from truck exhaust and other combustion related sources is inconsequential • Given the nature of the dust material, the likelihood of adverse health effects arising from exposure to the estimated concentrations of this material is low.	

Mitigation	• Additional mitigation measures as recommended by RWDI will reduce the impacts associated with particulate including:
	  • Comprehensive measures to reduce off-site haul route dust including sweeping/flushing of roads, paving of shoulders
	  • Operational changes during peak construction periods
	  • Integration of weather condition information and monitoring of actual dust conditions into dust mitigation strategy	

Net Effects	• Level and frequency of exceedances will be below predicted levels given additional mitigation measures. • Soiling effects on buildings and outdoor surfaces may occur in vicinity • Health related effects not anticipated	
Conclusion	• Likelihood of health–related effects from particulate exposure is low. • Soiling effects due to dust anticipated in vicinity of landfill, impact management measures linked to monitoring of actual conditions after mitigation, are required	

Exhibit 6-2. Public Health and Safety

	Criterion	Definition / Rationale
	• **1(c) In the Community** • **Aviation Effects Due to Gull Interference**	• Birds are attracted to landfill sites. This may pose a threat to any aviation activity occurring in the vicinity of the landfill area due to contact with aircraft.
Discussion/ Assessment	• No airport within 8 km Transport Canada Guideline • Nearest regulated airport is Sarnia Airport, 25 km to west. • No history of bird interference associated with current landfill • No impact anticipated from expansion	
Mitigation	• None required	
Net Effects	• No risk to air traffic	
Conclusion	• Distance between airport and landfill and gull movement patterns indicate that this is not an issue.	

Exhibit 6-3. Natural Environment and Resources

	Criterion	Definition / Rationale
	• **2(a) On-Site and in the Site Vicinity** • **Loss / Displacement of Surface Water Resources**	Construction of a landfill may cause the removal of all or part of a natural stream.
Discussion / Assessment	• Small portions of the headwaters of four tributaries to Bear Creek are on site and may be physically altered or removed by the landfill expansion. These are dry ditches and swales for much of the year. No fish habitat values were identified in these swales and their only function is to convey surface runoff during freshet and after extended periods of rain. No groundwater discharges to drainage courses on site.	
Mitigation	• Baseline characteristics of quantity and timing of runoff will be maintained through construction of ditches and swales on site to replace any physical losses of existing channels.	
Net Effects	• Maintenance of existing flow characteristics on site and downstream.	
Conclusion	• No net loss or displacement of surface water resources.	

Exhibit 6-3. Natural Environment and Resources

	Criterion	Definition / Rationale
	• **2(a) On-Site and in the Site Vicinity** • **Disruption / Diversion of Surface Water Resources**	• The presence of a landfill creates the potential for disturbance in surface water flow, as the existing drainage pattern is altered, or the need to divert a stream channel.
Discussion/ Assessment	• Small portions of the headwaters of four tributaries to Bear Creek are on site and may be physically altered or removed by the landfill expansion. These are dry ditches and swales for much of the year. No fish habitat values were identified in these swales and their only function is to convey surface runoff during freshet and after extended periods of rain. • Stormwater will be discharged to Bear Creek and Brown Creek in the vicinity of the site. • No groundwater discharges to drainage courses on site. *Leachate Treatment* • Discharge of treated effluent to Bear Creek from an on- site treatment plant will increase flow to the stream.	
Mitigation	• Storm water ponds, ditches and swales on site will maintain baseline characteristics of timing and quantity of discharge. • Any stream crossings will be mitigated to maintain baseline flow and channel characteristics. *Leachate Treatment* • Treated effluent will be stored in a lagoon. Discharge to surface water will be seasonal and flow-weighted, and effluent volume will not exceed 15-25% of stream flow during periods of discharge. Discharge rate will not exceed channel capacity.	
Net Effects	• No change from baseline flow characteristics due to storm water discharge. *Leachate Treatment* • Increased flow to Bear Creek for brief periods (weeks to months) during discharge of treated effluent from on-site lagoons for surface water discharge alternative.	
Conclusion	• No disruption or diversion of surface water resources.	

Exhibit 6-3. Natural Environment and Resources

	Criterion	Definition / Rationale
	• **2(a) On-Site and in the Site Vicinity** • **Effects Due To Discharge of Treated Leachate to Bear Creek**	Two of the three leachate treatment alternatives under consideration require discharge of treated landfill leachate to Bear Creek, either through the Watford Sewage Treatment Plant or the discharge point from an on-site treatment plant.
Discussion/ Assessment	• Potential addition of various pollutants to Bear Creek from treated leachate may impair aquatic community downstream. • Seasonal discharge from storage lagoons to Bear Creek will increase flow from baseline.	
Mitigation	• Treated effluent will be stored in a lagoon on-site. Discharge to surface water will be seasonal and flow-weighted, and effluent volume will not exceed 15-25% of stream flow during periods of discharge. Discharge volume will not exceed channel capacity. • Water quality will be assured through high level of treatment of leachate, storage and discharge during periods of high flow in Bear Creek, and through discharge limits enforced by MOE Certificate of Approval for discharge. • Analysis of treated effluent quality prior to discharge will ensure that discharge meets Certificate of Approval limits.	
Net Effects	• Increased flow to Bear Creek for brief periods (weeks to months) during discharge of treated effluent from on-site lagoons. • Water quality will remain within existing baseline range of high solids and nutrients due to agricultural use and storm response.	
Conclusion	• No significant effects on water quality or aquatic life.	

Exhibit 6-3. Natural Environment and Resources

	Criterion	Definition / Rationale
	• **2(a) On-Site and in the Site Vicinity** • **Effect on the Availability of Groundwater Supply to Wells**	A landfill can impact the availability of the groundwater supply if groundwater is pumped from aquifers or if recharge to aquifers is reduced due to the landfill construction and operation.
Discussion/ Assessment	• The proposed landfill design is based on the 'hydraulic trap' principle where groundwater is induced to move toward the landfill waste to prevent the outward advective movement of leachate. • Below the proposed landfill a component of groundwater will be induced to move upward from the interface aquifer toward the landfill waste. The upward movement of groundwater will be slow owing to the low hydraulic conductivity of the overlying aquitard. Most groundwater within the interface aquifer will continue to move in a lateral direction towards the west, with a southwesterly component within the southern portion of the site. • Potentiometric pressures within the interface aquifer will be similar to future baseline conditions at the eastern site boundary and at the site boundaries within the southern portion of the WM property. At the north, south, and west site boundaries the decrease in potentiometric pressures will be less than 0.5 m. • The proposed landfill is located within a regional recharge area for the interface aquifer. The predicted loss of water in this recharge area as a result of the upward movement of groundwater below the proposed landfill will be negligible owing to the low hydraulic conductivity of the overlying aquitard. On a regional basis, the recharge to the interface aquifer will continue to be about 1.5 mm/a. Therefore, the proposed landfill will not have a detectable effect on the availability of groundwater as a resource.	
Mitigation	• No mitigation of predicted landfill effects is required.	
Net Effects	• The potential hydrogeologic effects of the proposed landfill on groundwater resources will be acceptable.	
Conclusion	• The proposed landfill will not have a detectable affect on the availability of groundwater as a resource.	

Exhibit 6-3. Natural Environment and Resources

	Criterion	Definition / Rationale
	• **2(a) On-Site and in the Site Vicinity** • **Effects on Baseflow Quantity / Quality**	The presence of a landfill has the potential to affect the baseflow quality and/or quantity of surface water in the vicinity.
Discussion/ Assessment	• No impact on groundwater conditions • Based on the hydrogeologic modelling, groundwater conditions adjacent to the Kersey Drain and Brown Creek as well as Bear Creek will not be notably affected by the proposed landfill. Groundwater baseflow will continue to average about 0.7 m^3/a/m toward the Kersey Drain and Brown Creek, with most baseflow originating from the watershed east of the drain/creek, which does not contain the proposed landfill. Groundwater baseflow from the east side of Bear Creek will continue to average about 1.1 m^3/a/m. A baseflow flow component will also originate from the western portion of the Bear Creek Watershed, which does not contain the proposed landfill. • Predicted conditions for the proposed landfill indicate that the water table divide will be maintained east of the Warwick Landfill Site and within the southern portion of the WM property. A component of groundwater flow will continue to be toward the Kersey Drain and Brown Creek to the east and a component will be toward the west. On the upgradient side of the proposed landfill (east side), the water table elevation will increase by less than 0.5 m at the site boundary as a result of the low permeability liner system and ongoing leachate management systems within the Warwick Landfill Site. Within the southern portion of the WM property there will be no detectable effects on the water table elevation at the site boundaries. • Immediately north and south of the proposed landfill, a water table elevation decrease of less than 0.5 m at the site boundary is predicted, while at the west (downgradient) site boundary the water table elevation will decrease by less than 1 m. It is noted, however, that the proposed screening berms around the perimeter of the site will cause localized mounding in the water table, which will represent hydraulic barriers to water table elevation changes beyond the site boundaries. • Below the proposed landfill a component of groundwater will be induced to move upward from the interface aquifer toward the landfill waste. The upward movement of groundwater will be slow because of the low hydraulic conductivity of the overlying aquitard. • The proposed landfill is designed to induce the movement of groundwater toward the waste footprint, which will prevent the advective movement of leachate into the surrounding soil. Owing to the greater chemical concentrations for most constituents in the landfill leachate, contaminant movement from the waste may occur by diffusion. Groundwater quality with in the active aquitard will not be affected by landfill leachate. The Primary Liner will separate the active aquitard from the waste and leachate elevations within the waste will be below the base elevation of the active aquitard. • Untreated leachate storage in containment tank prevents leachate movement into the groundwater or leakage into the surface water system. The lagoons for treated leachate will be lined or liquid levels maintained to induce the movement of shallow groundwater into the lagoons.	
Mitigation	• No mitigation of predicted landfill effects is required.	
Net Effects	• The potential hydrogeologic effects of the proposed landfill on groundwater baseflow quality and quantity to surface watercourses will be acceptable.	
Conclusion	• The proposed landfill will not have a detectable effect on groundwater baseflow quality and quantity to surface watercourses.	

Exhibit 6-3. Natural Environment and Resources

	Criterion	Definition / Rationale
	• **2(a) On-Site and in the Site Vicinity** • **Loss of Terrestrial Ecosystems**	Terrestrial ecosystems refer to the land based habitats connected through the vegetation cover. The protection and integration of the terrestrial habitats maintains and regulates ecological health. The construction and operation of a landfill may physically remove all or part of these systems.
Discussion/ Assessment	• Loss of 5.5 ha of deciduous forest, 5.3 ha of old field and 1.7 ha of meadow marsh vegetation, of which the forest is most significant because of its maturity. • Loss of some individuals of two locally significant plant species: False Mermaid-weed and Spotted St. Johnswort. • Direct impacts to wildlife resources relate to displacement of animals due to loss of habitat. Minor loss of forest edge habitat primarily for birds but no loss of significant forest interior or core wildlife habitat. • Meadow marsh and old field habitat loss is minor loss of breeding habitat for common grassland and bird species and foraging habitat for Northern Leopard Frogs • No change in wildlife corridor, gap exists with current landfill • Expansion of the poplar stand 32.3ha for the leachate treatment method of evaportranspiration will replace some of the treed habitat lost through landfill development. Although the tree plantation is considerably larger than the natural forest that would be lost, this feature is less diverse (i.e., comprised of a single species) and structurally a very simple community, with limited to no undergrowth.	
Mitigation	• When Landfill is closed, the southern portion should be planted with a variety of locally indigenous trees and shrubs to increase forest cover and restore east-west wildlife corridor link. • Prior to forest clearing individuals of the two locally significant plant species should be transplanted to appropriate habitat where natural vegetation will remain. • Plant native tree and shrub species on berms.	
Net Effects	• The amount of natural vegetation will initially be reduced with the proposed expansion including 5.5 ha of deciduous forest. • In the long term, however, the amount of forest cover on site can be increased from the existing condition with the leachate treatment poplar plantation and an aggressive vegetation and restoration plan. • No loss of locally significant plant species	
Conclusion	• The area of natural vegetation loss is quite small • Temporary loss of forest habitat can be replaced when landfill is closed.	

Exhibit 6-3. Natural Environment and Resources

	Criterion	Definition / Rationale
	• **2(a) On-Site and in the Site Vicinity** • **Loss of Aquatic Ecosystems**	Aquatic ecosystems refer to the biological habitats that are connected through surface waters. The protection and integration of aquatic habitats maintains and regulates ecological health. The construction and operation of a landfill may physically remove all or part of these systems.
Discussion/ Assessment	• Small portions of the headwaters of four tributaries to Bear Creek are on site and may be physically altered or removed by the landfill expansion. • These are dry ditches and swales for much of the year. • No fish habitat values were identified in these swales and their only ecological function is to convey surface runoff during freshet and after extended periods of rain. • No groundwater discharges to drainage courses on site.	
Mitigation	• Timing and discharge of surface water on site will be maintained at baseline values through construction of ditches, swales and storm water ponds to replace any physical alteration of drainage courses.	
Net Effects	• No change in aquatic ecological function of water courses on site and downstream.	
Conclusion	• No loss of aquatic ecosystem or any part of it.	

Exhibit 6-3. Natural Environment and Resources

	Criterion	Definition / Rationale
	• **2(a) On-Site and in the Site Vicinity** • **Disturbance to Terrestrial Ecosystems**	Terrestrial ecosystems refer to the land based habitats connected through the vegetation cover. The protection and integration of the terrestrial habitats maintains and regulates ecological health. The presence of a landfill may alter the functioning of these systems.
Discussion/ Assessment	• Fragmentation of the existing forest cover reduces amount of habitat. Existing forest is too small to provide forest interior habitat • Blowing litter entering the woodlot from the landfill operations could smother plants and aid in spread of invasive species • Disturbances caused by cutting new edge to forest may aid the spread of invasive species into the remaining forest • Some reduction in the wide of the east-west wildlife corridor	
Mitigation	• When Landfill is closed, the southern portion should be planted with a variety of locally indigenous trees and shrubs to increase forest cover and restore east-west wildlife corridor link. • Effective litter control program is required to prevent litter from blowing into surrounding woodlots.	
Net Effects	• East-west wildlife corridor could be improved with reforestation when landfill is closed. • Preventing spread of invasive plants is very difficult to control and therefore some increase of invasive species into the woodlots is expected.	
Conclusion	• No significant disturbance to terrestrial ecosystem. • Minor reduction in ability of wildlife to utilize the forested corridor can be partially reversed with additional planting.	

Exhibit 6-3. Natural Environment and Resources

	Criterion	Definition / Rationale
	• **2(a) On-Site and in the Site Vicinity** • **Disturbance to Aquatic Ecosystems**	Aquatic ecosystems refer to the biological habitats that are connected through surface waters. The protection and integration of aquatic habitats maintains and regulates ecological health. The presence of a landfill may alter the functioning of these systems.
Discussion/ Assessment	• Potential impacts associated with construction and stormwater management (see Loss of Aquatic Habitat criteria) *Leachate Treatment* • Discharge of treated leachate has potential to disturb the aquatic ecosystem	
Mitigation	• Mitigation with respect to stormwater management incorporated into facility design , (see Loss of Aquatic Habitat criteria) *Leachate Treatment:* • discharge to surface water will proceed under the conditions of a Certificate of Approval issues by Ontario Ministry of Environment, a process which ensures that effects to surface water are minimized • Treated effluent will be stored in a lagoon on-site. Discharge to surface water will be seasonal and flow-weighted, and effluent volume will not exceed 15-25% of stream flow during periods of discharge. • Discharge volume will not exceed channel capacity. • Water quality will be assured through high level of treatment of leachate, storage and discharge during periods of high flow in Bear Creek, and through discharge limits enforced by MOE Certificate of Approval for discharge. • Potential disturbance due to construction of facilities for leachate treatment can be mitigated through standard procedures for erosion control and sediment management	
Net Effects	• No significant disturbance due to stormwater management. • No significant disturbance due to leachate treatment; no net change to aquatic habitat or baseline water quality and quantity characteristics in receiving waters.	
Conclusion	• No significant disturbance to aquatic ecosystems.	

Exhibit 6-3. Natural Environment and Resources

	Criterion	Definition / Rationale
	• **2(a) On-Site and in the Site Vicinity** • **Displacement of Agricultural Land**	The establishment of a landfill has the potential to displace agricultural resources, including the loss of prime agricultural land.
Discussion/ Assessment	• The proposed landfill expansion will result in a loss of approximately 113.6 ha of agricultural lands, 96.9% of this or 110.1 ha is prime agricultural lands (Canadian Land Inventory (CLI) Classes 1,2 and 3). • There is no opportunity to avoid prime agricultural lands during expansion of the current landfill. Lower capability soils exhibit constraints that also limit their suitability for use in waste disposal. Expansion of the current landfill avoids many agricultural character impacts that are typically associated with the siting of a new facility	
Mitigation	• The loss of agricultural lands cannot be mitigated.	
Net Effects	• Loss of approximately 110.1 hectares of prime agricultural land.	
Conclusion	• The loss of 110.1 hectares of prime agricultural lands will not significantly affect the agricultural productivity of the area.	

Exhibit 6-3. Natural Environment and Resources

	Criterion	Definition / Rationale
	• **2(a) On-Site and in the Site Vicinity** • **Sterilization of Industrial Mineral Resources**	The establishment of a landfill may limit the opportunity to extract industrial mineral resources located beneath or near the landfill.
Discussion/ Assessment	• No impact on mineral resources • The proposed landfill site is located in an area of thick clayey soil. There are no industrial mineral resources on or below the site.	
Mitigation	• No mitigation is required.	
Net Effects	• No detrimental impact on the region's existing and potential sand and gravel resources or potential oil and gas resources.	
Conclusion	• The proposed landfill will not have a detectable affect on industrial mineral resources.	

Exhibit 6-3. Natural Environment and Resources

	Criterion	Definition / Rationale
	• **2(a) On-Site and in the Site Vicinity** • **Displacement of Forestry Resources**	The establishment of a landfill may limit the opportunity to utilize forestry resources located on the site.
Discussion/ Assessment	• Loss of 5.5 ha of mature deciduous forest, including a variety of deciduous tree species including hickory, ash and maple. • No identified commercial value therefore no loss of forestry resources • Loss of fuel wood potential	
Mitigation	• Salvage usable trees for fuelwood at the time the woodlot is removed	
Net Effects	• No loss to forestry resources	
Conclusion	• Removal of the woodland resource will not result in a loss of commercial value forest resources. The fuelwood value can be salvaged at the time of tree removal.	

Exhibit 6-3. Natural Environment and Resources

	Criterion	Definition / Rationale
	• **2(a) On-Site and in the Site Vicinity** • **Displacement of Recreational Resources**	The establishment of a landfill may displace existing recreational resources in the area, which could adversely affect the community at large. Recreational resources include naturalist and interpretive opportunities.
Discussion/ Assessment	• No recreational resources are located on-site. • The Snowmobile Trail, which traverses the 0 to 1 km and 1 to 3.5 km study areas, will not be displaced due to landfill expansion development. • There are no other recreational resources located in the 1 to 3.5 km study area. The parks located in the Village of Watford were assessed as part of the community facilities in Section 6.1: Social and Cultural.	
Mitigation	• None required	
Net Effects	• No net impact	
Conclusion	• No displacement of recreational resources	

Exhibit 6-3. Natural Environment and Resources

	Criterion	Definition / Rationale
	• **2(a) On-Site and in the Site Vicinity** • **Disruption to Recreational Resources**	The establishment and operation of a landfill may effect existing recreational resources in the surrounding area. Disturbances could result from noise, dust, odour, visibility, gulls and traffic congestion. Recreational resources include naturalist and interpretive opportunities.
Discussion/ Assessment	On-Site • No recreational resources are located on-site. 0 to 1 km Study Area • Some residents among those surveyed/interviewed indicated that snowmobiling was one of their outdoor activities. There is predicted to be a high level of visual impact for people travelling on the snowmobile trail for the life of the landfill expansion. In particular, the stockpiling activities will be in view, since snowmobilers' views of the landfill expansion will not be blocked by the screening berms. No noise increases are predicted from landfilling operations, site preparation/cell construction noise or from traffic that would be heard on snowmobiles. At the nearest residential receptor (R13) to the trail in the 0 to 1 km study area, some infrequent dust and odour exceedances are predicted The snowmobilers' protective gear and their brief and transitory contact while traveling along the snowmobile trail means that no significant impact is predicted to the use of the trail due to landfill expansion operations. 1 to 3.5 km Study Area • To the east and west of the 0 to 1 km study area, the level of visual impact on the snowmobile trail is predicted to be moderate to low, depending on the distance from the landfill. No noise, dust or odour impacts from traffic or the landfill expansion are predicted for these sections of the trail. No significant disruption associated with the development of the landfill expansion is predicted on the use of portions of the snowmobile trail in the 1 to 3.5 km study area.	
Mitigation	• None required.	
Net Effects	• No significant impacts are expected on the snowmobile trail	
Conclusion	• No significant impact on recreational resources.	

Exhibit 6-3. Natural Environment and Resources

	Criterion	Definition / Rationale
	• **2(b) Along the Haul Route** • **Disturbance to Terrestrial Ecosystems**	Terrestrial ecosystems refer to the land based habitats connected through the vegetation cover. The protection and integration of the terrestrial habitats maintains and regulates ecological health. The effect of hauling the waste and construction materials may effect and alter the functioning of these systems along the haul route.
Discussion/ Assessment	• No significant impact • No loss or disturbance of any element of terrestrial ecosystem • Recommended road improvements anticipated to be accommodated within existing road right of way, in which no significant terrestrial habitat is identified	
Mitigation	• None required	
Net Effects	• No significant net effects	
Conclusion	• The impact on terrestrial ecosystems is expected to be minimal due to the lack of vegetation along the haul route within the rights of way.	

Exhibit 6-3. Natural Environment and Resources

	Criterion	Definition / Rationale
	• **2(b) Along the Haul Route** • **Disturbance to Aquatic Ecosystems**	Aquatic ecosystems refer to the biological habitats that are connected through surface waters. The protection and integration of aquatic habitats maintains and regulates ecological health. The effect of hauling the waste and construction materials may affect and alter the functioning of these systems along the haul route.
Discussion/ Assessment	• Potential disturbance from spills along route • The haul route crosses four ephemeral tributaries of Bear Creek via existing rights of way and culverts/bridges over the channels. • Dry creek channels serve to convey flow during freshet and sustained rain events – no aquatic habitat values identified. • Low probability of spills of solid waste from vehicle accidents – confined to small area. • No increase in sediment input anticipated	
Mitigation	• Standard highway safety practices • Spills containment and spills response procedures and training • Covered containers of waste to prevent litter.	
Net Effects	• No significant effect anticipated given existing creek characteristics, low probability of spills and recommended mitigation measures	
Conclusion	• No significant disturbance of aquatic ecosystem along the haul route.	

Exhibit 6-3. Natural Environment and Resources

	Criterion	Definition / Rationale
	• **2(b) Along the Haul Route** • **Disturbance to Recreational Resources**	The establishment of a landfill and related truck traffic may effect the existing recreational resources along the haul route. Disturbances could result from air quality or nuisance effects including noise, dust, litter, odour and traffic congestion.
Discussion/ Assessment	• No recreational resources are located along the haul route.	
Mitigation	• None required	
Net Effects	• No net effect	
Conclusion	• No disturbance to recreational resources along the haul route	

Exhibit 6-4. Social and Cultural

	Criterion	Definition / Rationale
	• **3(a) On-Site and in the Site Vicinity** • **Displacement of Residents from Houses**	• Residents living on the landfill site will have to relocate.
Discussion/ Assessment	• Two residences, located at 7929 and 7888 Zion Line are owned by WM and will be demolished before development of the landfill expansion. These residences currently have tenants living on the property.	
Mitigation	• No mitigation required	
Net Effects	• No net effects	
Conclusion	• In relocating, the tenants may choose to rent a home in another location in the community or to leave the community. Data on the number and vulnerability of the tenants at this property were not available.	

Exhibit 6-4. Social and Cultural

	Criterion	Definition / Rationale
	• **3(a) On-Site and in the Site Vicinity** • **Disruption to Use and Enjoyment of Residential Properties Due to Nuisance Effects**	• Potential nuisance effects associated with the landfill may disturb the daily activities, and the use of residential and agricultural properties in the vicinity. Disturbances could result from noise, dust, odour, visibility, gulls, litter and traffic congestion.
Discussion/ Assessment	0 to 1 km Study Area • The social impacts will vary by receptor, by nuisance effect and how the property is used. Up to 20 residences are expected to experience occasional dust, odour and litter exceedances, noise increases and visual impacts during the life of the landfill. Dust: - Two to 17 residences located in this study area are expected to experience dust emissions (TSP, PM_{10} and $PM_{2.5}$) which exceed provincial guidelines at times during the landfill operating life. The highest concentrations and frequency of exceedances are predicted at the residences located on the haul route and to the north-east of the landfill. Odour: - Odour levels exceeding provincial guidelines are predicted at 5-12 residences at times during landfill operations. The most affected residences are those located north-east of the landfill. Visual: - A high level of visual impact for most of the life of the landfill is predicted for all receptors in the study area from year 11 onwards. A break in the berm along CR79 is required to accommodate the new site entrance; this entrance will allow an unobstructed view of the landfill for travelers on CR79 Litter: - Light to moderate blowing of litter may occur on an occasional basis throughout the duration of the landfill expansion for all receptors Traffic: - There is expected to be an increase in traffic volume for 9 residences located on CR79 north of Zion Line for all years of landfill operation. Noise: - Moderate to significant noise increases are predicted for 9 to 16 residences for all years of landfilling. Increases in noise levels are predicted to fluctuate throughout the operating life. Landfill noise levels are expected to increase by detectable levels (3 to 5 dBA) for 9 to 12 residences, and by significant levels (6 to 10 dBA) for 2-4 residences. The increase in site preparation noise is predicted to be significant for 2 to 4 receptors in Year Sixteen and Year Twenty-One. Detectable traffic noise increases are expected for 9 residences on County Road 79, north of Zion Line for all years of landfill operation. -On a receptor basis, overall nuisance impacts will range from minimal to substantial. A large majority of residents in the 0 to 1 km study area indicated that they use their properties for gardening, nature appreciation and relaxation. In response to the nuisance effects, residents may reduce the amount of time spent outdoors and/or may inhibit some outdoor activities at certain times. It is anticipated that because of the nuisance effects, people will experience a diminished level of satisfaction with their properties. This in turn could reduce the value of their properties to themselves (regardless of whether the market value of the property changes).	

Exhibit 6-4. Social and Cultural

	Criterion	Definition / Rationale
	1 to 3.5 km Study Area • Some residences located in the 1 to 3.5 km study area (outside of the Village of Watford) are expected to experience various levels of visual impacts throughout the life of the landfill. Dust, odour and noise exceedances and litter impacts are not predicted to extend beyond the 0 to 1 km study area. Over half of the residences outside of the Village of Watford (48 to 67 receptors out of the possible 98) are expected to experience moderate to low levels of visual impact and 4 to 16 receptors a high level of visual impact. Residences located on the northern fringe of the Village of Watford may experience views of the proposed expansion. The existing woodlot and the phasing of the landfill construction progressing in a northerly direction would minimize impacts. A 1 to 3% increase in heavy landfill-related vehicles is predicted for those residences located on the secondary haul route. No WM heavy vehicles are anticipate to go through Watford. • On a receptor basis, the resulting impacts are expected to be minimal. A large majority of residents in the 1 to 3.5 km study area indicated that they use their properties for relaxing, entertaining and yard work. In response to the nuisance effects residents may reduce the amount of time spent outdoors and/or may inhibit some outdoor activities at certain times.

Mitigation	• Mitigation measures recommended by the noise, air quality, visual and transportation disciplines will result in a significant reduction in nuisance impacts on residents. These measure include:
	  • Dust Mitigation Strategy
	  • Litter Management Strategy
	  • Enhanced visual screening through use of additional vegetation, berm treatment and fencing
	  • Odour reduction through good operating practices and effect of landfill cover
	  • Acoustic Shielding of wood chipping/crushing operations
	• Community input has also identified specific mitigation measures for consideration.

Net Effects	• The additional mitigation measures described above will reduce the social impacts for neighbouring residents. The measures described above will also improve the aesthetics of the expanded landfill. • A number of impact management measures are proposed (i.e., property value protection; nuisance compensation payments; other nuisance impact measures; community impact management measures; complaints/dispute resolution/small claims compensation process; and monitoring and community information) to reduce potential social impacts.
Conclusion	• With the full range of mitigation measures identified by the technical disciplines, many of the effects will be within existing standards and, to a large degree, minimized. Additional mitigation suggested by the community may also be helpful in further reducing impacts. The proposed landfill expansion facility will still have some social impacts on a number of residents and, to a lesser extent, on the community. • With a regular monitoring program, implementation of the identified impact management measures, and an open communication process between the company, residents and the Township, it is reasonable to expect that the negative effects can be minimized and the positive effects enhanced.

Exhibit 6-4. Social and Cultural

	Criterion	Definition / Rationale
	• **3(a) On-Site and in the Site Vicinity** • **Disruption to Use and Enjoyment of Public Facilities and Institutions Due to Nuisances**	• Potential nuisance effects associated with the landfill may disturb the daily activities of community facilities in the vicinity. Disturbances could result from noise, dust, odour, visibility, gulls, litter and traffic congestion.
Discussion/ Assessment	On-site • There are no community facilities or institutions located on-site 0 to 1 km Study Area • Two of the 3 community facilities located in the 0 to 1 km study area are expected to experience multiple nuisance impacts throughout the life of the landfill. • The Watford Cemetery and the Roman Catholic Cemetery are predicted to experience a high level of visual impact for the life of the landfill. Occasions of dust and odour exceedances are predicted to impact the during the life of the landfill expansion. • The increase in noise is predicted to be significant for the cemeteries from on-site operations at the landfill for Years One and Eleven and from site preparation/cell construction in Years One, Sixteen and Twenty-One. • The two cemeteries are predicted to be subject to occasions of low levels of blowing litter for all the years of landfill operation. The odour levels are expected to exceed the criteria on occasion for all years of landfill operations (between 1% and 3% of the time) for the Cemeteries. • Faith Evangelical Baptist Church is predicted to experience high visual impacts only for all years of landfill operations. • The dust and odour exceedances may be intrusive at times for people visiting graves or attending funerals. The view of the landfill expansion, regarded by some residents as "unsightly", may reduce the aesthetic appeal of the cemetery area, but will not likely disrupt graveside visits or funeral proceedings. •	
	1 to 3.5 km Study Area • A few of the community facilities located in the 1 to 3.5 km study area are predicted to experience various levels of visual impacts throughout the life of the landfill. • Occasions of dust, odour and noise exceedances and litter events are not expected to extend beyond the 0 to 1 km study area. • Six community facilities (Watford Community Arena, Baseball/Soccer Fields, Watford Memorial Park, Centennial Hall, East Lambton Elementary School and Brookside Retirement Home) are expected to experience moderate to high visual effects from the landfill expansion throughout its operating life. • Nana's House Child Care Centre is predicted to experience low to moderate visual effects as the landfill progresses through the years. The remaining 21 community facilities (Ruth Ann's Home Day Care, the Township of Warwick Municipal Office and the 19 community facilities in the Village of Watford) are expected to experience no visual effects.	

Mitigation	• Mitigation measures recommended by the noise, air quality, visual and transportation disciplines will result in a significant reduction in nuisance impacts on residents. These measure include:
	  ◦ Dust Mitigation Strategy
	  ◦ Litter Management Strategy
	  ◦ Enhanced visual screening through use of additional vegetation, berm treatment and fencing
	  ◦ Odour reduction through good operating practices and effect of landfill cover.
	• Community input has also identified specific mitigation measures for consideration.	

Exhibit 6-4. Social and Cultural

	Criterion	Definition / Rationale
Net Effects	• The additional mitigation measures described above will reduce the social impacts for some of the public facilities and institutions. The measures described above will also improve the aesthetics of the expanded landfill. • A number of impact management measures are proposed that may be relevant in addressing net impacts on community facilities.	
Conclusion	• With the full range of mitigation measures identified by the technical disciplines, many of the effects will be within existing standards and, to a large degree, minimized. However, the proposed landfill expansion facility will still have some social impacts on some users of neighboring community facilities. o Noise from woodchipping/crushing and all stationary sources will be well within MOE Guidelines. o Noise from on-site traffic will be within MOE Guidelines for Landfills. o Dust concentrations predicted to exceed Provincial Guidelines less than 6% of the time at discrete receptors and 10% of the time at any point along the haul route. The net effects may have some impact on residents which may require impact management. • With a regular monitoring program, implementation of the identified impact management measures, and an open communication process between the company, residents and the Township, it is reasonable to expect that the negative effects can be minimized and the positive effects enhanced.	

Exhibit 6-4. Social and Cultural

	Criterion	Definition / Rationale
	• **3(a) On-Site and in the Site Vicinity** • **Disruption to Local Traffic Networks**	• Increased traffic volume resulting from the landfill expansion could disturb the overall traffic flow through the study area, and effectively reduce the available road capacity
Discussion/ Assessment	Note: Traffic impacts considered under criteria "Disruption to Local Traffic Networks: Along the Haul Route" • No impact anticipated on level of service on local roads within the site vicinity, other than along direct haul routes.	
• Mitigation	• See criteria "Disruption to Local Traffic Networks: Along the Haul Route"	
• Net Effects	• See criteria "Disruption to Local Traffic Networks: Along the Haul Route"	
• Conclusion	• Local road network, beyond the direct haul route not expected to be impacted by landfill expansion.	

Exhibit 6-4. Social and Cultural

	Criterion	Definition / Rationale
	• **3(a) On-Site and in the Site Vicinity** • **Visual Effect of the Landfill Operations**	• The presence of a landfill operation can affect the visual appeal of a landscape, including the perceived community character.
Discussion/ Assessment	• Receptors within the defined viewshed would experience varying degrees of visual impact (high, moderate, low) for various development stages. • Visual intrusion may affect perceived community character • No plume is associated with incineration of leachate therefore no associated impact with this aspect of operation	

• Mitigation	• Detailed recommendations for impact mitigation are included in the Visual Assessment technical report
	• Recommended mitigation includes:
	  • Adjustment to the berms, landfill and buffer
	  • Additional landscaping in the form of evergreen and deciduous trees and shrubs.	

• Net Effects	• Viewshed impacts have been identified for receptors within high to moderate visual impact zones. Of the three user groups of receptors, i.e., residential, recreational facilities and commercial, residential users would experience the most significant visual impacts.
	• Community Character can be impacted by change to man made or natural features that contribute to a community's visual character. No man made features will be removed with the expansion, however some impact will occur to natural features which are a valuable visual resource and an important part of the Watford image, specifically:
	  • Visibility of agricultural lands immediately south of the existing landfill would be disrupted
	  • Approximately 5.5-ha of woodlot at the southwest corner of the north property would be removed
	• Landfill activity would be visible from the Watford cemetery lands
	• Perception of community character for receptors within the village center would be unchanged
	• 46% of the "village fringe area" would experience visibility of the expansion
	• 36% of the defined "community apron" area, particularly in the north east portion, would experience an altered visual perception of community character
	• 45% of the total length of primary access road to Watford would be affected by a view of the landfill expansion	

• Conclusion	• The objective of additional mitigation measures is to screen or disguise operations during site life and to visually integrate the landfill site in the long term by developing an onsite landscape character which resembles the character of the surrounding landscape. The recommended mitigation measures will assist in minimizing the visual impact of the landfill in the immediate area and in the broader community. Recommendations include enhanced visual screening through use of additional vegetation, berm treatment and fencing. • Community input has also identified specific mitigation measures for consideration.	

Exhibit 6-4. Social and Cultural

	Criterion	Definition / Rationale
	• **3(a) On-Site and in the Site Vicinity** • **Nuisance Associated with Vermin**	• Landfills attract vermin and gulls, which can be a nuisance and lead to a decrease in property enjoyment by residents in the area. Vermin and gulls can also be a nuisance to agricultural operations.
Discussion/ Assessment	• Gulls are common in the vicinity of agricultural operations as they are attracted to normal field cultivation, seeding and harvesting activities. Poultry production in the vicinity of the site is occurring indoors in controlled environments, opportunity for disease transfer is minimal. • No evidence of any impact from existing landfill due to vermin • Impact from expansion would be an extremely rare occurrence.	
Mitigation	• None required beyond continuation of good operational procedures (including small working face, application of daily cover)	
Net Effects	• No significant net effect is anticipated	
Conclusion	• Vermin from the landfill is not expected to impact residents or agricultural operations in the vicinity of the expanded landfill.	

Exhibit 6-4. Social and Cultural

	Criterion	Definition / Rationale
	• **3(a) On-Site and in the Site Vicinity** • **Displacement of Cultural Resources**	• Cultural resources (archaeological resources, built heritage features and cultural landscapes, including farm complexes, agricultural lands, roadscapes and cemeteries) are an important component of human heritage and are protected under legislation. These non-renewable cultural resources may be displaced by the construction of the landfill.
Discussion/ Assessment	• Significant impacts are anticipated for two agricultural landscapes. • Significance of impact is due to the well-preserved nature of the lands to be developed, their high heritage value, and the anticipated disruptions and displacements to those landscapes. • Little potential for adverse impact to built heritage features and cultural landscapes (habitable and non-habitable) in the site vicinity.	
Mitigation	• Displacement of agricultural lands cannot be mitigated.	
Net Effects	• Displacement of two agricultural landscapes of high value	
Conclusion	• Significant on-site impacts are anticipated for two agricultural landscapes of high heritage value	

Exhibit 6-4. Social and Cultural

	Criterion	Definition / Rationale
	• **3(a) On-Site and in the Site Vicinity** • **Disturbance to Cultural Resources Due to Nuisance Effects**	Cultural resources may be disturbed by the construction and ongoing operation of the landfill. Disturbances could result from noise, dust, odour, visibility, gulls, litter and traffic congestion.
Discussion/ Assessment	• There is little potential for adverse changes to built heritage features and cultural landscapes (habitable and non-habitable) in the site vicinity.	
Mitigation	• Mitigation recommendations for nuisance effects will help to maintain heritage attributes of the former rural landscape.	
Net Effects	• No significant net effects	
Conclusion	• Nuisance mitigation measures will minimize the effect on cultural resources.	

Exhibit 6-4. Social and Cultural

	Criterion	Definition / Rationale
	• **3(a) On-Site and in the Site Vicinity** • **Displacement / Destruction of Archaeological Resources**	• Archaeological resources are non-renewable cultural resources that might be displaced or disrupted by the construction and operation of a landfill.
Discussion/ Assessment	• Significant on-site impacts are anticipated for six archaeological resources: AfHl-8, -9, -10, -11, and –12. This is due to the nature of the archaeological deposits, their potential heritage value, and the anticipated disruptions and/or displacements to those archaeological resources. • Site – AfHl-14 – is located on WM property in the site vicinity, but no disruptions and/or displacements impacts are anticipated.	
Mitigation	• Heritage value has not been firmly established for the identified archaeological sites: a Stage 3 archaeological resource assessment is still required. Only sites determined to have heritage value will be subject to mitigation. • Appropriate mitigation will be developed when Stage 3 information is available.	
Net Effects	• Displacement or destruction of archaeological resources may occur through construction of the landfill and its ancillary facilities. • An assessment of net effects will be made following evaluation of mitigation options	
Conclusion	• Mitigation measures will be identified and employed for identified archaeological sites as required	

Exhibit 6-4. Social and Cultural

	Criterion	Definition / Rationale
	• **3(a) On-Site and in the Site Vicinity** • **Level of Public Service Provided by the Landfill**	The presence of a landfill operation within a municipality may provide an increased level of public service to local residents and businesses.
Discussion/ Assessment	▪ Expansion will provide continuation of non-hazardous waste disposal services for the community ▪ Mini transfer area will continue to provide opportunity for local residents and businesses for direct waste/recyclables drop off ▪ Additional services for material diversion form landfill including composting and construction and demolition waste processing will be available for municipal and business and agricultural sector use	
Mitigation	▪ Positive effect of services opportunity can be enhanced by WM providing reduced costs or free services to sectors of the community	
Net Effects	▪ Net positive effect for the community	
Conclusion	▪ Expansion of the landfill creates opportunity for service continuation and enhancement for the community	

Exhibit 6-4. Social and Cultural

	Criterion	Definition / Rationale
	• **3(a) On-Site and in the Site Vicinity** • **Effects on Other Public Services**	• The presence of a landfill may have positive or negative spin-off effects on other public services.
Discussion/ Assessment	▪ Additional road maintenance along the haul routes will be required due to addition of landfill truck traffic	
Mitigation	▪ As part of overall community benefit agreement, WM to finance additional costs to the municipality for any additional costs directly attributable to landfill activity, through royalty or other financial compensation mechanisms	
Net Effects	▪ No negative effect on provision of public services when mitigation measures in place ▪ Enhancement of environmental monitoring services provides a benefit to the community ▪ Community benefit agreement may enable municipality to maintain general public services at current levels over the long term or enhance services in priority areas	
Conclusion	▪ Expansion will have no negative effect on provision of other services ▪ Expansion provides an opportunity to secure funding for maintaining or enhancing public services in the community.	

Exhibit 6-4. Social and Cultural

	Criterion	Definition / Rationale
	• **3(b) Along the Haul Routes** • **Disruption to Use and Enjoyment of Residential and Agricultural Properties Due to Nuisance Effects**	• Potential nuisance effects associated with traffic moving to and from the landfill along the haul route may disturb the daily activities, and the use of residential and agricultural properties. Disturbances could result from noise, dust, litter and odour and traffic congestion.
Discussion/ Assessment	Primary Haul Route Study Area • The social impacts will vary by receptor and by nuisance effect and how the property is used. Based on the nuisance data, the 10 residential receptors in the primary haul route study area are expected to experience dust and/or odour exceedances at times and moderate to high levels of visual impact for most of the life of the landfill. Light to moderate blowing of litter may have the potential to occur on an occasional basis throughout the duration of the landfill expansion for all receptors in the study area. • There is expected to be an increase in traffic volume for 9 of the 10 residences for all years of landfill operation. No noise increases due to landfilling operations or site preparation/cell construction are predicted for 9 of the 10 residences in the haul route study area. Noise increases due to traffic will be detectable, incrementally increasing (by3 to 5 dBA) during the years of landfill operation • The health study concluded that the likelihood of adverse health effects arising from exposure to landfill emissions was considered minimal. However, residents cited a number of health problems (e.g. asthma, respiratory ailments and environmental allergies) that might be affected by minimal increases in odour, dust and airborne chemicals. • On a receptor basis, the resulting impacts will be substantial to minimal. A large majority of residents in the study area indicated that they use their properties for gardening, nature appreciation and relaxation. In response to the nuisance effects, residents may reduce the amount of time spent outdoors and/or may inhibit some outdoor activities at certain times. It is anticipated that because of the nuisance effects, people will experience a diminished level of satisfaction with their properties. This in turn could reduce the value of their properties to themselves (regardless of whether the market value of the property changes). Secondary Haul Route Study Area • Some receptors located in the secondary haul route study area are predicted to experience some visual impacts throughout the life of the landfill. Dust and odour exceedances and occasions of litter events are not expected to extend beyond the 0 to 1 km study area. Some receptors along the secondary haul route are expected to have moderate views of the landfill; those receptors located on County Road 79 north to Zion Line are expected to experience a high level of visual impact. A 1 to 3% increase in heavy landfill-related vehicles is predicted for those residences located on the secondary haul route. No WM heavy vehicles are anticipated to go through Watford. There are no noise increases expected on the secondary haul route from site construction or landfill noise. Some receptors may experience a very slight increase (less than 1 dBA) in noise from traffic on the haul route. Some residences are expected to experience some odour exceedances from Year 11 (2015) onwards.	

Mitigation	• Mitigation measures recommended by the noise, air quality, visual and transportation disciplines will result in a significant reduction in nuisance impacts on residents. These measure include:
	  • Dust Mitigation Strategy
	  • Litter Management Strategy
	  • Enhanced visual screening through use of additional vegetation, berm treatment and fencing
	  • Odour reduction through good operating practices and effect of landfill cover
	• Community input has also identified specific mitigation measures for consideration.	

Exhibit 6-4. Social and Cultural

	Criterion	Definition / Rationale
Net Effects	• The additional mitigation measures described will reduce the social impacts for some residents along the haul route. The measures described above will also improve the aesthetics of the expanded landfill and contribute to traffic flow and safety. • A number of impact management measures are proposed (i.e., property value protection; nuisance compensation payments; other nuisance impact measures; community impact management measures; complaints/dispute resolution/small claims compensation process; and monitoring and community information) to reduce potential social impacts.	
Conclusion	• With the full range of mitigation measures identified by the technical disciplines, many of the effects will be within existing standards and, to a large degree, minimized. However, the proposed landfill expansion facility will still have some social impacts on a number of residents o The net effects may have some impact on residents which may require impact management. • With a regular monitoring program, implementation of the identified impact management measures, and an open communication process between the company, residents and the Township, it is reasonable to expect that the negative effects can be minimized and the positive effects enhanced.	

Exhibit 6-4. Social and Cultural

	Criterion	Definition / Rationale
	• **3(b) Along the Haul Routes** • **Disruption to Use and Enjoyment of Public Facilities and Institutions Due to Nuisances**	Potential nuisance effects associated with traffic moving to and from the landfill may disturb the daily activities at community facilities. Disturbances could result from noise, dust, litter and odour and traffic congestion.
Discussion/ Assessment	Primary Haul Route Study Area • No public facilities and institutions are located along the primary haul route. Secondary Haul Route Study Area There are five community facilities located along the secondary haul route. The Watford Cemetery and Roman Catholic Cemetery are predicted to be subject to high levels of visual impact, occasions of low litter impacts and occasions of odour exceedances for all years of landfill operations. Some dust exceedances, on occasion, are predicted for the cemeteries. Significant increases in noise due to landfill operations and site/cell preparation in some years of landfilling are predicted.. The increase in noise from landfill operations and traffic at the cemeteries is predicted to be significant in terms of decibel change, but the resulting noise level (predicted at 55 dBA) is not expected to interfere with speech intelligibility at normal voice levels. When services occur in the cemetery, interruption by noise from traffic on CR 79, which has been reported in the past, would be expected to continue. The nuisance impacts at these community facilities may, on occasion, be intrusive for people visiting the cemeteries. Recommended mitigation measures will reduce the impacts to some extent for these community facilities. • For the two remaining two community facilities (Brookside Retirement Living and Nana's House Child Care) no impacts are predicted related to dust, odour, litter and noise.	

Mitigation	• Mitigation measures recommended by the noise, air quality, visual and transportation disciplines will result in a significant reduction in nuisance impacts on public facilities and institutions. These measure include:
	  • Dust Management Strategy
	  • Litter Management Strategy
	  • Enhanced visual screening through use of additional vegetation, berm treatment and fencing
	  • Odour reduction through good operating practices and effect of landfill cover
	• Community input has also identified specific mitigation measures for consideration.	

Net Effects	• The additional mitigation measures described above will reduce the social impacts for public facilities along the haul route. The measures described above will also improve the aesthetics of the expanded landfill and contribute to traffic flow and safety. • A number of impact management measures are recommended to reduce social impacts.	
Conclusion	• With the full range of mitigation measures identified by the technical disciplines, many of the effects will be within existing standards and, to a large degree, minimized. However, the proposed landfill expansion facility will still have some social impacts on the community. • With a regular monitoring program, implementation of the identified impact management measures, and an open communication process between the company, residents and the Township, it is reasonable to expect that the negative effects can be minimized and the positive effects enhanced.	

Exhibit 6-4. Social and Cultural

	Criterion	Definition / Rationale
	• **3(b) Along the Haul Routes** • **Disruption to Local Traffic Networks Along the Haul Routes**	Increased traffic volume resulting from the landfill expansion could disturb the overall traffic flow through the study area, and effectively reduce the available road capacity
Discussion/ Assessment	• No negative impact to local road network or level of service on local roads (other than the direct haul route) due to landfill construction and operation. • Haul route road network will require improvements to accommodate landfill traffic	
Mitigation	• Recommended road improvements : CR79@402(south): northbound left turn lane S=40m CR79@Site Access: southbound left turn lane; S=30m northbound left turn lane; S=30m • Improvements provide through traffic on CR79 with uninterrupted flow without delay from turning landfill traffic; • Reduced speed on CR79 would enhance safety at HWY 402 ramp terminals and overall safety for all vehicles on this length of CR79 • Illumination of recommended roadworks would improve visibility over current conditions, for all traffic during non-daylight hours	
Net Effects	• No net effects on Haul route traffic flow	
Conclusion	• With recommended mitigation along haul route , the local road network can adequately accommodate ultimate traffic while maintaining (or possibly improving) safety of all road users. All intersections along haul routes expected to operate at acceptable levels of service and critical movement delay. Individual road segments are expected to operate well within their design capacity.	

Exhibit 6-4. Social and Cultural

	Criterion	Definition / Rationale
	• **3(b) Along the Haul Routes** • **Disturbance to Cultural Resources Due to Nuisance Effects**	Cultural resources may be disturbed by the traffic to and from the landfill. Disturbances could result from noise, dust, litter, odour and traffic congestion.
Discussion/ Assessment	• There is little potential for adverse impact to built heritage features and cultural landscapes (habitable and non-habitable) along the haul route	
Mitigation	• None required	
Net Effects	• None	
Conclusion	• No significant impacts anticipated	

Exhibit 6-4. Social and Cultural

	Criterion	Definition / Rationale
	• **3(c) In the Community** • **Changes to Community Character**	Perceived incompatibility of the proposed landfill with the existing and future physical characteristics of the community, as well as potential changes in social stability.
Discussion/ Assessment	• The current community character as defined by the residents is a rural agricultural community with the objective to develop an industrial component. This is in conformity with the official plan as well. • The community is also considered to be close-knit and people are proud of their history and heritage. As demonstrated by the range of activities in the community, there is a lot of pride in the community and considerable social, recreational and cultural activities show the community to be a vibrant place to live. In addition, the broader region has the characteristics of a summer recreational area with access to the beaches on Lake Huron. • Landfill expansion will increase the visibility of this industrial activity on the northern entrance to the Watford Village part of Warwick Township, giving an increasingly industrial character to the urban settlement area, and, for many residents will result in a negative perception. On the other hand, the landfill will likely contribute to industrial expansion as planned. • The basic character of the area is likely to remain as rural agricultural and rural residential with growing industrial development during the 25 or so years of development of an expanded Warwick landfill.	
Mitigation	• No mitigation specific to maintaining community character is recommended • Royalty payments to the Township may be used to enhance community attributes • The township may choose to use compensation payments to enhance community attributes (e.g. build a community facility).	
Net Effects	• With the implementation of impact management measures, no significant impact on community character is anticipated.	
Conclusion	• If the full range of mitigation measures is put into effect and a proper impact management program implemented, the character of the community can be maintained.	

Exhibit 6-4. Social and Cultural

	Criterion	Definition / Rationale
	• **3(c) In the Community** • **Changes to Community Cohesion**	The proposed landfill expansion is perceived as reducing the attractiveness of the community as a place to live, or in some way interferes with residents' patterns of social interaction.
Discussion/ Assessment	• Residents describe the community as close, neighbourly and supportive. There is a strong sense of belonging and this in part is reinforced by the fact that many families have been in the area for many generations. • There are a large number of organizations in the community that provide activities during the course of the year. This includes church groups, sport groups and a variety of service clubs, womens' organizations and children's organizations as well as public services such as the library. The church and recreational groups are seen as central to the community in maintaining its cohesion. • There has however been a decline in younger people staying and putting down roots in the community. This has been particularly evident in the recent school closures. • It is expected that during the next 25 years, the cohesion of the community might diminish somewhat if younger people continue to leave in the search for employment, regardless of whether or not the landfill expansion is approved. However, if the industrial component increases in the area (i.e. in the Industrial Park), so that young people can stay and raise their families in the community, the cohesion should be maintained and possibly enhanced. Given that the mobility rates have been quite constant over the past 20 years, it is expected that there will not be a lot of new people moving into the community beyond what might be able to be absorbed into the existing economic structure • Landfill expansion is not expected to impact these general trends.	

Mitigation	• No mitigation specific to restoring or enhancing community cohesion is recommended.
	• Some recommended mitigation/impact management measures to address other social impacts may benefit the broader community including:
	  • Support for community activities; and
	  • Support for industrial activity, i.e. assist in recruiting businesses to the area.	

Net Effects	• With the implementation of impact management measures, no net effect on the cohesion of the community is anticipated.	
Conclusion	• If the full range of mitigation measures is put into effect and a proper impact management program implemented, the high level of cohesion of the community can be maintained.	

Exhibit 6-4. Social and Cultural

	Criterion	Definition / Rationale
	• **3(c) In the Community** • **Level of Community Service Provided by the Landfill**	The presence of a landfill operation within a municipality can provide an increased level of public service to residents and businesses within and around the community.
Discussion/ Assessment	▪ Expansion will provide continuation of non-hazardous waste disposal services to the community ▪ Additional services for material diversion form landfill including composting and construction and demolition waste processing will be available for municipal and business and agricultural sector use ▪ Availability of disposal services may be an attraction for new businesses locating in the community	
Mitigation	▪ Positive effect of services opportunity can be enhanced by WM provision of reduced costs or free services to sectors of the community	
Net Effects	▪ Net positive effect for the community	
Conclusion	▪ Expansion of the landfill creates opportunity for continuation and enhancement of waste management services for the community	

Exhibit 6-4. Social and Cultural

	Criterion	Definition / Rationale
	• **3(c) In the Community** • **Effect on Other Public Services**	• The presence of a landfill may have positive or negative spin-off effects on other public services in the community.
Discussion/ Assessment	▪ Additional costs for road maintenance along the haul routes ▪ Leachate management option which utilized Watford STP may require facility upgrades ▪ Environmental monitoring will provide information regarding water quality and possibly other issues in the site vicinity	
Mitigation	▪ Through community benefit agreement, WM to finance additional costs to the municipality for any additional costs directly attributable to landfill activity, through royalty or other financial compensation mechanisms	
Net Effects	▪ No negative effect on public services when mitigation measures in place ▪ Enhancement of environmental monitoring services a benefit to the community ▪ Community benefit agreement may enable municipality to maintain public services at current levels over the long term or enhance services in priority areas	
Conclusion	▪ Expansion provides an opportunity to secure funding for maintaining or enhancing public services in the community. ▪ Expansion will have no negative effect on provision of other services	

Exhibit 6-4. Social and Cultural

	Criterion	Definition / Rationale
	• **3(c) In the Community** • **Compatibility with Municipal Land Use Designations and Official Plans**	• The expanded landfill has the potential to affect the viability of present and future land uses, which may have an effect on planning decisions made in the surrounding community. .
Discussion/ Assessment	▪ Expansion does not require amendment to the County of Lambton Official Plan. ▪ Amendment to the Warwick Official Plan is required to designate the entire site of the proposed facility as "Landfill Site", including the fill area and areas with uses associated with the operation of the landfill. ▪ Expansion does not constitute an incompatible use with agricultural uses, particularly when the existing landfill is considered with the same surrounding agricultural use. ▪ Township of Warwick has a substantial amount of vacant and designated land available within the Village of Watford to accommodate future growth. No future change to the land use pattern is expected outside of Watford, and therefore no land use compatibility issues are predicted.	
Mitigation	• Mitigate potential impacts as recommended by other disciplines • Modify the Township's OP to reflect Provincial land use standards for landfills • Develop a Site Plan Agreement between WM and the Township of Warwick to implement mitigation requirements for any potential impacts of the expansion, and thus guide its development and phasing. The agreement would provide the framework for mitigation measures required during the operating life of the landfill. • Revise the Zoning By-law to reflect the Site Plan agreement	
Net Effects	• Minimal land use effects; no land use compatibility issues are predicted.	
Conclusion	• There would be minimal land use compatibility impact from the proposed expansion. Provided other impacts are adequately mitigated, the land use measures noted will guide the expansion and ensure that potential impacts on the surrounding area are prevented and controlled through planning policy.	

Exhibit 6-5. Economic

	Criterion	Definition / Rationale
	• **4(a) On-Site and in the Site Vicinity** • **Displacement of Businesses** (including farms)	Businesses on-site would be displaced by the landfill. These businesses may incur a business loss as a result of relocation.
Discussion/ Assessment	• No businesses will be directly displaced by landfill expansion • The Subject Lands do not contain any agricultural buildings or facilities. The proposed landfill expansion will not, therefore, result in the retirement or displacement of agricultural infrastructure. • Lease-based cropping within the landfill expansion area will be discontinued	
Mitigation	• None required	
Net Effects	• There will be no displacement of agricultural business infrastructure. • Lease-based cropping within the landfill expansion area will be discontinued, net reduction in this opportunity.	
Conclusion	• No significant displacement of businesses due to landfill expansion	

Exhibit 6-5. Economic

	Criterion	Definition / Rationale
	• **4(a) On-Site and in the Site Vicinity** • **Disruption to Businesses** (including farms) **Due to Nuisance Effects**	Some types of businesses located in the site vicinity may be adversely affected by the potential nuisance effects or perceived effects associated with the construction and operation of a landfill such as noise, litter, dust, odour, visibility, gulls, vermin and traffic congestion. These businesses may incur losses as a result of these nuisance effects, or perceived effects. Furthermore, businesses may choose to relocate causing a loss of employment in the vicinity.
Discussion/ Assessment	• Perception of human health risks associated with air quality in the vicinity of the landfill may affect individual's decisions to work at or patronize businesses in the vicinity of the landfill. However , no particularly sensitive businesses were identified and impact is expected to be minimal • Excessive soiling due to TSP and dust fall may result in soiling of buildings, no businesses particularly sensitive to dust were identified • Owners and patrons of businesses within the viewshed would experience varying degrees of visual impact (high, moderate, low) for various development stages. Nuisance due to odour and visual impacts may affect sensitive businesses such as those reliant on visitor and tourist traffic. None of these businesses were identified in the Watford community. • Blowing litter events, (predicted to be infrequent to occasional prior to mitigation measures) could affect agricultural businesses through decrease in productivity and additional equipment repair and maintenance • No impact on customer base from the agricultural sector is anticipated • Based on agricultural operations and activity in the area, negative impacts on agriculture are anticipated to be low • No impact on business revenue is anticipated	
Mitigation	• Community information program recommended to avoid disruption to business due to perceived landfill effects • Mitigation recommended by air quality discipline to reduce nuisance dust, odour and litter impacts • Mitigation through good on-site management practices and periodic off-site litter pick up will mitigate any litter impact on agriculture	
Net Effects	• Minor effects can be mitigated through recommended programs; no net effect anticipated	
Conclusion	• Potential impacts can be avoided or mitigated through the recommended mitigation programs	

Exhibit 6-5. Economic

	Criterion	Definition / Rationale
	• **4(a) On-Site and in the Site Vicinity** • **Property Value Effects**	• Expansion of the landfill operation may adversely affect property values in the vicinity.
Discussion/ Assessment	• Noise from increased landfill traffic may effect residences located on CR79 in proximity to the landfill, requiring mitigation to reduce noise levels inside the residences. This effect may result in reduction in demand for these residences and, by extension a negative change in property value • Potential nuisance impacts from air quality effects may similarly have a stigmatizing effect and resulting a negative change in property values for residences in the vicinity of the landfill • Visual exposure to the landfill without adequate mitigation, could result in effects on residential properties, which could potentially effect property values • Uncertainty regarding potential negative effects of the landfill may result in perceived health and nuisance concerns and property value change • These potential real estate impacts are applicable to residential and to a lesser extent, commercial properties and agricultural lands • Property value impacts are expected to be limited to a 1km area based on experience with similar developments but this extent will be influenced by the degree of uncertainty regarding potential health and nuisance impacts	
Mitigation	• Mitigation measures as recommended for visual, air quality and noise effects • Property value protection and monitoring program recommended to address actual changes in property value as a result of landfill development • Community information program recommended to reduce uncertainties and unwarranted stigmatization of business and residential properties	
Net Effects	• Mitigation of actual property value changes can be achieved through a property value protection program • No net impacts are anticipated	
Conclusion	• Actual and perceived impacts from expansion may result in negative changes in property values in the vicinity of the landfill. Actual impacts can be reduced through mitigation measures; perceived impacts can be somewhat reduced with community information and communications. Should property value changes occur, property owners can be protected through a Property Value Protection program	

Exhibit 6-5. Economic

	Criterion	Definition / Rationale
	• **4(b) Along the Haul Routes** • **Disruption to Businesses (including farms) Due to Nuisance Effects**	• Some types of businesses located along the haul routes may be adversely affected by the potential nuisance effects, or perceived effects, associated with the traffic to and from the landfill. These businesses may incur losses (including reduction in production or product quality from farms or agribusiness's) as a result of these nuisance effects, or perceived effects. Furthermore, businesses may choose to relocate causing a loss of employment in the surrounding area.
Discussion/ Assessment	• Based on agricultural operations and activity along the haul route, negative impacts on agriculture due to landfill truck traffic are anticipated to be low • Some excessive TSP and dust fall is anticipated along haul routes; this may result in additional costs for clean up or equipment maintenance • No impact on business revenue is anticipated • No non-agricultural businesses are located along the haul route	
Mitigation	• Consider agricultural vehicle movement in road improvement designs • Implement recommended dust reduction measures	
Net Effects	• No significant net effects to agricultural or non-agricultural businesses have been identified along the haul route as a consequence of the proposed landfill expansion.	
Conclusion	• Some excessive TSP and dust fall is anticipated along haul routes; where this results in additional costs for clean up or equipment maintenance, impact management measures can provide compensation. No other impacts to businesses along haul routes are anticipated	

Exhibit 6-5. Economic

	Criterion	Definition / Rationale
	• **4(b) Along the Haul Routes** • **Property Value Effects**	Expansion of the landfill operation may adversely affect property values along the haul route.
Discussion/ Assessment	• Noise from increased landfill traffic may effect residences located on the haul route, requiring mitigation to reduce noise levels inside the residences. This effect may result in reduction in demand for these residences and , by extension a negative change in property value • potential nuisance impacts from air quality effects may similarly have a stigmatizing effect and resulting a negative change in property values for residences in the vicinity of the landfill • visual exposure to the landfill without adequate mitigation, could result in displacement of residences and/or stigma effects on residential properties or business properties reliant on aesthetic appeal, which could potentially effect property values • Uncertainty regarding potential negative effects of the landfill may result in perceived health and nuisance concerns and property value change • These generalized real estate impacts are applicable to residential and to a lesser extent, commercial properties and agricultural lands	
Mitigation	• Mitigation measures as recommended for visual, air quality and noise effects • Property value protection and monitoring program recommended to address actual changes in property value as a result of landfill development • Community information program recommended to reduce uncertainties and unwarranted stigmatization of business and residential properties	
Net Effects	• Mitigation of actual property value changes can be achieved through the recommended property value protection program • No net impacts are anticipated	
Conclusion	• Actual and perceived impacts from expansion may result in negative changes in property values along the haul route. Actual impacts can be reduced through recommended mitigation measures; perceived impacts can be somewhat reduced with community information and communications. Should property value changes occur, property owners can be protected through a Property Value Protection program	

Exhibit 6-5. Economic

	Criterion	Definition / Rationale
	• **4(c) In the Community** • **Property Value Effects**	Expansion of the landfill operation may adversely affect property values in the broader community.
Discussion/ Assessment	• Property value impacts beyond those identified for site vicinity and along haul routes are not anticipated	
Mitigation	• Community information program recommended to reduce uncertainties and unwarranted stigmatization of business and residential properties	
Net Effects	• No net effects anticipated	
Conclusion	• Property value effects in areas of the community beyond those identified through nuisance impact analysis are not anticipated. Community information will reduce uncertainties and unwarranted stigmatization of properties.	

Exhibit 6-5. Economic

	Criterion	Definition / Rationale
	• **4(c) In the Community** • **Business Losses (regional, e.g., tourism)**	• The potential or perceived effects associated with the construction and operation of a landfill may adversely affect some types of businesses in the community. The presence of a landfill may also keep some potential customers away, and could result in a reduction of spin-off employment in the area.
Discussion/ Assessment	• No businesses were identified in the community which are expected to be sensitive to the potential effects of the landfill • No impact on agribusiness employment is anticipated • No business losses are anticipated • Landfill not expected to be a significant factor detracting from regional business development • Landfill may support the attraction of new businesses which would benefit from proximity to the landfill, including those requiring waste disposal facilities and those who can benefit from the availability of landfill gas as a power source	
Mitigation	• Community information program recommended to reduce uncertainties and unwarranted stigmatization of the vicinity	
Net Effects	• No adverse net effect	
Conclusion	• No revenue or employment losses are anticipated as a result of landfill expansion. With appropriate information to reduce uncertainty, the facility will not detract from regional economic development.	

Exhibit 6-5. Economic

	Criterion	Definition / Rationale
	• **4(c) In the Community** • **New Business Opportunities Related Directly to Landfill Construction and Operation**	A large capital project, such as the construction and operation of a landfill, can have positive economic effects on the municipality in which it is located. New business opportunities may be created for local businesses supplying products or services directly to the landfill.
Discussion/ Assessment	• Capital expenditure and annual operating expenditure estimated to have significant positive impact on local economy, benefiting existing business and attracting new suppliers to the area who can meet the needs of the landfill operation • Total capital expenditure over 25 years of $112 million estimated to produce direct and indirect and induced value added of $68 million in the Sarnia/Lambton area, and support new labour income of $ 43.6 million. New employment in the areas estimated to be 748 person years • **Of this total, direct impacts account for $52 million of value added and 512 person years of employment.** • Annual operating expenditure by the landfill provides additional stimulus to the local economy. Based on median year operating expenditure estimates, total local value added to the local economy will amount to $5.5 million annually and an additional 118 person years of employment. • **Of this annual total, direct business with the landfill accounts for $3.6 million of value added and 79 person years of employment each year.** • The types of direct business opportunities include construction supplies and services, trucking services, vehicle purchases and general supplies such as fuel, office supplies and maintenance equipment and services.	
Mitigation	• The extent that local economy benefits from landfill expenditure depends on the capacity of local suppliers to produce the goods and services demanded by the landfill operation and the spin-off indirect and induced demand. • Recommended continued use of local suppliers wherever possible to maximize economic benefits to the local economy	
Net Effects	• Significant net benefits to local economy anticipated.	
Conclusion	• Landfill expansion is expected to have a significant net positive impact on the local economy, benefiting existing businesses and attracting new suppliers to meet the needs of the landfill operation.	

Exhibit 6-5. Economic

	Criterion	Definition / Rationale
	• **4(c) In the Community** • **New Business Opportunities in Related Industries and Services**	New business opportunities may be created for local businesses, or as secondary suppliers to industries working for the landfill (e.g., restaurants, gas stations, machine shops, repair shops, welding shops, equipment rentals etc.).
Discussion/ Assessment	• New business opportunities anticipated for local business who support the spin-off activity from landfill operations and employment. • Total capital expenditure over 25 years of $112 million estimated to produce overall value added of $68 million in the Sarnia/Lambton area, and support new labour income of $ 43.6 million. New employment in the areas estimated to be 748 person years. **The value added and employment impacts associated with "indirect and induced" activity account for $15.6 million and 236 person years of this impact.** • Annual operating expenditure by the landfill provides additional stimulus to the local economy. Based on median year operating expenditure estimates, total local value added in the local economy will amount to $5.5 million annually and an additional 118 person years of employment. **This impact includes $1.2 million and 38 person years associated with "indirect and induced" activity.** • The types of spin-off business opportunities associated with development may include restaurants, gas stations, machine shops, repair shops, welding shops, equipment rentals. These activities will support the direct suppliers to the landfill. • Second round or induced demand for a wide range of consumer based products would then result from the income generated in the community through enhanced business and labour income. • In addition, new businesses may be attracted to the area which can directly benefit from proximity to landfill facilities. (Those with high disposal volumes or costs associated with transporting wastes) This would in turn generate local business to support the new activity. • Use of landfill gas as a fuel source (to heat large buildings or greenhouses for example) provides a further significant opportunity for new local and regional business development.	
Mitigation	• The extent that local economy benefits from related expenditure and the multiplier effects of major new activity depends on the capacity of local suppliers to produce the goods and services demanded. • Recommended continued use of local suppliers for direct requirements to provide initial stimulus to the local economy. • Recommended attraction of new business which would be complimented by or complementary to the operation of the landfill	
Net Effects	• Significant positive impact on the local economy anticipated	
Conclusion	• New business opportunities are anticipated for local businesses providing related goods and services, or as secondary suppliers to industries working for the landfill. In addition, attracting new business compatible with landfill development is a significant opportunity for local and regional economic development.	

Exhibit 6-5. Economic

	Criterion	Definition / Rationale
	• **4(c) In the Community** • **Public Costs for Indirect Liabilities**	Some public services may have to be upgraded as a result of the landfill expansion.
Discussion/ Assessment	• Additional road maintenance along the 3km haul route from Highway 402 will be required due to additional heavy truck traffic. • Road improvements will be required to meet operational and safety standards along the haul route (as per recommendations from the Transportation impact analysis)	
Mitigation	• Recommended that WM provide sufficient funding to the County of Lambton to fund the improvements and ensure that additional road maintenance costs which are attributable to landfill traffic are provided for.	
Net Effects	• No net effect on local, provincial or federal government finances.	
Conclusion	• Upgrading of local road networks to support additional landfill traffic will be supported by WM so that there will be no net cost to the community.	

Exhibit 6-5. Economic

	Criterion	Definition / Rationale
	• **4(c) In the Community** • **Direct Employment in Landfill Construction and Operation**	The expansion of the landfill will create new employment opportunities both in the construction, and in the day-to-day operation of the landfill.
Discussion/ Assessment	• Capital expenditure for landfill construction over 25 years will generate 512 direct person years of employment. All of this new employment will be local, that is within the Sarnia/Lambton economy. • This includes 15-25 non-WM contract personnel brought on during cell construction phases • Operation of the landfill will generate an additional 79 person years of direct employment locally each year, (based on the median year of operations). • This includes 22- 32 WM personnel dealing with on-site operations	
Mitigation	• None required	
Net Effects	• Positive economic impact on the local economy	
Conclusion	• Construction and operation of the landfill will have a significant employment impact in the local economy, including on-site employees during operations and non-WM contract employment during the ongoing cell construction	

Exhibit 6-5. Economic

	Criterion	Definition / Rationale
	• **4(c) In the Community** • **Indirect Employment in Related Industries and Services**	The landfill expansion has the potential to create increased employment opportunities in local firms supplying products or services directly to the landfill, or as secondary suppliers to industries working for the landfill.
Discussion/ Assessment	• Indirect and induced economic activity associated with 25-year capital expenditure will generate 1,208 person years of employment provincially, 236 of these employment years will be within the local economy of Sarnia-Lambton • Indirect and induced economic activity associated with annual operations will generate 62 person years of employment provincially, 38 of these employment years will be within the local economy of Sarnia-Lambton • No estimate has been made of new employment associated with businesses attracted to proximity of the landfill facility, but the local economy would benefit from any realized opportunity.	
Mitigation	• None required	
Net Effects	• Positive economic benefit to local and provincial economies	
Conclusion	• Indirect employment in industries and services related to the landfill will be significant. Attracting new businesses complementary to landfill operations provides additional potential for job creation.	

Exhibit 6-5. Economic

	Criterion	Definition / Rationale
	• **4(c) In the Community** • **Effects on the Municipal Tax Base**	The expansion of the landfill has the potential to affect municipal tax revenues.
Discussion/ Assessment	• Taxation impacts were estimated for direct and indirect economic activity associated with the landfill. • Municipal taxes generated from the 25-year capital expenditure are estimated at $2.5 million. • Annually, operation of the landfill will generate $144,467 in municipal tax revenue • Annual revenue accruing to the local municipality through host community benefits is estimated at $750,000, based on $1/tonne of waste receipts. • Property tax payable on the WM property is currently approximately $26,500/year. Assuming all lands would be reclassified under " Industrial Occupied" class, property tax payable would increase to approximately $55,000/year. • Current revenue from WM host community payments amounts to approximately 13% of the Township of Warwick budget (2001 Budget Estimate) Without landfill expansion this revenue source would no longer be available.	
Mitigation	• Host community agreement to be negotiated	
Net Effects	• Net positive effect on local municipal finances	
Conclusion	• "Host Community Fees" negotiated with the municipality provide an opportunity to enhance the fiscal stability of the community. These fees, in addition to enhanced property taxes and revenue generated through new economic activity, provide a significant economic benefit to the local community.	

Exhibit 6-5. Economic

	Criterion	Definition / Rationale
	• **4(c) In the Community** • **Effect on the Cost of Service to Customers**	• The costs of constructing the landfill will effect the price of tipping fees to the site. This affects the cost of service to County residents. .
Discussion/ Assessment	• No impact on landfill tipping fees is anticipated beyond standard inflationary increases. • No impact to current free residential waste disposal and free drop of recyclables at the landfill for Warwick residents • Expanded landfill will provide residents and businesses with an expanded range of services, including processing of asphalt, concrete and wood waste, and composting. • Utilization of gas for leachate incineration is not included in the preferred leachate management system.	
Mitigation	• Community benefit of free disposal and recyclables drop off is anticipated to continue as part of the host community agreement	
Net Effects	• Net positive impact will continue	
Conclusion	• With the continuation of the current Township of Warwick community benefit of free disposal for residential waste and recyclables drop off, the community will not experience any impact on cost of service.	

Exhibit 6-5. Economic

	Criterion	Definition / Rationale
	• **4(d) Provincial / Federal** • **Effects on the Provincial / Federal Tax Base**	The expansion of the landfill has the potential to affect provincial/federal tax revenues.
Discussion/ Assessment	• 25-year capital expenditure will generate Federal taxes of approximately $21.7 million and Provincial revenue of $15 million • Annual operating expenditure will generate Federal taxes of approximately $1.3 million and Provincial revenue of $0.8 million annually • These taxation impacts reflect initial expenditure as well as indirect and induced economic activity.	
Mitigation	• None required	
Net Effects	• Positive effect on tax base of Province and Federal government	
Conclusion	• Capital expenditure and annual operating expenditure will have a significant positive impact on Federal and Provincial finances.	

Exhibit 6-5. Economic

	Criterion	Definition / Rationale
	• **4(d) Provincial / Federal** • **Effects on Provincial Diversion Programs**	The landfill expansion could potentially affect provincial diversion objectives.
Discussion/ Assessment	• The provincial per capita waste generation rate is expected to remain constant at 1,170 kg/yr. given population and economic trends • Without expansion of the Warwick site, Provincial disposal requirements are estimated to exceed available capacity by 130 million tonnes over the next 25 years. Expansion will help to bridge the supply gap but will not result in an oversupply of landfill capacity. • This conclusion was reached after assuming aggressive waste diversion of up to 75%. • Given the projected under-supply relative to disposal demand, no emergency headroom exists in Ontario over a 20-year period. • In the short term, relaxing service area and fill rate restrictions would enable Ontario landfills to meet demand, but supply would be exhausted more quickly. Without relaxation of these conditions, export out of province is the only available short-term measure to meet demand. • No clear relationship between tip fees and diversion rates was identified; other factors including political commitment, community support and participation in diversion, and new diversion funding incentives play significant roles in diversion achievements. • Diversion goals will not be influenced by the landfill expansion. • Expansion will provide residents and businesses with an expanded range of services, including processing of asphalt, concrete and wood waste, and composting. • WM will continue to provide recycling drop off facility	
Mitigation	• No mitigation is required.	
Net Effects	• Additional composting opportunity and recycling material drop off provided to local community • No significant net effect on Provincial diversion rates or programs.	
Conclusion	• Analysis of landfill capacity and demand in Ontario indicates there is a requirement for additional disposal capacity. Expansion of Warwick landfill will not significantly effect Provincial diversion programs as factors such as political commitment and community support underlie the success of diversion programs.	

There is no evidence of any impact from existing landfill vermin on human health, therefore, the expansion will not result in any risk to human health.

Along the Haul Route

There is no evidence of waste material spillage during transport to the existing landfill, and the potential occurrence with the expanded site is considered to be a rare event. Additionally, no hazardous materials are currently accepted at the site, and will not be in the future. Therefore, the risk of contact with spilled waste material is low and the potential impact associated with a spill is mitigatable with the standard spill response measures that will be in place.

Overall safety and operations of the road network will be maintained or improved with implementation of the recommended intersection improvements. This includes undertaking road improvements as detailed in traffic impact assessment at Highway 402 and CR79, and at the CR79 site entrance. Additionally, the speed limit on CR79 would be reduced to 70 km/h from the Highway 402 overpass to Watford. WM would also implement measures to ensure all trucks /vehicles leaving facility are free of debris prior to accessing road network, provide illumination at site entrances (and consider lighting requirements associated with intersection improvements), provide attention and timely response to road maintenance requirements, and take into consideration agricultural equipment movements in the design of road upgrades.

The level and frequency of exceedances of total suspended particulate (TSP) and finer particulate matter (PM_{25} and PM_{10}) will be will be below predicted levels given additional mitigation measures. Soiling effects on buildings and outdoor surfaces due to dust may occur in vicinity of landfill, however, impact management measures linked to monitoring of actual conditions after mitigation will be undertaken. The likelihood of health–related effects from particulate exposure is low.

There is no airport within the 8 km zone identified by Transport Canada Guideline (nearest regulated airport is Sarnia Airport, 25 km to west), and there is no history of bird interference associated with current landfill. The distance between the Sarnia Airport and the landfill and gull movement patterns indicate that bird interference is not an issue. Therefore, there is no risk to air traffic anticipated from expansion of the landfill.

6.4.2 Natural Environment and Resources

On-site and Site Vicinity

Small portions of the headwaters of four tributaries to Bear Creek are on site and may be physically altered or removed by the landfill expansion. These are dry ditches and swales for much of the year, and no fish habitat values were identified in these swales. Their only function is to convey surface runoff during the spring freshet and after extended periods of rain. The baseline characteristics of quantity and timing of runoff will be maintained through construction of ditches and swales on site to replace any physical losses of existing channels. As a result, no net loss or displacement of surface water resources will occur. Similarly, there will be no change in the aquatic ecological function of watercourses on site and downstream.

There will be increased flow to Bear Creek for brief periods (weeks to months) during periods of discharge of treated effluent from on-site lagoons. However, the water quality will remain within existing baseline range of high solids and nutrients (due to agricultural use and storm response) and analysis of treated effluent quality prior to discharge will ensure that discharge meets Certificate of Approval limits. Additionally, the treated leachate will be stored and only discharged during periods of high flow in Bear Creek (discharge limits are enforced by MOE Certificate of Approval for discharge). Therefore, there will not be any significant effects on water quality or aquatic life.

The proposed landfill will not have a detectable effect on the availability of groundwater as a resource, and will not have a detectable effect on groundwater baseflow quality and quantity to surface watercourses.

The amount of natural vegetation will initially be reduced with the proposed expansion, including 5.5 ha of deciduous forest (no loss of locally significant plant species). However, in the long term, the amount of forest cover on the site will be increased from the existing condition with the leachate treatment poplar plantation and an aggressive vegetation and restoration plan when the landfill is closed. Therefore, there will be no significant disturbance to the existing terrestrial ecosystem. Any minor reduction in the ability of wildlife to utilize the existing forested corridor can be partially reversed with additional planting.

The proposed landfill expansion will result in a loss of approximately 113.6 ha of agricultural lands, 96.9% of this or 110.1 ha is prime agricultural lands (Canadian Land Inventory (CLI) Classes 1,2 and 3). There is no opportunity to avoid the prime agricultural lands during expansion of the current landfill. Expansion of the current landfill avoids many agricultural character impacts that are typically associated with the siting of a new facility. However, the loss of 110.1 hectares of prime agricultural lands will not significantly affect the agricultural productivity of the area.

The proposed landfill will not have a detectable affect on industrial mineral resources.

The loss of 5.5 ha of mature deciduous forest (woodland resource) will not result in a loss of commercial value forest resources, and the fuelwood value can be salvaged at the time of tree removal.

There are no recreational resources are located on-site, therefore no impacts from the landfill expansion will occur.

Along the Haul Route

The impact on terrestrial ecosystems is expected to be minimal due to the lack of vegetation along the haul route within the rights of way. Similarly, no significant effect is anticipated on aquatic ecosystems along the haul route given existing creek characteristics, low probability of spills and recommended mitigation measures.

There are no recreational resources are located along the haul route.

6.4.3 Social and Cultural

On-site and Site Vicinity

Two residences, located at 7929 and 7888 Zion Line, are owned by WM and will be demolished before development of the landfill expansion. These residences currently have tenants living on the property. In relocating, the tenants may choose to rent a home in another location in the community or to leave the community.

A number of impact management measures are proposed (i.e., property value protection; nuisance compensation payments; other nuisance impact measures; community impact management measures; complaints/dispute resolution/small claims compensation process; and monitoring and community information) to reduce potential social impacts. Additionally, with the full range of mitigation measures identified by the technical disciplines, many of the effects will be within existing standards and, to a large degree, minimized. Additional mitigation suggested by the community may also be helpful in further reducing impacts. The proposed landfill expansion facility will still have some social impacts on a number of residents and, to a lesser extent, on the community. However, with a regular monitoring program, implementation of the identified impact management measures, and an open communication process between the company, residents and the Township, it is reasonable to expect that the negative effects can be minimized and the positive effects enhanced.

With regard to public facilities and institutions, implementation of the full range of mitigation measures identified by the technical disciplines will result in many of the effects being minimized to within existing standards. However, the proposed landfill expansion facility will still have some social impacts on some users of neighbouring community facilities.

Noise from woodchipping/crushing and all stationary sources will be well within MOE Guidelines, and noise from on-site traffic will be within MOE Guidelines for Landfills.

Dust concentrations are predicted to exceed Provincial Guidelines less than 6% of the time at discrete receptors and 10% of the time at any point along the haul route. The net effects may have some impact on residents which may require impact management.

No impact anticipated on level of service on local roads within the site vicinity, other than along direct haul routes.

Viewshed impacts have been identified for receptors within high to moderate visual impact zones. Of the three user groups of receptors (i.e., residential, recreational facilities and commercial), residential users would experience the most significant visual impacts. Since community character can be impacted by changes to man made or natural features that contribute to a community's visual character, it is important to note that some impact will occur to natural features (no man made features will be removed with the expansion), which are a valuable visual resource and an important part of the Watford image. Specifically, visibility of agricultural lands immediately south of the existing landfill would be disrupted, and approximately 5.5 ha of woodlot at the southwest corner of the north property would be removed. However, perception of community character for receptors within the village center would be unchanged.

The objective of mitigation measures for viewshed impacts is to screen or disguise operations during site life and to visually integrate the landfill site in the long-term by developing an onsite landscape character that resembles the character of the surrounding landscape. The recommended mitigation measures will assist in minimizing the visual impact of the landfill in the immediate area and in the broader community. Recommendations include enhanced visual screening through use of additional vegetation, berm treatment and fencing. Community input has also identified specific mitigation measures that will be considered.

Vermin from the landfill is not expected to impact residents or agricultural operations in the vicinity of the expanded landfill.

Significant impacts are anticipated for two agricultural landscapes. The significance of the impact is due to the well-preserved nature of the lands to be developed, their high heritage value, and the anticipated disruptions and displacements to those landscapes. Unfortunately, displacement of these agricultural lands cannot be mitigated.

There is minor potential for adverse impact to built heritage features and cultural landscapes (habitable and non-habitable) in the site vicinity.

Significant on-site impacts are anticipated for six archaeological resources: AfHl-8, -9, -10, -11, and –12. This is due to the nature of the archaeological deposits, their potential heritage value, and the anticipated disruptions and/or displacements to those archaeological resources. As a result, a Stage 3 archaeological resource assessment is still required. Upon completion of the Stage 3 assessment, the appropriate mitigation will be developed.

Expansion of the landfill will provide continuation of non-hazardous waste disposal services for the community. A mini waste transfer area will continue to provide the opportunity for local residents and businesses to directly drop off waste/recyclables. Additional services for material diversion form the landfill, including composting and construction and demolition waste processing, will be available for municipal and business and agricultural sector use. All of these factors create opportunities for service continuation and enhancement for the community.

There are no negative effects on the provision of public services when mitigation measures are in place. Additionally, enhancement of environmental monitoring services will provide a benefit to the community and, the community benefit agreement may enable the municipality to maintain general public services at current levels over the long-term, or enhance services in priority areas.

Along the Haul Route

A number of impact management measures are proposed (i.e., property value protection; nuisance compensation payments; other nuisance impact measures; community impact management measures; complaints/dispute resolution/small claims compensation process; and monitoring and community information) to reduce potential social impacts along the haul routes. With the full range of mitigation measures identified by the technical disciplines, many of the effects along the haul route will be within existing standards and, to a large degree, minimized. Nonetheless, the proposed landfill expansion facility will still have some social

impacts on a number of residents, and the net effects may require impact management. However, with a regular monitoring program, implementation of the identified impact management measures, and an open communication process between the company, residents and the Township, it is reasonable to expect that the negative effects can be minimized and the positive effects enhanced.

The recommended road improvements along the haul route include a northbound left turn lane at CR79 and Highway 402 (south), and a northbound and southbound left turn lane at the site entrance on CR79. These improvements will provide through traffic on CR79 with uninterrupted flow without delay from turning landfill traffic. Additionally, reduced speed on CR79 would enhance safety at the Highway 402 ramp terminals and overall safety for all vehicles on this length of CR79. Illumination of recommended roadworks would improve visibility over current conditions, for all traffic during non-daylight hours. With these and other recommended mitigation measures along the haul route, the local road network can adequately accommodate ultimate traffic while maintaining (or possibly improving) safety of all road users. All intersections along haul routes are expected to operate at acceptable levels of service and critical movement delay. Individual road segments are expected to operate well within their design capacity.

There is minimal potential for adverse impact to built heritage features and cultural landscapes (habitable and non-habitable) along the haul route.

In the Community

If the full range of mitigation measures is put into effect and a proper impact management program implemented, the character of the community and the high level of cohesion of the community can be maintained.

Expansion of the landfill creates opportunity for continuation and enhancement of waste management services for the community.

There are no negative effects anticipated on public services when mitigation measures are in place. In fact, enhancement of environmental monitoring services will be a benefit to the community. Additionally, the community benefit agreement may enable municipality to maintain public services at current levels over the long term or enhance services in priority areas.

There would be minimal land use compatibility impact from the proposed expansion. Provided other impacts are adequately mitigated, the land use measures proposed will guide the expansion and ensure that potential impacts on the surrounding area are prevented and controlled through planning policy.

6.4.4 Economics

On-site and Site Vicinity and Along the Haul Routes

No businesses will be directly displaced by landfill expansion. The Subject Lands do not contain any agricultural buildings or facilities. The proposed landfill expansion will not, therefore, result in the retirement or displacement of agricultural infrastructure. Lease-based cropping within the landfill expansion area will be discontinued.

No particularly sensitive businesses were identified that may be disrupted by nuisance effects from the landfill, and any perceived impact is expected to be minimal. Overall, potential nuisance effects on businesses can be avoided or mitigated through the recommended mitigation programs.

Actual and perceived impacts from expansion may result in negative changes in property values in the vicinity of the landfill. Actual impacts can be reduced through mitigation measures; perceived impacts can be somewhat reduced with community information and communications. Should property value changes occur, property owners will be protected through a Property Value Protection program.

Along the Haul Route

No significant net effects to agricultural or non-agricultural businesses have been identified along the haul route as a consequence of the proposed landfill expansion. Some excessive TSP and dust fall is anticipated along haul routes; where this results in additional costs for clean up or equipment maintenance, impact management measures can provide compensation. No other impacts to businesses along haul routes are anticipated.

Actual and perceived impacts from expansion may result in negative changes in property values along the haul route. Actual impacts can be reduced through recommended mitigation measures; perceived impacts can be somewhat reduced with community information and communications. Should property value changes occur, property owners can be protected through a Property Value Protection program.

In the Community

Property value effects in areas of the community beyond those identified through nuisance impact analysis are not anticipated. Community information will reduce uncertainties and unwarranted stigmatization of properties.

No revenue or employment losses are anticipated as a result of landfill expansion. With the appropriate information to reduce uncertainty, the facility will not detract from regional economic development.

Landfill expansion is expected to have a significant net positive impact on the local economy, benefiting existing businesses and attracting new suppliers to meet the needs of the landfill operation. Total capital expenditures by WM will result in $52 million of value added direct

impacts and 512 person years of employment. Annual operating expenditures by WM will result in direct business with the landfill that adds up to $3.6 million of value added and 79 person years of employment each year.

New business opportunities are anticipated for local businesses providing related goods and services, or as secondary suppliers to industries working for the landfill. In addition, attracting new business compatible with landfill development is a significant opportunity for local and regional economic development. The value added and employment impacts associated with "indirect and induced" activity account for $15.6 million and 236 person years of this impact. Additionally, Annual operating expenditure by the landfill provides stimulus to the local economy. Based on median year operating expenditure estimates, total local value added in the local economy will amount to $5.5 million annually and an additional 118 person years of employment. This impact includes $1.2 million and 38 person years associated with "indirect and induced" activity.

Construction and operation of the landfill will have a significant employment impact in the local economy, including on-site employees during operations and non-WM contract employment during the ongoing cell construction. Capital expenditure for landfill construction over 25 years will generate 512 direct person years of employment. All of this new employment will be local (within the Sarnia/Lambton economy). This includes 15-25 non-WM contract personnel brought on during cell construction phases. Operation of the landfill will generate an additional 79 person years of direct employment locally each year, (based on the median year of operations). This includes 22- 32 WM personnel dealing with on-site operations.

Indirect employment in industries and services related to the landfill will be significant. Attracting new businesses complementary to landfill operations provides additional potential for job creation. Indirect and induced economic activity associated with 25-year capital expenditure will generate 1,208 person years of employment provincially, 236 of these employment years will be within the local economy of Sarnia-Lambton. Indirect and induced economic activity associated with annual operations will generate 62 person years of employment provincially, 38 of these employment years will be within the local economy of Sarnia-Lambton.

"Host Community Fees" negotiated with the municipality provide an opportunity to enhance the fiscal stability of the community. These fees, in addition to enhanced property taxes and revenue generated through new economic activity, provide a significant economic benefit to the local community.

Municipal taxes generated from the 25-year capital expenditure are estimated at $2.5 million. Annually, operation of the landfill will generate $144,467 in municipal tax revenue. Annual revenue accruing to the local municipality through host community benefits is estimated at $750,000, based on $1/tonne of waste receipts. Property tax payable on the WM property is currently approximately $26,500/year. Assuming all lands would be reclassified under " Industrial Occupied" class, property tax payable would increase to approximately $55,000/year.

Current revenue from WM host community payments amounts to approximately 13% of the Township of Warwick budget (2001 Budget Estimate) Without landfill expansion this revenue source would no longer be available.

With the continuation of the current Township of Warwick community benefit of free disposal for residential waste and recyclables drop off, the community will not experience any impact on cost of service.

Upgrading of local road networks to support additional landfill traffic will be supported by WM so that there will be no net cost to the community.

Provincial / Federal

Capital expenditure and annual operating expenditure will have a significant positive impact on Federal and Provincial finances.

Analysis of landfill capacity and demand in Ontario indicates there is a requirement for additional disposal capacity. Expansion of Warwick landfill will not significantly affect Provincial diversion programs, as factors such as political commitment and community support underlie the success of diversion programs.

6.5 Environmental Advantages and Disadvantages of THE Undertaking

Exhibits 6-6 is a summary of the Environmental Advantages and Disadvantages of the undertaking based on the impact assessment analysis.

The expansion of the Warwick landfill by Waste Management Corporation (WM), with specific mitigation and impact management programs in place, will have low and acceptable net effects on the public health and safety, and the natural environment. The facility construction and operation will have a positive economic impact in the community.

With the implementation of a landfill design that is consistent with Ministry of the Environment (MOE) regulations, the risk of impacts to public health and safety from landfill gas, leachate migration, gaseous emissions from landfill equipment, dust, and disease transmission via insects or vermin are either negligible, or no net effects are anticipated. WM acknowledges that although the health risk assessment demonstrates that there is no risk to public health and safety, any change to ambient conditions may aggravate people who are susceptible.

WM recognizes that mitigation measures are necessary to reduce or minimize the effects on the social environment in the immediate area around the landfill and along the haul route, primarily the effects from localized nuisance effects (e.g., odour, dust, noise and visual). In particular, these potential nuisance effects will be significantly reduced with aggressive Dust Management and Litter Control Strategies, as well as adherence to sound operational practices to minimize odour.

Exhibit 6-6. Summary of the Environmental Advantages and Disadvantages of the Undertaking

	Advantages (Positive or Neutral Residual Effects)	Disadvantages (Negative Residual Effects)
Public Health and Safety	• With proper mitigation techniques (as described above) the risk of landfill gas (LFG) migrating off-site, accumulating in confined spaces and presenting an explosive hazard is negligible. • No significant net health effects with respect to Exposure to LFG • Level and frequency of exceedances will be below predicted levels given additional mitigation measures. • Health related effects not anticipated with respect to Fine Particulate Exposure • Site design mitigates potential impact with respect to Leachate-Impacted Groundwater or Surface Water • No further mitigation required with respect to Leachate-Impacted Groundwater or Surface Water • The potential hydrogeologic effects of the proposed landfill on groundwater and surface water will be acceptable. • The potential hydrogeologic effects of the proposed landfill operations on groundwater and surface water will be acceptable. • No downstream flood hazard • No risk to human health with respect to Disease Transmission Via Insects or Vermin • Minimal risk of net effect with respect to hazardous materials spills • Overall safety and operations of road network maintained or improved with recommended intersection improvements • Level and frequency of exceedances will be below predicted levels given additional mitigation measures • Health related effects not anticipated with respect to Fine Particulate Exposure • No risk to air traffic	• Soiling effects on buildings and outdoor surfaces may occur in site vicinity.

Exhibit 6-6. Summary of the Environmental Advantages and Disadvantages of the Undertaking

	Advantages (Positive or Neutral Residual Effects)	Disadvantages
Natural Environment and Resources	• Maintenance of existing flow characteristics on site and downstream. • No change from baseline flow characteristics due to storm water discharge. • Water quality will remain within existing baseline range of high solids and nutrients due to agricultural use and storm response. • The potential hydrogeologic effects of the proposed landfill on groundwater resources will be acceptable. • The potential hydrogeologic effects of the proposed landfill on groundwater baseflow quality and quantity to surface watercourses will be acceptable. • In the long term, the amount of forest cover on site can be increased from the existing condition with the leachate treatment poplar plantation and an aggressive vegetation and restoration plan. • No loss of locally significant plant species • No change in aquatic ecological function of water courses on site and downstream. • East-west wildlife corridor could be improved with reforestation when landfill is closed. • No significant disturbance due to aquatic ecosystems stormwater management. • No significant disturbance due to leachate treatment; no net change to aquatic habitat or baseline water quality and quantity characteristics in receiving waters. • No detrimental impact on the region's existing and potential sand and gravel resources or potential oil and gas resources. • No loss to forestry resources • No net impact on Recreational Resources • No significant impacts are expected on the snowmobile trail • No significant net effects to terrestrial ecosystems	• Increased flow to Bear Creek for brief periods (weeks to months) during discharge of treated effluent from on-site lagoons for surface water discharge contingency alternative. • Increased flow to Bear Creek for brief periods (weeks to months) during discharge of treated effluent from on-site lagoons. • The amount of natural vegetation will initially be reduced with the proposed expansion including 5.5 ha of deciduous forest. • Preventing spread of invasive plants is very difficult to control and therefore some increase of invasive species into the woodlots is expected. • Loss of approximately 208.8 hectares of prime agricultural land.

Exhibit 6-6. Summary of the Environmental Advantages and Disadvantages of the Undertaking

	Advantages (Positive or Neutral Residual Effects)	Disadvantages
Social and Cultural	• No net effects with respect to Displacement of Residents from Houses • The additional mitigation measures described above will reduce the social impacts for neighbouring residents. The measures described above will also improve the aesthetics of the expanded landfill. • A number of impact management measures are proposed (i.e., property value protection; nuisance compensation payments; other nuisance impact measures; community impact management measures; complaints/dispute resolution/small claims compensation process; and monitoring and community information) to reduce potential social impacts. • The additional mitigation measures described above will reduce the social impacts for some of the public facilities and institutions. The measures described above will also improve the aesthetics of the expanded landfill. • A number of impact management measures are proposed that may be relevant in addressing net impacts on community facilities. • No impact anticipated on level of service on local roads within the site vicinity, other than along direct haul routes. • No significant net effect is anticipated with respect to Nuisance Associated with Vermin • Perception of community character for receptors within the village center would be unchanged • No significant net effects to Cultural Resources Due to Nuisance Effects • Net positive effect for the community with respect to Level of Public Service Provided by the Landfill • No negative effect on provision of public services when mitigation measures in place • Enhancement of environmental monitoring services provides a benefit to the community • Community benefit agreement may enable municipality to maintain general public services at current levels over the long term or enhance services in priority areas	• Increased traffic volume resulting from the landfill expansion could disturb the overall traffic flow through the study area, and effectively reduce the available road capacity • Viewshed impacts have been identified for receptors within high to moderate visual impact zones. Of the three user groups of receptors, i.e., residential, recreational facilities and commercial, residential users would experience the most significant visual impacts. • Some impact to community character will occur to natural features which are a valuable visual resource and an important part of the Watford image, specifically: • Visibility of agricultural lands immediately south of the existing landfill would be disrupted • Approximately 5.5-ha of woodlot at the southwest corner of the north property would be removed • Landfill activity would be visible from the Watford cemetery lands • 46% of the “village fringe area” would experience visibility of the expansion • 36% of the defined “community apron” area, particularly in the north east portion, would experience an altered visual perception of community character

Exhibit 6-6. Summary of the Environmental Advantages and Disadvantages of the Undertaking

	Advantages (Positive or Neutral Residual Effects)	Disadvantages
	• The additional mitigation measures described will reduce the social impacts for some residents along the haul route. The measures described above will also improve the aesthetics of the expanded landfill and contribute to traffic flow and safety. • The additional mitigation measures described above will reduce the social impacts for public facilities along the haul route. The measures described above will also improve the aesthetics of the expanded landfill and contribute to traffic flow and safety. • A number of impact management measures are recommended to reduce social impacts. • No net effects on Haul route traffic flow • No net effects on Cultural resources due to nuisance effects • With the implementation of impact management measures, no significant impact on community character is anticipated. • Some recommended mitigation/impact management measures to address other social impacts may benefit the broader community including: • Support for community activities; and • Support for industrial activity, i.e. assist in recruiting businesses to the area. • Minimal land use effects; no land use compatibility issues are predicted. • No mitigation specific to restoring or enhancing community cohesion is recommended.	• 45% of the total length of primary access road to Watford would be affected by a view of the landfill expansion • Displacement of two agricultural landscapes of high value • Displacement of archaeological resources may occur through construction of the landfill and its ancillary facilities.

Exhibit 6-6. Summary of the Environmental Advantages and Disadvantages of the Undertaking

	Advantages (Positive or Neutral Residual Effects)	Disadvantages
Economics	• There will be no displacement of agricultural business infrastructure. • Minor effects can be mitigated through recommended programs; no net effect anticipated with respect to Disruption to Businesses (including farms) Due to Nuisance Effects • Mitigation of actual property value changes can be achieved through a property value protection program • No net impacts are anticipated with respect to property value along the haul route • No significant net effects to agricultural or non-agricultural businesses have been identified along the haul route as a consequence of the proposed landfill expansion. • No net effects anticipated with respect to Property Value Effects in the community with the implementation of the PVP • No adverse net effect with respect to Business Losses (regional, e.g., tourism) In the Community • Significant net benefits to local economy anticipated with respect to New Business Opportunities Related Directly to Landfill Construction and Operation • Significant positive impact on the local economy anticipated with respect to New Business Opportunities in Related Industries and Services • Positive economic impact on the local economy • Positive economic benefit to local and provincial economies with respect to Indirect Employment in Related Industries and Services • Net positive effect on local municipal finances • Net positive impact will continue with respect to Cost of Service to Customers • Positive effect on tax base of Province and Federal government • Additional composting opportunity and recycling material drop off provided to local community • No significant net effect on Provincial diversion rates or programs.	• Lease-based cropping within the landfill expansion area will be discontinued, net reduction in this opportunity.

Road improvements will ensure road safety along the haul route and may also improve traffic operations.

Impact Management measures, a Property Value Protection Program and the Community Commitments Agreement will address any residual net impacts on residents and the community due to the presence of the facility and will enhance the positive contributions of this facility to the community.

7. IMPACT MANAGEMENT PLAN

In the design and development of the proposed landfill expansion, WM has included a full range of mitigation measures to ensure that nuisance impacts from the landfill site are minimized. WM has also stated its commitment to employ good management practices in the operation of the landfill site. Despite these best efforts, some residents will experience some nuisance effects, under worst-case operating or meteorological conditions. These 'residual nuisance effects' are predicted to occur from time to time in some off-site areas and may affect residents in varying degrees.

The purpose of this section, is to describe the supplementary measures that WM will take, in addition to mitigation, to manage and minimize residual nuisance effects. It also provides an overview of the ongoing monitoring practices proposed for the site, as well as contingency measures, should unforeseen impacts be found through monitoring.

The impact management measures identified for the proposed Warwick Landfill expansion may be part of an agreement between WM and the Township of Warwick. This agreement, called a 'Community Commitments Agreement' (CCA), may be the formal mechanism for implementing the impact management measures.

The Impact Management Plan is to:

- Provide details on impact management measures to deal with post mitigation residual effects;
- Outline the process to prepare detailed monitoring and contingency plans; and
- Provide information on the CCA.

WM may also enter into a separate agreement with Lambton County to implement impact management measures relating to County facilities.

7.1 Governing Principles

WM will be governed by the following principles in the development of the project to minimize residual nuisance effects and to maximize positive impacts.

7.1.1 Principle 1

All reasonable efforts will be undertaken to reduce and address any negative effects after the implementation of mitigation measures.

Rationale:

Resident dissatisfaction with the prospect of an expanded landfill is based, in part, on their concerns regarding negative environmental effects that may occur. This principle is important in developing trust in the proponent's efforts to manage these effects.

7.1.2 Principle 2

Following all reasonable efforts in site design, construction and operation to minimize the impact on the surrounding community, impact management measures are used to compensate for occasional residual nuisance effects from the proposed landfill expansion.

Rationale:

Even with the application of mitigation measures, there may still be some residual nuisance effects from a landfill expansion. Impact management measures will be used to enhance positive effects and offset negative residual effects from a landfill expansion, demonstrating the proponent's commitment to the community.

7.1.3 Principle 3

Effects from the landfill site will be managed to minimize the potential for impairment of environmental quality, risk to human health and risk of economic loss to the community or members of the community.

Rationale:

This principle reinforces the concept that the community, and its members, should not be disadvantaged physically or financially because of the landfill expansion. The existing legislation and the resulting policies, procedures and standards ensure that basic health and environmental quality standards are maintained and financial assurance is established. Beyond the legislated requirements, the proponent will also take all reasonable actions to ensure that the residents and community are not disadvantaged due to impacts.

7.1.4 Principle 4

Mechanisms will be established for information disclosure on landfill operations, monitoring activities and results on a regular basis. A process will be in place for ongoing dialogue between the proponent, landfill neighbours and the community.

Rationale:

Information disclosure and exchange allows residents to understand the nature of the impacts and the monitoring and follow-up actions by the proponent. This allows them to be informed thus, reducing some of the concern related to the uncertainty of the degree of impacts and actions taken to address unforeseen effects. The information exchange also strengthens credibility and trust in the proponent.

7.1.5 Principle 5

Affected residents are entitled to be compensated as a result of residual nuisance effects they may experience as a result of landfill expansion.

Rationale:

A major concern among residents in the landfill community is that the community will suffer the burden of impacts while the larger Ontario community and the proponent reaps the benefits. This principle seeks to address this concern by ensuring that there are visible benefits to the affected individuals and the community beyond those identified in the impact assessment.

7.1.6 Principle 6

The host community, subject to the negotiation of CCA, should share in the financial benefits of the project, in addition to those benefits already identified in the economic impact assessment. Financial benefits may include a host fee, local purchasing, and exchange of services or in-kind benefits.

Rationale:

The proponent, as a good corporate citizen, recognizes its role in helping support the host municipality and will contribute to an ongoing relationship and good rapport with the community through support for community initiatives.

7.1.7 Principle 7

People potentially affected by the project should be involved in the development of the CCA.

Rationale:

Involving local residents and the municipality in the development of a CCA provides the proponent with information on the local needs and preferences. It addresses the public consultation principle that people should be involved in matters that will affect them. This involvement helps to build trust between the proponent, the municipality and the residents.

7.1.8 Principle 8

The CCA must recognize the business opportunity for WM to be both competitive and profitable.

Rationale:

Any CCA must serve the needs of the community and recognizing that the proponent is a business, allow the proponent to be regionally competitive. The negotiated agreement between the municipality and the proponent will need to address this balance.

7.2 Ordered Implementation

The impact management measures are intended to be in an ordered manner:

1. The primary objective is to ensure that the design and operation of the proposed facility incorporates the types of mitigation measures that will avoid or minimize negative impacts in the first place.
2. Monitoring measures are then implemented to ensure that the mitigation is working and contingency measures are put in place to address any unanticipated effects.
3. Compensation is used to address residual nuisance impacts that cannot be dealt with through the application of other measures. Compensation is generally provided for the community as a whole and for impacted individual residents.

Community relations measures ensure that ongoing communication with the community is mutually beneficial.

7.3 Waste Management's Impact Management Plan

WM is committed to implementing a full range of operational practices and mitigation measures to reduce or minimize nuisance effects from the landfill expansion. WM recognizes that there may be residual impacts that remain after all of these operational practices and mitigative measures are undertaken. The impact management measures described below are intended to address these and are based on conservative estimates of those residual impacts. Furthermore, if monitoring reveals that residual nuisance impacts are higher than anticipated, then adjustments to impact management may be made.

The proposed impact management measures are based on experience from similar situations and professional judgment. They also reflect the concerns and issues that were raised in small group meetings and interviews with local residents, key community members, and representatives from community facilities, as well as input through mail back surveys.

Section 7.3 describes WM commitments for monitoring, contingency, compensation and community relation's measures. **Section 7.4** outlines the process, content and timing of the Community Commitments Agreement.

7.3.1 Monitoring Plans

Intent

Monitoring of landfill operations and the associated environmental impacts evaluates whether the landfill is operating as designed and impacts are occurring as anticipated. In the context of impact management, a commitment to, and implementation of, a sound monitoring plan helps build trust with the community (see Principles 1, 2 and 3).

WM Commitments

WM has committed to monitor the effects from the proposed landfill expansion as described in DP#8. Exhibit 7-1 indicates the types of items WM will monitor. Specific details of the monitoring programs will be provided in the Environmental Protection Act (EPA) documentation that will be submitted concurrently with the Environmental Assessment (EA). The details will include information on specific monitoring programs, roles and responsibilities, timing, and the number and location of monitoring wells, as well as roles and responsibilities and timing for monitoring programs.

Exhibit 7-1. Monitoring Plans

Type of Monitoring	Items Monitored
Landfill Operations	• Amount of waste/contaminated soil tonnage each day, week, year • Annual (or more frequent) survey of landfill mound • Amount of landfill with interim cover, final cap, vegetation • Complaints, action taken, response • New cells constructed
Stormwater Management	• On-Site Ditches (selected locations) • Stormwater Pond Contents • Stormwater Pond Discharge • Downgradient Stream Location(s) • Upgradient Stream Location (if applicable) • At Weather Station on Site • Wind direction and velocity • Precipitation • Temperature
Groundwater	• Pumping of secondary Drainage Layer with treatment of water prior to disposal • A full Environmental Monitoring and Contingency Plan will be prepared.
Leachate Treatment	• Leachate monitoring program to determine any effects on water quality in Bear Creek.
Air Quality	• Monitor off-site particulate concentrations, particularly the PM10 and PM2.5 fractions. • The monitoring station should also be equipped to measure meteorological parameters such as wind speed and wind direction. This will help determine the impact related to on-site and external haul route activities. The station may also be used to validate the predicted concentrations and determine the relative conservatism within the modeling. • Regularly inspect the covered landfill areas (existing and future landfill areas) to identify any fissures, cracks or erosion of the soil cover that would allow for unmitigated landfill gas to escape directly to the atmosphere. This inspection could be undertaken with the use of a handheld portable flame ionization detector (FID) capable of measuring methane in small quantities. • An annual monitoring program for volatile organic compounds at the property line during the worst-case, summer conditions. • Develop a monitoring plan, which may include: o outlining landfill cover inspection intervals o methods of recording odour complaints o log of mitigation work completed.

Type of Monitoring	Items Monitored
	• Develop a reporting system for odour complaints, and relate odour events to local meteorological conditions at the site. This system would allow CWS to track and potentially validate odour complaints from the public. This strategy could assist in determining the source of odours and expedite mitigation.
Litter	• Routine monitoring and retrieving escaped litter
Gas	• Install landfill gas monitoring probes, as required, at landfill boundary • Regular monitoring program for LFG probes; predetermined methane level would trigger further mitigation activities
Agriculture	• Monitor groundwater, wells and surface water for leachate contamination, on an on going basis. • Provide monitoring program to identify and remove litter from neighbouring farm fields, including a spring and later summer pickup coinciding with most active farm operations.
Visual	• Ongoing visual impact monitoring program should be considered. Series of photographs would be assessed for discrepancies between built conditions and anticipated conditions.

7.3.2 Contingency Plans

Intent

Contingency plans are developed to proactively identify measures or a process for taking action on unexpected problems from landfill operations (See Principles 2 and 3).

WM Commitments

WM has committed to developing plans for contingency measures. The plans will include trigger mechanisms, actions to be taken, timing and roles and responsibilities including that of the community. The contingency plans will be outlined in EPA documentation to be submitted to the MOE concurrently with EA documentation. Exhibit 7-2 describes some of the contingency plans to be developed.

Exhibit 7-2. Contingency Plans

Contingency Plan	Contingency Plan Details
Leachate-Impacted Groundwater	• Leachate elevation control with waste sumps or trenches. • Groundwater control through use of the Secondary Drainage Layer. • Perimeter leachate interceptor system within the active aquitard. • Perimeter cut-off wall. • If required, temporary or permanent groundwater supplies would be provided to affected groundwater users.

Contingency Plan	Contingency Plan Details
Contaminated Stormwater	• If confined to a local area, close off ditch and sump out contaminated water into tanker truck for treatment in an on-site leachate treatment plant, or dispose (if suitable) in a treated leachate pond for irrigation on poplar forest, or haul to off-site sewage treatment plant. • If stormwater pond is contaminated, do not permit discharge. Pump out and pump or truck for treatment to an on-site leachate treatment plant or dispose (if suitable) in a treated leachate pond for irrigation on a poplar forest or haul to an off-site sewage treatment plant.
Emergency Spill Response - Waste Truck on Public Road	• Have crew trained on notification and clean up procedures so men and equipment can attend to local waste spill. • Cooperate with local officials (e.g., police, road crews, environment officials, etc.) • Prevent contact with ditches and watercourses and retrieve from vulnerable locations. • Clean up spilled material into roll off or appropriate containers and remove to landfill.
Emergency Spill Response - Liquids on Public Road	• Have crew trained on notification and clean up procedures so men and equipment to local waste spill. • Assemble appropriate protective equipment and containment equipment. • Contain spill with absorbent material, ponds and berms. Ditch, berm or excavate sump as required to contain spill. • Clean up liquid or solids into appropriate leak-proof containers, such as drums or lugger boxes. • Dispose to proper facility. • If spill is a dangerous chemical or toxic to handle with equipment on site, then contain any escape paths and engage crews skilled in handling hazardous waste.

The contingency or emergency response plan will be covered in the EPA level documents and will be much more extensive. Some of the items covered might include the following:

- General procedures for all major emergencies;
- Telephone number lists;
- Roles and responsibilities of site personnel;
- Utility shut-off locations;
- Emergency evacuation routes;
- Emergency gathering point;
- Procedures for suspension of landfill operations;
- Communicating with media;
- Injury, accident;
- Severe weather procedures for wind;
- Severe weather procedures for electrical storms;
- Severe weather procedures for flood;
- Fires;
- Hot loads;
- Barred waste;
- Suspicious material in waste;
- Explosion or gas leak;
- Bomb threat; and
- Labour unrest/strikes/ demonstrations.

7.3.3 Compensation Measures

Intent

Compensation is provided to address residual nuisance impacts after all efforts have been made to address them through mitigation, monitoring and contingency measures. Compensation is also intended to support the local community for hosting the landfill expansion (See Principles 3, 5, and 6).

WM Commitments

WM's compensation measures are described below, according to the type of compensation provided.

Individual Impact-Related Compensation to Residents

Intent

One goal of impact management is to assist residents living in homes who may be subject to various nuisance impacts, but wish to stay in their homes. Providing financial compensation to residents is one method of accomplishing this goal (see Principles 3 and 5).

WM Commitments

WM will provide financial compensation to owners in the residences which meet specified criteria (see below). The financial compensation will be provided at the start of site preparation and will continue for the active life of the landfill site. This compensation will be available to present and future residents of the residential property. The amount and timing of the compensation payment will be specified in the CCA.

Criteria for Individual Impact-Related Compensation

Residual nuisance impacts are those remaining after all possible mitigation measures identified in the impact assessment have been applied. A full account of the net or residual impacts predicted to occur as a result of the proposed Warwick landfill expansion is provided in Discussion Paper #7: Impact Assessment.

A set of impact criteria has been developed by WM to identify those residential properties anticipated to experience the highest potential residual nuisance impacts (dust, noise and odour). Exhibit 7-3 describes the criteria used to develop a primary influence area.

Financial nuisance impact-related compensation will be paid by WM for residences located within the primary influence area. Within the primary influence area, residences are predicted to experience one nuisance impacts (i.e., dust, odour and noise) from the proposed landfill expansion.

Exhibit 7-3. Criteria for Impact-Related Compensation

Nuisance Impact		Description	Impact Criterion for Compensation	Basis
Dust	***TSP***	Total Suspended Particulate Matter – causing reduced visibility	Any exceedance of the MOE 24-hour Ambient Air Quality Criteria (AAQC) of 120 u/m^3 in any year.	Exceedance of government Ambient Air Quality Criteria (AAQC)
	Dustfall	A measure of those particles of sufficient weight to settle quickly from the air by gravity.	Any exceedance of the MOE 24-hour Ambient Air Quality Criteria (AAQC) of 7 g/m^2 in any year.	Exceedance of government Ambient Air Quality Criteria (AAQC).
Odour		The response to olfactory stimulation that produces annoyance. Effects of odours are primarily based on subjective experiences of individuals.	If predicted odour is 1 ou/m^3 or more for 0.6% of the time or more in any modelled year, or, Predicted odour is over 3 ou/m^3 at any frequency.	MOE recommends a maximum odour concentration of 1 ou/m^3 (10 minute average) as a basis for assessing potential impacts. The impact criterion was developed based on odour levels considered significant by SENES Consultants. The 0.6% frequency is approximately once a week on average.
Noise	***Construction***	Noise due to landfill construction activity, particularly the construction of perimeter berms	Noise increases greater than 58 dBA total.	Receptors within 500 m of the proposed berms may experience elevated noise levels due to berm construction. Aercoustics estimates that the sound levels will be at 58 dBA at 500 m from the limit of construction activity.
	Landfill Operations	Noise due to landfill operations.	Any noise exceedances of landfill standards guideline of 55 dBA in any year.	Exceedances of government Landfill Standards Guideline.
	Traffic	Noise due to landfill – related truck traffic. Increase in traffic volume.	All residences on the haul route.	All residences on the haul route will experience an increase in traffic and varying degrees of traffic noise increases.

Exhibit 7-4 indicates residences in the vicinity of the Warwick Landfill that are predicted to experience one or more significant nuisance impacts, based on the **Exhibit 7-3** criteria.

Exhibit 7-4. Receptors that Meet the Criteria for Individual Compensation During Reclamation

Receptor	TSP	Traffic	Construction Noise	Odour	
	Over 120 µg/m^3	*Traffic Volume or Noise*	*Over 6 dBA above ambient*	*Over 3 ou/m^3*	*Over 1 ou/m^3 for over 0.6% of the time.*
R2	x	x			x
R3	x	x			x
R4	x	x			x
R5	x	x			x
R6	x	x			x
R7	x	x			
R8	x	x			
R9	x	x			
R10		x			
R11	x				
R12	x				
R13	x	x			x
R14	x		x	x	x
R26	x		x		x
R27			x		
R30	x		x		
R34	x		x		x
Total	15	10	5	1	9

As shown in Exhibit 7-4, 17 residences (not including properties owned by WM) are eligible for nuisance impact financial compensation. These residences are all located within 1 km of the landfill and/or on the primary landfill haul route.

Individual impact related compensation may be extended to other residences depending on the results of dust, odour and noise monitoring. It is also understood that unanticipated upset operating conditions or unforeseen meteorological conditions may create additional impacts at specific times during the landfill life. Should they occur, and residents issue a complaint about dust, noise or odour, WM will undertake monitoring to confirm that the impacts are occurring. If monitoring confirms that the nuisance impacts are occurring at the levels indicated in the criteria, residents experiencing these residual impacts may be offered impact-related compensation on a case-by-case basis.

This compensation is intended for residents who may experience residual impacts of the landfill. Non-resident property owners are not eligible for impact-related compensation.

Residences are eligible if one impact criteria are met.

7.3.4 Property Value Protection

Intent

A Property Value Protection (PVP) plan is provided to ensure that impacted property owners will not suffer financially from the proposed landfill expansion (see Principle 3).

WM Commitments

A property value protection plan (PVP) will be provided by WM to properties meeting certain criteria, (described below). Property owners are immediately eligible for the PVP. The PVP will extend to the end of the operating life of the landfill expansion.

Criteria for Property Value Protection

WM has established a zone for property value protection which extends beyond the properties experiencing the highest nuisance effects. Based on this criteria, the property value protection plan includes all properties or portions of land parcels within the zone.

Key components of Waste Management's PVP include:

a) Owners of residential and non-residential properties with high visual impact will have the option of accessing the PVP when they want to sell their property.

b) The fair market value of the subject property will be determined based on a comparable property not located beside a landfill site.

c) At WM expense, one appraisal will be conducted on the subject property. In case of disagreement, a second appraisal will be conducted, and the average taken of the two.

d) The subject property will be put up for sale for a period of 12 months.

e) WM will have the option to buy the property at fair market value or to 'top up' the difference between the highest offer received and the identified fair market value.

f) Current property owners are eligible to access PVP. Subsequent property owners, that have benefited from the purchase of a property that has been supported by PVP, are not eligible for further access to PVP.

7.3.5 Off-site Property Specific Impact Management Measures

Intent

A variety of measures can be proposed to be put in place on residents' properties, to assist property owners in dealing with residual impacts (See Principles 3 and 5).

WM Commitments

WM will meet with owners of residential properties who meet the criteria for individual compensation to discuss options for reducing predicted residual nuisance effects on their properties. Any off-site impact management measures will be determined on a case-by-case basis.

Nuisance Claims Procedure

Intent

A Nuisance Claims procedure aims to address situations where damage to physical property may be caused by the presence of a landfill (e.g. flat tires caused by road debris) (See Principles 2, 3 and 5).

WM Commitments

A Nuisance Claims procedure will be established by WM to compensate individuals for damage due to landfill operations.

7.3.6 Community Wide Compensation

Host Community Fee

Intent

Host community fees are a method for municipalities to achieve financial assessment from landfill operations and compensation for community-wide adverse impacts (See Principle 6).

WM Commitments

WM may provide a host community fee to the Township of Warwick. Whether there is a host community fee, and the amount of such fee will be determined by whether there are successful negotiations with the Township of Warwick.

Use of Local Service Providers by Landfill

Intent

The intent of using local service providers is to provide as much economic benefit to the community as possible (See Principles 2 and 6).

WM Commitments

Local businesses may register with WM. WM will maintain a list of local service providers and will send the appropriate providers all requests for quotations.

Compensation for Unforeseen Impact on Municipal Services

Intent

The goal of compensation for unforeseen impacts on municipal services is to ensure that the municipality does not incur additional costs that could increase municipal expenditures as a result of the development, operation, and closure of the landfill (see Principle 3).

WM Commitments

WM will develop a procedure for the host municipality to apply to WM for unanticipated costs for municipal services that can be shown to result from the operations of the expanded landfill site.

Cost of Disposal of Waste

Intent

Assisting the community with the costs of waste management is one method for the proponent to enable residents to share in the financial benefits of the project and demonstrate its support of the community (See Principles 5 and 6).

WM Commitments

WM may provide to residents in the Township of Warwick free waste disposal for residential waste to a maximum annual tonnage (to be negotiated with the host community) and subject to negotiation of the CCA.

Community Trust Fund

Intent

A community trust fund provides resources to a municipality in support of beneficial community projects (See Principle 6).

WM Commitments

WM may contribute a sum of money annually to a community trust fund. The money will be placed in a trust fund for beneficial broader community uses. The fund will be administered through a Community Fund Committee to be established. The Committee may include participation from landfill neighbours, the larger community, WM, the Town, the County, and others as may be appropriate. The community trust fund, including all agreements with the municipality will be negotiated in the CCA.

Funding of Special Projects

Intent

The intent is for the proponent to support community projects by providing funding for specifically identified projects (See Principle 6).

WM Commitments

WM will consider formal requests from community organizations to participate in supporting community facilities and projects.

Financial Assurance Package

Intent

Financial assurance is a form of security for the community to address any problems that may occur in the timeframe from landfill closure (including early closure) to the end of the contaminating lifespan. (See Principle 3).

WM Commitments

WM will negotiate the financial assurance package with the MOE. WM will provide these details, including the amount of the financial assurance package in the EPA documentation.

Post Landfill End Use

Intent

Involving the community in decisions regarding alternative end uses of the landfill site after closure enables the end-use to reflect community preferences (See Principle 4).

WM Commitments

In response to comments made in the public consultation program, and to allow for potential changes in the community over 25 years, WM will consult with the community on possible end uses for the landfill site within two years of expected landfill closure. WM welcomes comments from the public and stakeholders on possible end uses during landfill operations and in future consultations on end use.

7.3.4 Community Relations Measures

Public Liaison Committee

Intent

A public liaison committee is an advisory committee that serves as a liaison, or conduit of information between the community and the proponent over time as the landfill development proceeds. The committee can raise issues, review monitoring reports, manage communications with the community, develop procedures and resolve issues (See Principle 4).

WM Commitments

WM will establish a public liaison committee to serve as an advisory body. WM will consult with the Warwick Public Liaison Committee to see if members would be willing to continue the landfill liaison activities for the landfill expansion, should it be approved. If the PLC members do not state interest in continuing their work for an expanded landfill site, then WM will establish another liaison committee group for that purpose.

Information Sharing

Intent

Ongoing open communications between the proponent/site operator and the community will serve to develop and maintain credibility and trust over time (See Principle 4).

WM Commitments

WM will continue to provide site tours and hold meetings on request. Semi-annual newsletters or flyers to the community will provide landfill activity updates, information on reports available, a summary of activities of the PLC, and description of any issues and activities taken to resolve them.

Complaints Management

Intent

A complaints and response system developed in an impact management agreement would serve to assure the community that unforeseen problems and issues will be promptly addressed and reported on to the claimant (see Principles 2 and 3).

WM Commitments

WM will maintain its 24-hour toll-free line for emergency use (i.e. for issues requiring immediate attention). Complaints may be made to the landfill site office during business hours. A response will be provided during the following business day. A complaints management procedure will be developed by WM for review by the Public Liaison Committee, or its equivalent (see the section on Public Liaison Committee above).

7.4 Community Commitments Agreement (CCA)

7.4.1 Process

Consultation with the Township and County on the CCA

Discussions between WM and the Township and WM and the County will be initiated and formal meetings will be held with the host municipality.

Consultation with Affected Township Residents

Township residents throughout the consultation program have provided a number of comments on impact management. A summary of these comments is provided in **Appendix E**. WM will meet with community members to discuss the draft Community Commitments Agreement.

7.4.2 Content

WM will develop the parameters and details of the CCA through discussions with the Township of Warwick and the County of Lambton.

7.4.3 Timing

The development of the CCA, including consultation with affected residents, will proceed throughout the EA process. The details to be negotiated may be finalized following EA and EPA submission to the Minister of the Environment.

8. PUBLIC AND AGENCY CONSULTATION

8.1 Consultation Program Overview of Principles

Public consultation is an important component of an EA process as it allows residents, the general public, government agencies and stakeholders a forum to provide input and engage in dialogue throughout the process. The EA process benefits from public consultation by integrating local knowledge and suggestions for improvements to the EA studies and to the public consultation program itself.[7]

A series of principles were developed to guide the public consultation program, as follows:

- The process will be clear, open and inclusive;
- Stakeholder concerns will be identified and addressed throughout the duration of the EA work;
- There will be multiple consultation opportunities, utilizing a number of techniques, at key decision-making points in the project;
- Issues and concerns, and WM's responses to them will be documented as part of the project; and
- Consultation will be flexible and respond to input from the public and stakeholders; changes to the program will be made when appropriate.

8.2 Consultation Approach

The plan proposed for public consultation in the EA was developed in Discussion Paper #1 – Public Consultation Plan (July 16, 2001) and has been amended through input from the public, stakeholders, government agencies, the Environmental Assessment Study Group (EASG) and the Peer Review Team (PRT).

The consultation program for this project involved a broad range of stakeholders, residents and interested parties; provided a variety of opportunities for people to become informed and involved; and identified, documented and addressed issues as they arose throughout the EA. The key stakeholders are described in Section 8.3.

During the EA, a series of discussion papers (DPs) were developed to serve as a focus for consultation with the peer reviewers, the EASG, the public and agencies. The draft discussion papers presented the ideas or findings for review and comment at key milestones in the planning process. Following the review process, the DPs were finalized and form the core of the EA documentation. Section 8.4 describes this in further detail.

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7. The public consultation program described in this report refers to the activities and events during the EA; public consultation (including consultation with government agencies) during the Terms of Reference phase was described in Background Documents 8 and 9 to the Terms of Reference.

8.2.1 Key Project Milestones

The public consultation program for the Warwick landfill expansion during the EA Phase focused on the following project milestones:

- Approval of the Terms of Reference (January 11, 2000);
- Initiation of the EA Phase (July 2000);
- Evaluation of Alternatives (November 2000)
- Initiation of Impact Assessment (December 2001);
- Baseline Conditions (September 2002);
- Facilities Characteristics (November 2002);
- Completion of Impact Assessment (October 2004);
- D & O Plan (October 2004);
- Impact Management Plan (October 2004); and
- Submission of EA/EPA documentation (Fall 2005).

8.3 Key Stakeholders for the Public Consultation Program

8.3.1 Local Residents

Landfill neighbours and local residents were a key focus for public consultation activities and events during the EA. The local residents were involved through small group meetings, community surveys, key contact interviews, open houses and workshops.

8.3.2 Environmental Assessment Study Group

The Environmental Assessment Study Group (EASG) was formed by WM to provide comments and advice to WM on matters related to the EA on the proposed landfill expansion. This committee provided an opportunity for representatives of major stakeholder groups in the community (including the general public) to discuss the detailed environmental assessment. Membership on the EASG included:

- The Township of Warwick (2)
- Lambton County (1)
- The Warwick Watford Landfill Committee (2)
- Sarnia-Lambton Office of Economic Development (1)
- Lambton County Federation of Agriculture (1)
- Residents living in the vicinity of the landfill site (2)
- Members of the public living in the broader community (2)
- Waste Management of Canada Corporation (2)

A representative of the Ministry of the Environment was invited to attend as a resource.

8.3.3 WWLC

The Warwick Watford Landfill Committee (WWLC) was founded in 1988 in response to an earlier landfill expansion application by the former landfill owner. The WWLC has stated its opposition to the proposed landfill expansion. Throughout the EA, the WWLC provided comments on the respective discussion papers and consultation process and activities. The WWLC had two members and an advisor on the EASG.

8.3.4 Other Members of the Public

The broader community was invited to be involved in the EA consultation process through newsletters distributed throughout Warwick Township and advertisements for discussion papers and consultation events placed in the Watford-Guide Advocate and the Forest Standard. Another opportunity for members of the public to provide input to the EA was through attendance at the EASG meetings, which were advertised in the Watford Guide-Advocate and the Forest Standard. A public comment period was set aside on the Agenda at each EASG meeting.

8.3.5 First Nations

The seven First Nations identified in the Lake St. Clair watershed are located at a minimum distance of approximately 30 km to a maximum of 68 km from the Warwick site, as follows:

1. Aamjiwnaang (previously Chippewas of Sarnia) – 47 km
2. Chippewas of Kettle and Stony Point - 30 km
3. Chippewas of the Thames First Nation - 35 km
4. Moravian of the Thames - 45 km
5. Munsee-Delaware Nation - 37 km
6. Oneida Nation of the Thames - 41 km
7. Walpole Island - 68 km

No Specific or General/Comprehensive Land Claim applications have been filed by any of these First Nations in the land area associated with the Warwick landfill expansion. A letter was sent by WM to each First Nation on October 5, 2005, advising them of the upcoming EA submission and asking them if they would like would like to receive a notice of EA submission and/or EA documents.

8.4 Discussion Paper Review Process

A unique approach to public consultation was taken by WM for the Warwick landfill expansion EA. Generally, proponents conduct EA studies, issue a draft EA document and carry out consultation on that document. WM offered the public, stakeholders, government reviewers, peer reviewers and the EASG the opportunity to review the EA documentation in discrete parts called discussion papers. This approach allowed for a thorough review of the methodology and results for each milestone in the EA planning process before final decisions were made.

WM and its consultants developed a series of nine discussion papers to serve as a focus for consultation with the PRT, the EASG, the public and government agencies. Comments received from all sources were incorporated into each final discussion paper with responses by WM. Following the discussion paper review process, the discussion papers were finalized and formed the core of the EA documentation.

The discussion papers developed by WM for the EA are listed below:

1. **Proposed Public Consultation Program** – a description of the opportunities for consultation during the EA.
2. **Proposed Criteria and Indicators for the Assessment of Alternatives -** the proposed site alternatives, and the criteria and indicators proposed to evaluate them.
3. **Initial Comparative Evaluation of Alternatives** – results of the site alternatives evaluation - preferred alternatives.
4. **Impact Assessment Process** – the proposed impact assessment criteria, disciplines, study areas and study methods.
5. **Baseline Conditions** – description of the environment, by discipline, during the key timeframes to be considered in the impact assessment.
6. **Facility Characteristics** – description of the proposed landfill facility, based on the preferred alternatives.
7. **Impact Assessment** – summary of impacts, mitigation and net effects, by discipline.
8. **Conceptual Design and Operations Plan** – summary of the D&O plan, building on landfill facility characteristic assumptions and incorporating mitigation.
9. **Impact Management Plan** – management plan for net effects after mitigation, including the Community Commitments Agreement (CCA).

The following steps describe the process undertaken for the review of the discussion papers:

- Step 1 – WM and its consultants prepare the draft of a discussion paper on an aspect of the environmental assessment.
- Step 2 – The draft discussion paper is provided to the peer reviewers, relevant government agencies, and the general public[8] for review and comment, and to the EASG for their information.
- Step 3 – WM prepares a summary table of comments received on the draft discussion paper in Step 2. This table would indicate the comment and its source.
- Step 4 –WM provides the table of comments to the EASG for review and comment. A meeting is held with the EASG to obtain their comments on the Discussion Paper and the summary of comments. A member of the PRT makes a presentation at the EASG meeting, and answers any questions on the peer review comments.
- Step 5 – WM prepares the final discussion paper, including a table of comments received and responses to them.

Comments on the final version of a discussion paper may be made to WM and MOE throughout the EA process.

* Notice of draft discussion papers was given to the public through newspaper advertisements and EA newsletters. Information on each discussion paper and copies of the draft discussion papers were available at open houses/workshops.

8.5 Government / Agency Consultation in the EA

The government/agency consultation program during the EA phase involved agencies at the municipal, provincial and federal level. The contacts on the government agency list were initially identified in Background Document 9 to the Terms of Reference and amended as information on new contacts became available. As each draft discussion paper became available, a copy was sent to each agency contact on the list with a letter of transmittal asking for the agency's review of the draft discussion paper. All government review agency comments received by WM on each discussion paper are documented, along with responses prepared by WM, in a table in each final discussion paper. A list of government agency contacts is provided in **Appendix E**.

8 *Notice of draft discussion papers was given to the public through newspaper advertisements and EA newsletters. Information on each discussion paper and copies of the draft discussion papers were available at open houses/workshops.*

8.5.1 Peer Review Process

During the EA phase a formal, professional and independent peer review was commissioned by the Township of Warwick and funded by WM. This peer review process was formalized in a Memorandum of Agreement signed by both parties late in 2000. In the absence of any legal requirement, WM has committed approximately $800,000 to fund a full technical and legal review of the EA. The peer review process was effectively managed by the Township of Warwick. WM's strategy was to fund one comprehensive peer review, in place of advocacy funding, in the effort to provide for a single, competent, technical review rather than competing advocacy positions. This approach provided the broadest technical review with access to the greatest number of interested persons and stakeholder groups.

The peer review team prepared reports on the discussion papers, presented them in public presentations to Council and at the EASG meetings. The reports by the PRT were publicly available and distributed on request.

The peer review team comments on Discussion Papers #1 to #8 and WM responses are provided in each respective final discussion paper. When the peer review team comments are ready on Discussion Paper #9, they will be forwarded to the Ministry of the Environment during the public review period following EA submission. The list of peer review team members, disciplines represented and report dates are provided in Appendix E.

8.6 Public Consultation in the EA

The public consultation program during the EA provided residents, the general public, stakeholder groups, the PRT and the EASG with a variety of means to provide input and engage in dialogue on the EA process, discussion paper documentation and the public consultation program. A summary of the consultation activities and timeframes associated with each discussion paper is provided in **Appendix E**. Each public consultation event is described below.

8.6.1 Open Houses

Open houses were held to provide stakeholders and the public an opportunity to review and discuss each discussion paper. WM staff and consultants were on hand to explain information on display panels, answer questions, and note comments and suggestions from those attending.

Open houses were generally held from 2:00 or 4:00 pm in the afternoon until 9:00 p.m. in the evening. They were advertised in two local newspapers, the Watford-Guide Advocate and the Forest Standard. Flyers advertising the open houses were distributed to approximately 450 persons on the stakeholder contact list. A series of display panels describing the contents of the relevant discussion paper(s) was provided at each open house and reproduced as handouts for the public. A comment sheet invited participants to also provide their views at the open house or subsequently. A sample of an open house advertisement and flyer is provided in Appendix C. A sample of the display panel handouts is provided in Appendix D.

Open House #1

The first EA open house was held to discuss the EA process/schedule and the public consultation program proposed for the EA Phase. It was held on July 26, 2000 at Centennial Hall in Watford, with an attendance of 21 individuals. A landfill site tour was offered to people attending the open house. Open House #1 was advertised in the Watford-Guide Advocate and the Forest Standard on July 19th and 26th, 2000, and in EA Newsletter #1, distributed July 18th, 2000. Comments made at this open house included concerns regarding the size and proximity of the landfill to the Village of Watford and suggestions on improving PLC involvement in the EASG process.

Open House #2

The purpose of open house #2 was to introduce DP#2 on the proposed criteria and indicators for the assessment of site alternatives. The open house was held on June 7th 2001 from 2:00 to 9:00 pm, at Centennial Hall in Watford, with a total of 24 people attending. Open House #2 was advertised in the Watford Guide and the Forest Standard on May 30th and June 6th, 2001. A presentation was given at the open house on the site alternatives: the landfill footprint area, leachate treatment methods, access routes and end use. Comments made by attendees included: landfill footprints being too high; issues related to on-site treatment of leachate; consideration of an incineration option; creating a wetland to treat leachate; and safety issues regarding transporting waste by trucks.

Open House #3

Open House #3 presented the results of the evaluation of site alternatives, identifying the preferred location of the landfill footprint, means to treat the leachate, and truck access routes to the site. Draft DP#4: Impact Assessment was also introduced at the open house. The open house was held on January 16, 2002 at Centennial Hall in Watford, had an attendance of 31 people. Advertisements for the open house were placed in the Watford Guide and the Forest Standard on January 9th, 2002. Flyers advertising the open house were mailed to all residents on the stakeholder contact list on or about January 3, 2002. Comments made at the open house included concerns about the height of the expansion, and the suggestion that WM should do more to recycle.

Open House #4

Held on November 28, 2002 at Centennial Hall, Watford open house #4 presented information on DP #5: Baseline Conditions and #6: Facility Characteristics. Information was provided on the existing environmental conditions in the vicinity of the Warwick landfill; the future conditions without the landfill expansion; and the preliminary characteristics of the expanded landfill site being considered for approval. The attendance at this open house was 25. Reporters from the Watford Guide Advocate and the Sarnia Observer represented members of the media. The open house was advertised in the Watford Guide and the Forest Standard on November 20th and 27th, 2002. Flyers advertising the open house were mailed to all residents on the stakeholder contact list on November 14th, 2002.

Presentations on the baseline studies were provided by the following disciplines: agriculture, hydrogeology, social impact, transportation; and facility characteristics followed by a question and answer session. In response to a request made at Open House #4, an additional evening of presentations was planned to include presentations from the remaining disciplines. No comment sheets were completed at the open house; comments made in the question and answer session were documented in final DPs #5 and #6.

Open House #5/Evening of Presentations

An open house/evening of presentations was held on January 7, 2003 at Lambton Mutual Insurance Company, Watford with an attendance of 18 people. The presentations by the various disciplines were conducted from 6:30 to 9:30 pm. The purpose of the open house was to present additional information on components of: the existing environmental conditions in the vicinity of the Warwick landfill and future conditions without the landfill expansion (Draft DP#5); and the preliminary characteristics of the expanded landfill site being considered for approval (Draft DP#6). The presentations were made by the respective disciplines responsible for: air quality, archaeology/heritage, economics, land use, landfill design, landfill gas, natural environment, noise, and visual.

Each presentation was followed by a question and answer period. A reporter from the Sarnia Observer represented members of the media. The open house/evening of presentations was advertised in the Watford Guide Advocate and the Forest Standard (December 11th and December 18th, 2002). Flyers advertising the event were mailed to all residents on the stakeholder contact list on December 10th, 2002. No comment sheets were handed in nor mailed subsequently, comments provided in the question and answer session were documented in final DPs #5 and #6. A reporter from the Sarnia Observer represented members of the media.

Open House #6

Open House #6 was held to provide information and initiate discussion on Draft DP#7, which described the results of the impact assessment studies and predicted net environmental effects that could occur if the landfill expansion were to be approved. DP#8 was also introduced at the open house, with information on the design and operations plan, the preferences established for site access and leachate treatment, and additional mitigation measures. Open House #6 was held on December 8, 2004 from 2 to 5 and 6 to 9 pm. The attendance at the open house was approximately 38. Advertisements for the open house were placed in the Watford Guide and the Forest Standard on November 25 and December 2, 2004. Flyers advertising the open house were mailed to all residents on the stakeholder contact list on or about November 22, 2004.

Comments at the open included: increased noise due to the landfill operations and back-up beepers, increased traffic and the condition of the roads, protection of agricultural land, view of the landfill, the dust and increased odour from landfill operations, economic effects on the town, property values, leachate treatment, trucking leachate versus treating it on-site, health concerns, height, location and vegetation on berms and increased seagulls and rodents (i.e. rats, skunks). No comment sheets were handed in at the open house.

Open House #7

On March 10, 2004 open house #7 was held at Centennial Hall in Watford from 2 to 5 and 6 to 9 pm. The open house was held to introduce DP#9 to the public and other stakeholders. DP#9, the Impact Management Plan, described measures to monitor landfill performance and impacts, address unanticipated effects, protect property values and provide individual and community benefits. Advertisements for the open house were placed in the Watford Guide and the Forest Standard on February 24 and March 3, 2005. Flyers advertising the open house were mailed to all residents on the stakeholder contact list on or about January 31, 2005. Approximately 20 people attended the open house. Three comment sheets were handed in at this event.

Comments at the open house included selection of property appraisers, inclusion of businesses for compensation, area and timeframe for property value protection, community funds from the landfill to be administered by a board, concern about woodlot displacement, timing of the Community Commitments agreement and the financial assurance, current dust and noise effects from the landfill and each municipality is to be responsible for its own waste. Responses to comments received at open houses #6 and #7 are provided in final DPs #7, #8 and #9, as part of the EA submission to the Minister of the Environment.

8.6.2 Workshops

Four workshops were held during the EA public consultation, one on site alternatives and criteria in November 2001, one on facility characteristics in February 2003 and two on impact assessment results and the proposed design and operation plan in January and February 2005. A sample of the advertisements and flyers for the workshops is provided in Appendix E.

Workshop #1

Workshop 1, on site alternatives and criteria, was held on was on November 29, 2001 at Centennial Hall, Watford, with 21 people attending. The workshop sought the public's view on which criteria are most important in determining the following: where the landfill footprint could be placed; how leachate could be treated; and the main access route to the site. The workshop included a presentation on objectives and ground rules for the workshop; how criteria are prioritized and trade-offs made in our everyday lives; and the Warwick expansion site alternatives and criteria. A small group discussion followed on criteria and trade-offs.

Documents available at the workshop were: workshop agenda; workbook for participants; copy of presentation overheads; colour diagrams of each proposed leachate treatment alternative; and copies of draft DP#2 (November 2000). The workshop was advertised in the Watford-Guide Advocate and the Forest Standard on November 14th and 21st, 2001. In addition, flyers produced of the enlarged ad were mailed to the stakeholder contact list on November 9th, 2001.

Workshop #2

The purpose of the workshop was to present additional information on Draft DP#6 (Facility Characteristics). This workshop was held on February 17, 2003 at Lambton Mutual in Watford, and had an attendance of 31 people. The presentation period was from 6:45 – 7:45 pm followed

by a question and answer period. Advertisements for the workshop were place in the Watford Guide –Advocate, and the Forest Standard on February 5 and 12, 2003. Flyers advertising the event were mailed to all residents on the stakeholder contact list on January 30th, 2003.

Documents available at the workshop included: final DP#1 to 4, Draft DP#5 including the Background Documents, Draft DP#6, the Peer Review Team Report on DP #5, Terms of Reference, ToR Background Reports, EA Newsletters, and handouts for each presentation. All display boards were available as handouts. A floor model showing the site and surrounding area was also provided for participants.

Workshop #3

This workshop on DP #7 – Impact Assessment and DP#8 – Design and Operations Plan was held on Saturday, January 15, 2005 for all interested residents. The purpose of the workshop was to present findings of the impact assessment and the proposed design and operations plans for the expanded landfill. Presentations were made from 8:30 am to 3:50 pm by the following disciplines: Natural Environment, Air Quality, Health, Noise, Agriculture, Economics and Social. Each presentation was followed by a question and answer period. Advertisements were placed in the Watford Guide-Advocate and Forest Standard on January 6th and January 13th, 2005.

Flyers advertising Workshops #3 and #4 were mailed to approximately 450 people on December 22, 2004. One comment sheet was mailed in following the workshop, outlining concerns related to current dust, noise from back-up beepers, alignment of the 1 km study area, and use of the Watford Lagoons. Many comments were made in response to the information presented. All comments made at the workshop and WM responses to them are documented in final DP#7 and #8 as part of the EA documentation submitted to the Minister of the Environment.

Documents available at Workshops #3 and #4 included: Final DP#5 and #6, Draft DP#7 to #9, Background Reports for DP #5 and #7, Terms of Reference, ToR Background Reports, EA Newsletters, and handouts of each presentation. All display boards were available as handouts. A floor model showing the site and surrounding area was also provided for participants.

Workshop #4

A second workshop on DP#7 and #8 was held to present information on the following disciplines: Hydrogeology, Transportation, Land Use Planning, Visual, Diversion, Archaeology/Heritage, and Design and Operations. The workshop was held on February 26, 2005, with approximately 16 people in attendance. The workshop was advertised in the Watford Guide-Advocate and Forest Standard on February 17th and 24th, (to confirm) 2005.

Flyers advertising Workshops #3 and #4 were mailed to approximately 450 people on December 22, 2004. No comment sheets were handed in nor mailed subsequently, but comments made in response to the presentations and WM responses to them are documented in final DP#7 and #8 as part of the EA documentation submitted to the Minister of the Environment. All display boards were available as handouts. A floor model showing the site and surrounding area was also provided for participants.

8.6.3 Newsletters

Newsletters were developed at key milestones in the EA process to inform the public and stakeholder groups about the purpose and content of each discussion paper as it became available in draft form.

Multiple copies of each newsletter were distributed to the Landfill Office, Warwick Municipal Office, Watford Public Library, and the WM Information Centre in Watford. Individual copies were distributed to all residences, farms, lock boxes and businesses in the Township of Warwick. Copies of each newsletter were also mailed to approximately 450 persons on the stakeholder contact list. Approximately 2500 to 2700 copies in total of each newsletter were distributed. A sample EA newsletter is provided in Appendix F.

- EA Newsletter 1 (July 2000) was distributed starting on July 19, 2000. The newsletter provided information on approval of the Terms of Reference, outlined WM's EA process (i.e. a description of how the EA process works, stages of the EA process, peer review) and introduced the Community Commitments Agreement. The newsletter also provided information on Draft DP#1: Public Consultation Plan, including the proposed discussion papers and their purpose, the EASG's role, public consultation activities proposed during the EA, upcoming events and a proposed consultation schedule. The EA open house and the availability of DP#1 were advertised in the newsletter.
- EA Newsletter 2 (May 2001) included information on Final DP#1, illustrating the final steps in the discussion paper review process. EA Newsletter #2 focused on introducing Draft DP#2: Proposed Criteria and Indicators for the Assessment of Alternatives. The proposed assessment criteria and the various site alternatives (landfill footprint, leachate treatment, and haul route) were described. Two end use options were proposed. The Warwick peer review team was introduced. EA Newsletter #2 was distributed beginning on May 22, 2001.
- EA Newsletter 3 (February 2002) was distributed beginning on February 4, 2002. The newsletter provided results of the site alternatives evaluation of the landfill footprint, leachate treatment and truck haul routes as described in Draft DP#3. Information was also provided on Draft DP#4: Impact Assessment Process. Sections in the newsletter described the social impact assessment activities, changes to the public consultation program, status of the discussion papers, notice of availability of Final DP#2 and contact information. An EA process diagram outlined the steps up to EA and EPA submission.
- EA Newsletter 4 (June 2002) provided readers with an EA update, upcoming consultation events, topics of each discussion paper, status of the discussion papers and a discussion of the Community Commitments Agreement. EA Newsletter #4 was distributed beginning on June 19, 2002.
- EA Newsletter 5 (December 2002) was distributed beginning on December 18, 2002. EA Newsletter 5 provided readers with information on the availability of Draft DP#5 and #6 and Final DP#3. The newsletter included brief descriptions on the various baseline reports including; agriculture, air quality, archaeology and cultural heritage, economics,

hydrogeology, visual, natural environment, surface water, noise, transportation, social, and land use planning. The newsletter described the contents of Draft DP#6: Facility Characteristics, which provided preliminary landfill design characteristics and operations for the proposed expansion. An update on the status of the discussion papers and advertisement of the Information Centre in Watford were included in the newsletter.

- EA Newsletter 6 (November 2004) was distributed beginning on November 18, 2004. EA Newsletter #6 introduced Draft DP#7: Impact Assessment and Draft DP#8: Preliminary Design, Development and Operations Plan and advertised the availability of Draft DP#9: Impact Management Plan. The newsletter included a brief description of the impact assessment results for the various disciplines and the design improvements resulting from technical team analysis and recommendations. It also advertised consultation events and the next steps in the EA Process.
- EA Newsletter 7 (February 2005) was distributed beginning February 16, 2005. Newsletter #7 introduced Draft DP#9: Impact Management Plan. The newsletter included a brief description of the key elements of an impact management plan, how it was developed, WM's commitments for compensation, property value protection and a range of other measures to address potential impacts remaining after mitigation. The community commitment agreement process was described and upcoming consultation events advertised.

8.6.4 *Environmental Assessment Study Group*

The Environmental Assessment Study Group (EASG) meetings were structured to obtain EASG member (and public) comments on each draft discussion paper. The peer review team also provided a presentation on its review of each discussion paper at an EASG meeting. Once comments from all sources (i.e. public, government agencies, peer review team, and initial EASG comments) were compiled and WM responses provided, additional discussions were held at subsequent EASG meetings. All meetings were advertised in the Watford Guide-Advocate and the Forest Standard. A total of 21 EASG meetings were held during the EA. The EASG contact list, dates of meetings and topics discussed are provided in **Appendix E**.

8.6.5 *WM Information Centre*

The WM Information Centre in Watford, which opened on September 23, 2002, provided a forum for residents to ask questions and receive updates on the EA process. At the Information Centre, residents were able to access copies of current discussion papers, newsletters, open house display panels, and Peer Review Team reports. The WM Information Centre was initially advertised in the Watford Guide-Advocate and the Forest Standard on September 25 and October 2, 2002, through flyers mailed to the stakeholder contact list September 23-4, 2002 and subsequently in EA Newsletters #5, #6 and #7. Over 35 persons made contact with the Information Centre in Watford in person, by telephone, fax or e-mail. Key concerns expressed related noise levels, berm locations, hydrogeologic conditions, study areas, impact management meetings and the EASG process

8.6.6 Toll-Free Line

A toll-free telephone line was made available for residents to provide comments or ask questions regarding the proposed Warwick landfill expansion. Individuals could also ask to receive the latest newsletter or other documentation by calling the toll-free line. Over 56 calls were placed by individuals using the toll-free service. Twenty-nine calls related to requests for documentation. Comments and questions related to concerns about the proposed expansion (9); suggestions for improving the public consultation program (7); property values (4); attendance at consultation events (4) and a range of miscellaneous topics such as illegal dumping, border waste, the EA process. Some comments were also provided on haul route issues, leachate characteristics, dust impacts, study area and waste type (hazardous, non-hazardous).

8.6.7 Stakeholder Contact Database

The purpose of the stakeholder contact database was to maintain contact information for local residents, stakeholder groups, and other people with an interest in the landfill expansion. New contacts were added throughout the EA as they were identified. The stakeholder contact database was used for distribution of EA newsletters, notification of document availability and advertising open house and workshop events. Approximately 450 people were on the stakeholder contact list. A database of issues was also developed to track and record issues raised at all public consultation events.

8.6.8 Site Tour

A bus trip tour of the Ridge Landfill and the Pine Tree Acres site was offered to interested members of the public as part of the WM public consultation process. An advertisement was placed by WM inviting individuals to tour the Pine Tree Acres and Ridge Landfill sites. The tour took place on January 8, 2003 from 8:30 to 5:00 pm and was attended by 31 people.

The Ridge Landfill site is located within the Municipality of Chatham-Kent, approximately 5 km southwest of the Town of Blenheim. At the Ridge Landfill tour, a pamphlet was distributed which provided information on legal requirements, hours of operation, rules and regulations i.e. waste transport vehicles.

Pine Tree Acres, Inc. is a Non-Hazardous Solid Waste Disposal Facility located in Lenox, Michigan. The facility was initially owned and operated by a private enterprises, and became a Waste Management company in 1998. A fact sheet was provided at the Pine Tree Acres, Inc. tour that provided general information, waste types and volumes accepted, landfill gas recovery, physical size, capacity and site life, and environmental safeguards.

8.6.9 Discussion Paper Distribution

As discussion papers became available in draft form, multiple copies were distributed to the Watford Library, the Township of Warwick Offices, the Warwick Landfill Office, and the WM Information Centre in Watford. Advertisements were placed in the Watford Guide – Advocate

and the Forest Standard to notify readers of the availability of the documents, locations for obtaining a copy, and the process for providing comments on the discussion paper. Individual copies were distributed to members of the EASG, the peer review team, and the government agencies. A sample advertisement of document availability for the discussion papers are provided in **Appendix E**.

8.7 Findings from the Public Consultation Program

8.7.1 Reviewer Comments and WM Responses

Comments from the public, government agencies, EASG and peer review team on each discussion paper are documented in a table provided in each final discussion paper. WM responses have been provided for all comments, indicating whether the comment was adopted by WM, would be addressed in a later step, or not adopted. In the latter case, reasons are provided by WM for not including the reviewer's suggestion.

8.7.2 Changes to the EA due to Public Input

A number of changes were made to the landfill expansion EA based on the comments received from the public, government agencies, peer review team and the EASG. Included among key changes to the EA are the following:

- The consideration and assessment of a site entrance from County Road 79 once the King property was acquired by WM. The site entrance from County Road 79 was determined in the impact assessment to be preferred;
- The decision to not pursue the use of the Watford Lagoons as a leachate treatment alternative;
- Dropping from consideration the build-over option for the West Footprint alternative;
- Bringing back for further assessment a leachate treatment alternative involving trucking of leachate;
- Preserving a greater portion of the existing woodlot and increasing the separation distance to the cemetery to better buffer the cemetery activities;
- Eliminating future excavation of municipal waste landfilled within the existing licensed site in Cells 7, 9 and 11;
- Relocating the material recovery (diversion) area to eliminate potential conflicts in view of retaining the existing waste cells; and
- Revising recommendations for interchange improvements and speed limit reductions.

8.8 Public Consultation on the EA Documentation

This EA documentation, submitted to the Minister of the Environment, consists of final Discussion Papers #1 to #9, final supporting background documents from the various disciplines, and the report on Public Consultation. The submission of the EA documentation to the Minister of the Environment initiates the public and government agency review period of 7 weeks. During this timeframe comments may be provided in writing directly to the Ministry of the Environment (MOE), as follows:

Ms. Gemma Connolly, Special Project Officer
Project Coordination
Environmental Assessment and Approvals Branch
Ontario Ministry of Environment
2 St. Clair Avenue West, Floor 12A, Toronto
Toronto, ON M4V 1L5
Toll Free Number 1-800-461-6290
Tel: (416) 314-8001
Fax: (416) 314-8452

A copy of all comments will be forwarded to the proponent.

Following this timeframe, the Ministry of the Environment will complete its review and issue an "EA Review/Notice of Completion" document. A further final public comment period of 5 weeks is then initiated.

Following the final public review period, the MOE will evaluate the public submissions and make a decision on the WM application to expand the Warwick landfill site. The MOE decision may reflect the following:

- A - Approve/deny the application;
- B - Call for an EA Tribunal hearing on contentious issues; or
- C - Refer to mediation

This MOE "Decision on Approval" step is estimated to take approximately 13 weeks. The Minister of the Environment sets the timelines for Options B and C.

9. CONCLUSION

Waste Management of Canada Corporation (WM) is applying to expand its Warwick Landfill, as detailed in this Environmental Assessment document. The expansion would allow the landfill to accept up to 750,000 tonnes of municipal, industrial, commercial and institutional solid non-hazardous waste generated in Ontario for a period of approximately 25 years.

WM believes the expansion should be approved because:

1. This Environmental Assessment (EA) has been completed in compliance with the requirements of a "Terms of Reference" document (ToR) approved by the Ontario Minister of Environment. The ToR prescribes the mandatory components of an EA for this specific project. In providing approval, the Minister set out the requirements necessary to meet the public interest as expressed in the Environmental Assessment Act (EAA).
2. This EA submission documents an extensive process of research, design, consultation, analysis and review supporting the proposal to expand the Warwick Landfill.
3. This EA meets the purpose, intent and approval standard of the EAA because it:

- satisfied the prescriptive requirements of the ToR and
- demonstrates no significant residual environmental impacts of the undertaking.

The key highlights and results of this process included:

- extensive public consultation and input;
- best practice landfill design and operating procedures;
- use of third party technical experts to research and analyze all facets of the undertaking that could lead to environmental and human impacts;
- combining public feedback with technical expertise to design features and improvements to eliminate or mitigate environmental and human impacts;
- ensuring that, after mitigation, there are no significant residual environmental impacts of the undertaking; and
- planning for a Community Commitments Agreement to compensate local residents where social and property value impacts could not be fully mitigated in the immediate vicinity of the landfill.

Furthermore:

- the undertaking responds to a demonstrated need;
- with mitigation, there are few residual nuisance environmental effects (dust, odour and noise), which have negligible, if any effects on health;

- although there may be secondary social and land use effects resulting from the nuisance effects, these can be addressed through compensation plans and Property Value Protection for individuals and a Community Commitment Agreement;
- there is a permanent loss of 208.8 ha of prime agricultural land, and a permanent visual change of the landscape, but these disadvantages of the undertaking are outweighed by the advantages of the undertaking;
- the undertaking creates positive economic benefits both locally and to the province; and

Waste Management of Canada Corporation looks forward to a successful conclusion of this process.