Ministry of the Environment | Ministère de l'Environnement

Ontario

SUPPORTING INFORMATION WORKSHEET
SUPPLEMENT TO APPLICATION FOR APPROVAL, EPA S.9

This document lists the attachments to the Section 9 Application Form that may be required from an applicant. This worksheet is intended to assist applicants in completing the Application Form and should be read in conjunction with the Guide to Applying for Approval (Air and Noise) dated February, 2005.

This worksheet must be attached to a Section 9 Application Form to be considered complete

	Attachment	Guide to Applying Reference	Required if...	Included	Reference	Confidential
1.	Proof of Legal Name of Applicant	Section 4.1	Always Required unless Master Business Licence is submitted	☒ Yes ☐ N/A	Appndx. A	Not Applicable
2.	Copy of Master Business Licence	Section 4.2	Applicant is an Ontario Company and wishes to simplify the application process	☐ Yes ☒ N/A		Not Applicable
3.	Legal Survey	Section 4.3	If survey address is provided	☐ Yes ☒ N/A		
4.	Copy of NEDPA Permit	Section 4.3	Facility is within an area of development control as defined by the Niagara Escarpment Planning and Development Act	☐ Yes ☒ N/A		☐ Yes ☐ No
5.	Copy of Municipal Planning Approval (ORMCA)	Section 4.3	Facility is within the Oak Ridges Moraine Conservation Area	☐ Yes ☒ N/A		☐ Yes ☐ No
6.	Name, Address and Phone Number of the Operating Authority	Section 4.3	Equipment will be operated not by the applicant but by an Operating Authority	☒ Yes ☐ N/A	App. Form	☒ Yes ☐ No
7.	Name, Address and consent of the land/site owner for the installation/construction and operation of the equipment/facility	Section 4.3	Applicant is not the owner of the site where the facility is located	☐ Yes ☒ N/A		☐ Yes ☐ No

	Attachment	Guide to Applying Reference	Required if…	Included	Reference	Confidential
8.	Copy of current Certificate of Approval	Section 4.5	Application is for an amendment to a current CofA	☒ Yes ☐ N/A	Appndx B	Not Applicable
9.	List of all environmental approvals/permits applied for relating to this project or received in relation to this project.	Section 4.5	Other environmental approvals/permits have been applied for or issued under the EPA or OWRA in relation to this project only	☒ Yes ☐ N/A	App. Form	Not Applicable
10.	Copy of Provincial Officer's Order requiring submission of application	Section 4.5	Application is a result of a Provincial Officer's Order	☐ Yes ☒ N/A		Not Applicable
11.	List of all approvals issued to this facility under Section 9 of the *Environmental Protection Act*	Section 4.6	Previous Section 9 approvals have been issued to the facility	☐ Yes ☒ N/A		Not Applicable
12.	Supporting information that proposal is not a Prescribed instrument under the EBR	Section 4.6	Application meets the requirements of O. Reg 681/94	☐ Yes ☒ N/A		☐ Yes ☒ No
13.	Supporting information relating to exemption from the public participation requirements of the *Environmental Bill of Rights.*	Section 4.7	Applicant is requesting that the proposal is exempt from posting on the Environmental Registry	☐ Yes ☒ N/A		☐ Yes ☒ No
14.	Supporting information relating to exemption from or fulfilment of requirements under the *Environmental Assessment Act.*	Section 4.7	Application is part of an undertaking subject to the EAA	☐ Yes ☒ N/A		☐ Yes ☒ No
15.	List describing public consultation activities related to this project	Section 4.7,8	Applicant is involved in any public consultation / notification activities in addition to EBR / EAA	☐ Yes ☒ N/A		☐ Yes ☒ No
16.	Application Fee	Section 4.10	Always Required	☒ Yes ☐ N/A	Cheque	Not Applicable
17.	Financial Assurance	Section 2	If The Section 9 Director determines that Financial Assurance is necessary based on the nature of the Application (Waste Disposal Site or Remediation for example)	☐ Yes ☒ N/A		☐ Yes ☒ No
18.	Applicant Fee Worksheet	Section 4.9	Always Required	☒ Yes ☐ N/A	Appndx C	Not Applicable

Please note: the release of information contained in application forms and documentation submitted in support of applications for approval is subject to the provisions of the *Freedom of Information and Protection of Privacy Act*. This Act defines what may and may not be disclosed to the public, and is used to assess all requests for information contained in the documents on file with an application for approval.

The information submitted with an application for approval may also be subject to the *Environmental Bill of Rights*. In those situations, the application and the associated non-confidential supporting documentation is made available for review by members of the public.

The applicants should therefore identify all documents as noted above which are to be considered confidential and must provide detailed evidence in support of this claim. This evidence will be one of the factors the ministry would consider when making a decision regarding disclosure of specific documents on file.

Ministry of the Environment | Ministère de l'Environnement

Ontario

REQUEST UNDER s. 20(4) TO HAVE THE SCHEDULE 3 STANDARDS APPLY IN ADVANCE OF THE DATE REQUIRED BY REGULATION 419/05

General Information

Information requested in this form is collected under the authority of the *Environmental Protection Act,* R.S.O. 1990 (EPA) and the *Environmental Bill of Rights*, C. 28, Statutes of Ontario, 1993, (EBR) and will be used to evaluate requests to have the Schedule 3 Standards of Air Pollution – Local Air Quality Regulation (O. Reg. 419/05) in advance of the date required by the regulation. **INCOMPLETE FORMS WILL BE RETURNED TO THE APPLICANT.** Even if the form is accepted as complete the Ministry of the Environment may request additional information during the review of this request.

1. Questions regarding completion and submission of this request should be directed to the Environmental Assessment and Approvals Branch (EAAB) of the Ministry of the Environment at the address below or to the local Ministry of the Environment (MOE) District Office which has jurisdiction over the area in which the facility is located. A list of these District Offices is available on the Ministry of the Environment Internet site at http://www.ene.gov.on.ca/envision/org/op.htm#Reg/Dist.

2. Two copies of this form must be submitted to the Ministry of the Environment. The original should be sent to:

   Ministry of the Environment,
   Director, O.Reg. 419/05 s.20(4),
   Environmental Assessment and Approvals Branch
   2 St. Clair Avenue West, Floor 12A
   Toronto, Ontario, M4V 1L5
   Phone: 416-314-8001
   Toll Free: 1-800-461-6290
   Email: EAABGen@ene.gov.on.ca

   A copy of this form should be sent to the local District Office which has jurisdiction over the area where the facility is located.

3. Information contained in this application form is not considered confidential and will be made available to the public upon request. Information submitted as supporting information may be claimed as confidential but will be subject to the *Freedom of Information and Protection of Privacy Act* (FOIPPA) and the *EBR*. If you do not claim confidentiality at the time of submitting the information, the Ministry of the Environment may make the information available to the public without further notice to you.

Instructions

This form should be used to request to have Schedule 3 standards from O. Reg. 419/05 apply in advance of the date required by the regulation and should be accompanied by a description of the circumstances surrounding this request. In accordance with s.20(4) a person who discharges or causes or permits the discharge of a contaminant from a property may request the Director to consider issuing a written notice under s. 20(4) requiring that s.20 apply to the facility on a date specified in the notice. This request may be made for all of the contaminants at the facility or for specified contaminants.

The Director will not consider a request under s. 20(4) unless the person making the request provides the concentration at point of impingement using an approved dispersion model acceptable under s. 20 for the contaminants that are the subject of this request. This information should be summarized on the table included in this form or indicated in an application for a Certificate of Approval.

If the request is limited to specific contaminants (the request is not for all contaminants at a facility) then the person making the request must also include the concentration at point of impingement using an approved dispersion model acceptable under s. 20 for all contaminants that are not included in the request but are associated with the contaminants that are the subject of the request. For example, if the request is for only particulate, and metals or semi-volatile contaminants are associated with the particulate, then the concentration at point of impingement for the associated metals or semi-volatile contaminants should also be provided on the table included in this form.

Note – your compliance limit remains Schedule 1 or 2 (whichever applies) until a date specified in the Notice.

Regulatory Authority

Section 20(4) The Director may give a person who discharges or causes or permits discharges of contaminants from a facility notice requiring the person to comply with this section, beginning on a date specified in the notice that is not later than January 31, 2020, if the notice is requested in writing by the person.

Section 20(6) A notice or order under subsection (4) or (5) applies in respect of all contaminants unless the notice or order provides that it applies only in respect of contaminants specified in the notice or order.

1. Requestor Information *(Owner of works/facility)*

Requestor Name *(legal name of individual or organization as evidenced by legal documents)*: Waste Management of Canada Corporation

Business Identification Number: 876 294 844

Business Name *(the name under which the entity is operating or trading if different from the Applicant Name - also referred to as trade name)*:

Requestor Type:

- [X] Corporation
- [ ] Individual
- [ ] Partnership
- [ ] Sole Proprietor
- [ ] Federal Government
- [ ] Municipal Government
- [ ] Provincial Government
- [ ] Other *(describe)*:

North American Industry Classification System (NAICS) Code: 562210 (Waste Treatment and Disposal)

Business Activity Description *(a narrative description of the business endeavour, this may include products sold, services provided or machinery/equipment used, etc.)*: WMCC owns and operates the Richmond Sanitary Landfill in Greater Napanee, Ontario

2. Project Technical Information Contact

Name	Company
Jonathan Petsch, EIT	Comcor Environmental Limited

Civic Address - Street information *(address that has civic numbering and street information includes street number, name, type and direction)*	Unit Identifier *(i.e. suite or apartment number)*
320 Pinebush Road	Suite 12

Delivery Designator:
If signing authority mailing address is a Rural Route, Suburban Service, Mobile Route or General Delivery *(i.e., RR#3)*

Municipality	Postal Station	Province/State	Country	Postal Code
Cambridge		Ontario	Canada	N1T 1Z6

Telephone Number *(including area code & extension)*	Fax Number *(including area code)*	E-mail Address
519-621-6669 ext. 246	519-621-9944	petsch@comcor.com

3. Ontario Regulation 419/05 Information

1. Does this request apply to all contaminants? *(please complete the attached table for all applicable contaminants)*
   ☐ Yes ☒ No

2. How does the applied for change affect your compliance?
   ☒ Remain Compliant ☐ Remain Non-Complaint
   ☐ Move Into Compliance ☐ Move Into Non-Compliance

3. a) Which section of O. Reg. 419/05 currently applies to your facility?
   ☐ s.18 (Schedule 1) ☒ s. 19 (Schedule 2)

   b) Without this notice, when would O. Reg. 419/05 require s. 20 (Schedule 3) standards apply to your facility (dd/mm/yyyy)? 01/02/2013

4. Is this form submitted with an Application for Certificate of Approval under Section 9 of the EPA?
   ☒ Yes **if yes, is the application dependant on granting of notice?** ☒ Yes ☐ No
   ☐ No

5. Does this application relate to an Application for Certificate of Approval under Section 9 of the EPA that has already been made to the Ministry of the Environment or an existing Certificate of Approval?
   ☒ Yes **if yes, please provide the application reference number or current Certificate of Approval Number:** 8-4078-99-006
   ☐ No

6. Will this change affect any limits or conditions in your existing Certificate(s) of Approval under Section 9 of the EPA?
   ☐ Yes **if yes, please provide additional supporting information:**
   ☒ No

7. Is your facility currently subject to an approved abatement plan (e.g. Order) that would be affected by this change?
   ☐ Yes **if yes, have you discussed this change with MOE District Office representatives?** ☐ Yes ☐ No
   ☒ No

8. Has a request for approval for an alteration of a Schedule 3 standard under s. 32 of O. Reg. 419/05 been made for this facility?
   ☐ Yes **if yes, please attach a copy of ministry acknowledgement letter (if available) or an overview of the request**
   ☒ No

4. Statement of Requestor

I, the undersigned hereby declare that, to the best of my knowledge:

- The information contained herein and the information submitted in support of this application is complete and accurate in every way and I am aware of the penalties against providing false information as per s.184(2) of the *Environmental Protection Act*.
- The Project Technical Information Contact identified in section 2 of this form is authorized to act on my behalf for the purpose of obtaining a notice to have the Schedule 3 standards of O. Reg. 419/05 apply in advance of the date required by the regulation.
- I have used the most recent request form (as obtained from the Ministry of the Environment Internet site at http://www.ene.gov.on.ca/envision/gp/index.htm#PartAir or the Environmental Assessment and Approvals Branch at 1-800-461-6290) and I have included all necessary information required by O. Reg. 419/05 and identified on this form.

Name of Signing Authority *(please print)*	Title
Reid Cleland	Director of Disposal Operations

Telephone Number *(including area code & extension)*	Fax Number *(including area code)*	E-mail Address
519-849-5810	519-849-5811	rcleland@wm.com

Signature	Date *(dd/mm/yyyy)*
[signature]	2011/08/05

Address Information :

Civic Address - Street information *(address that has civic numbering and street information includes street number, name, type and direction)*	Unit Identifier *(i.e. suite or apartment number)*
8039 Zion Line	

Delivery Designator:
If signing authority mailing address is a Rural Route, Suburban Service, Mobile Route or General Delivery *(i.e., RR#3)* RR#4

Municipality	Postal Station	Province/State	Country	Postal Code
Watford		Ontario	Canada	N0M 2S0

Contaminants Requested Under Section 20(4)

For Office Use Only		
Reference #	Reviewer	Contact #

Instructions

Please complete the following table providing the concentration at point of impingement using an approved dispersion model acceptable under the current section of O. Reg. 419/05 that applies to your facility as well as s. 20 for the contaminants that are the subject of this request.

If the request is limited to specific contaminants discharged from the facility (the request is not for all contaminants at a facility) then please include the concentration at point of impingement using an approved dispersion model for all contaminants that are not included in the request but are associated with the contaminants that are the subject of the request. For example, if the request is for only particulate, and metals or semi-volatile contaminants are associated with the particulate they should also be provided on the table. Indicate with a check mark on the left hand column which contaminants are the subject of the request or leave the column black if all contaminants are subject.

If you are applying for a Certificate of Approval for a facility under Section 9 of the EPA and this request is accompanying the application for approval, information regarding compliance with s. 18 or s. 19 compliance is not necessary (information may be included with the application for a Certificate of Approval)

Site Information

Site Name: Richmond Sanitary Landfill	NAICS Code: 562210 (Waste Treatment and Disposal)
Site Address: 1271 Beechwood Road, RR#6, Greater Napanee	
County / District: Lennox & Addington	Postal Code: K7R 3L1
District Office: Kingston District Office	

Notes for Table:

a) Proper Chemical Name should be given (Abbreviations, acronyms, numeric codes, trade names and mixtures NOT ACCEPTABLE).
b) CAS Number : Chemical Abstracts Services Number (UNIQUE Identifier for a chemical)
c) POI Concentration : Point of Impingement Concentration

Do you require more space than offered in the table below?

☐ **Yes** **If yes, please attach a separate table**
☒ **No**

Is this request being submitted with an application for a Certificate of Approval (s.9) that includes an ESDM Report?

☒ **Yes** **If yes, the table below does not need to be completed**
☐ **No**

		Contaminant [a]	**CAS** [b] **Number**	Total Facility Emission Rate (g/s)	Schedule	Air Dispersion Model Used (if Sch. 3 please specify)	Maximum POI [c] Concentration (μg/m^3)	Averaging Period (hours)	MOE POI Limit (μg/m^3)	Limiting Effect	Percentage of MOE POI Limit
	1				☐ 1 ☐ 2	O. Reg. 346					
					3						
	2				☐ 1 ☐ 2	O. Reg. 346					
					3						
	3				☐ 1 ☐ 2	O. Reg. 346					
					3						
	4				☐ 1 ☐ 2	O. Reg. 346					
					3						
	5				☐ 1 ☐ 2	O .Reg. 346					
					3						
	6				☐ 1 ☐ 2	O. Reg.346					
					3						

APPENDIX D

Candlestick Flare Skid Specifications

LFG Specialties, L.L.C.

Proposal & Pricing

Utility Flare System

800 SCFM
Model PCFT622I6

Prepared for:
Remi Godin
Waste Management – Eastern Canada
(613)831-3561
rgodin@WM.com
Napanee
Canada

Reference #: 041101

May 5, 2011

Prepared by:
Kevin Z. Mason
Field Products Coordinator
LFG Specialties, L.L.C.
(419) 425 6235
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LFG Specialties, L.L.C.
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www.shawgrp.com/LFGspecialties

SALES AGREEMENT

This sales agreement "Agreement" which includes the Equipment Specification and the "INTERNATIONAL TERMS AND CONDITIONS OF SALE, LFG SPECIALTIES, L.L.C." attached hereto as Attachment 1 is entered into on the undersigned date, by and between the seller, LFG Specialties, L.L.C. ("Seller" or "LFG Specialties"), a Louisiana limited liability company, and the purchaser, UUWaste Management ("Purchaser", "Buyer", or "Client").

i. LFG Specialties is the manufacturer of certain flare equipment "Equipment" more fully described in Section I. below, "Equipment Specification".

ii. Purchaser wishes to purchase from LFG Specialties such Equipment under the terms and conditions set forth herein.

Now therefore, in consideration of the covenants contained herein and for other good and valuable consideration, the legal sufficiency of which is acknowledged, the parties wishing to be legally bound agree as follows:

I. EQUIPMENT SPECIFICATION

Purchaser hereby agrees to purchase from LFG Specialties such Equipment and Services as described in this Agreement and subject to the standard "International Terms and Conditions of Sale, LFG Specialties, L.L.C.", attached hereto and specifically incorporated herein by reference, as follows:

A. Equipment Scope:

LFG Specialties' scope of equipment supply and brief description of the system is listed below. For a more detailed system description please see Section G.

1. One LFG Specialties fully assembled skid mounted landfill gas candlestick flare including:
   - One flare Model CFT622I6 with peripheral equipment (capacity 75 – 750 SCFM of landfill gas at 30-50% methane content)
   - **Designed and constructed to operate as a complete unit to minimize installation and start-up time completely fabricated, assembled, pre-wired and tested prior to shipment.**
   - **Stack to be delivered completely wired from the stack junction box to the thermocouples, UV eye and igniter. Also from the stack junction box to the main control and power panels.**
   - One Varec flame trap assembly (model 450).
   - One propane pilot assembly with automatic igniter system
   - One Houston Service Industries Model 5204 or equal multistage centrifugal landfill gas blowers with belt drive and 30HP, 460 VAC, three phase motors (blower is rated for 200 – 800 SCFM @ 75 in. w.c. inlet vacuum and 15 in. w.c. discharge pressure, 100 deg. F, 700 ft. asl.)
   - Associated instrumentation including vacuum, pressure and temperature gauges
   - Two sets of associated Flex Couplings, manual isolation valves, and check valves
   - One 6 in. fail safe automatic electric header valve
   - One 24 in. condensate knock out pot with 20 micron demister/filter, 6 in. inlet and 6 in. outlet, sight glass, level switch, and drain port
   - One control rack with:
     - Flame-Trol III automatic flare controller with touch-screen interface with blower amp and blower hours displays
     - One 30 HP, 460 VAC, 3 Ph, variable frequency drive with pressure transmitter for inlet vacuum control
     - Power distribution panel

  - ♦ Main power disconnect and step down transformer
  - ♦ Structural roof for heat and weather protection
- ➢ One each thermal dispersion Flow Meter with totalizer and Yokogawa six channel paperless chart recorder to record flame temperature and landfill gas flow
- ➢ 8 ft. wide by 20 ft. long structural steel skid All skid components interconnecting piping and wiring
- ➢ Heat tracing and insulation including:
  - ♦ Bottom portion of the KOP
  - ♦ Bottom portion of the flare stack
  - ♦ Removable cover for the blower
  - ♦ Blower drain
  - ♦ Removable valve cover
  - ♦ Blower inlet and outlet piping
- ➢ Three electronic copies of the O & M Manual, cut sheets, and drawings
- ➢ Three paper copies of the User Manual

2. Commissioning of the equipment, including travel and living expenses (not to exceed 3 days)

Price for the LFG Specialties Model PCFT622I6 Utility Flare system as described in Section I, A, Items 1 & 2. **Price 116,534.00 USD**

B. Exceptions / Clarifications / Notes:

1. Landfill gas supply system must be properly engineered to provide a stable gas supply for the flare system to function properly.
2. A properly designed condensate removal system must be in place within 50 ft. [15.2 m] upstream of the flare system for reliable operation. Additionally, all condensate drain lines on the skid to be connected, by others, prior to start up. A recommended drain line schematic available upon request.
3. The flare system must be supplied power from a stable energy source with a voltage deviation of no more than 7%.
4. This proposal does not include site preparation or installation.
5. The flare system is not warranted against lightning strikes.
6. Title transfer will occur outside of the county of destination and we have not included any taxes, such as the IVA (VAT). If payment of these taxes is required it will be paid by purchaser.
7. Burner to be located in unclassified area.
8. Burner not CSA/CUL approved as assembly.
9. Pricing does not include import duties, foreign taxes or associated fees.
10. All pricing and title transfer is F.O.B. Findlay, OH USA.
11. All pricing is in US dollars
12. Should the system not be commissioned by LFG Specialties, any and all warranties will be void.
13. Purchaser shall arrange for and provide, at purchasers' expense a driver for the service technician from LFG Specialties throughout duration of his/her stay.

C. Delivery Schedule:

LFG Specialties makes every effort to meet our Customers delivery requests and special requirements. Delivery for the flare system outlined in this Agreement is:

Submittal Drawings:	4 weeks after receipt of order for submittal drawings
Equipment Shipment:	12 to 16 weeks from receipt of approval for submittal drawings (Actual delivery to be determined at time of submittal approval, transit & customs)

A storage fee of $100.00 USD per week may be charged if the site cannot accept delivery of the unit by the scheduled delivery date.

D. Payment Terms:

Purchaser shall make a down payment of fifty percent (50%) of the contract price, made payable in US dollars, via wire transfer, at the time of placing the order.

Purchaser shall make a payment of forty percent (40%) of the contract price, made payable in US dollars, via wire transfer, as the 2^{nd} payment. Such payment shall be payable within 30 days, against presentation of shipping documents. Furthermore, in the event that no suitable vessel is available within four (4) weeks after equipment is ready for shipment, the 2^{nd} payment shall also be made payable against presentation of dock receipt.

Purchaser shall secure an irrevocable Letter of Credit for the final ten percent (10%) of the contract price. The Letter of Credit is to be issued in favor of LFG Specialties by the Purchaser's Bank and confirmed at Purchaser's expense by a major United States bank four (4) weeks prior to the scheduled startup date. The Letter of Credit is to be valid until final payment is received, and made payable in US dollars, via wire transfer, upon the startup, commissioning and training of said equipment.

Prices are quoted firm for prompt acceptance and shipment per delivery schedule. Proposals are valid for 10 days from date of issue.

E. Field Service Rates and Availability:

LFG Specialties can furnish an on site advisor during any aspect of the installation and erection or startup of our equipment deemed necessary by our customers in accordance with our "INTERNATIONAL TERMS AND CONDITIONS OF SALE, LFG SPECIALTIES, L.L.C.". LFG Specialties recommends 3 days of start up assistance and training to commission the Utility Flare. Service personnel should be scheduled two weeks in advance for standard installation, erection, start-up or service work. The Customer Installation Checklist must be signed and returned prior to these services being performed.

Additional field service time (above and beyond the startup time described in Section I, A, 4) will be charged at $1,200.00 USD per day for field service engineers, plus travel and expenses.

F. Technical Data:

1. Gas Composition

   - 30-50% CH_4, Remainder – CO_2, Air, Inerts (gas compositions greater than 50% CH_4 will result in a radiation level greater than 500 BTU/ft^2 at 6 ft. elevation)
   - H_2S to be less than 1000 ppm (for concentrations greater than 1000 ppm please contact LFG Specialties concerning design of system)
   - O_2 to be less than 5%
   - Temp/Pres: 100° F, 12 in. w.c.

2. Flare Size

   - 6 in. tip, 22 ft. overall height flare

Note: A minimum distance from power lines and structures of 4 times the stack height must be maintained around the flare. If this distance is not feasible, please contact LFG Specialties engineering.

3. Destruction efficiency at design flow with gas methane content 30 to 50% -- 98% overall destruction of total hydrocarbons (per the US EPA AP-42)

   - Guaranteed to meet E.P.A. emission standards for landfill gas disposal in utility "candle type" flares.

Note: Flare is designed in accordance with the United States Environmental Protection Agency (EPA) established criteria for open flares, 40 CFR 60.18

4. Minimum methane content required to maintain stable flame and 98% destruction efficiency -- 30%

5. Flow/Emissions (expected) at maximum flow, 50% methane content and 1400°F combustion temperature:

N_2	73.5	% vol.
O_2	13.6	% vol.
CO_2	6.0	% vol.
H_2O	6.9	% vol.
NO_x	0.068	lbs./MMBTU *
CO	0.37	lbs./MMBTU *

* Per the US EPA AP-42 Supplement D, Table 13.5-1

6. Pressure loss through the flare, from the inlet flange through the flare stack, will typically be less than 10" w.c.

7. All utility flare units are designed and constructed to meet Seismic zone 4 guidelines and 100-mph wind loading requirements (per ASCE 7-88, Exp. C).

8. LFG Flow Ranges: The flare stack has a flow turndown ratio of 10:1 based on BTU content. The blower has a flow range outlined in Section A.

G. Equipment Warranty:

LFG Specialties guarantees the Equipment as outlined and specified in this Agreement for the period of twelve (12) months from date of shipment.

Along with standard Material, Workmanship and Performance Warranties outlined in the standard "Terms and Conditions of Sales" attached, LFG Specialties guarantees the equipment to meet present E.P.A. emission standards when installed and operated in accordance with specified design conditions.

Should the system not be commissioned by LFG Specialties, any and all warranties will be void.

H. Quality Control Standards

LFG Specialties follows the Quality Control Procedures as outlined by the applicable Unites States national codes and standards adhered to in the design, engineering, manufacture, assembly and test of our equipment, including but not limited to:

Structural Design	------	AISC
Drawings	------	ANSI S5.1
Fabrication (welding)	------	AWS
Electrical (components)	------	UL
(wiring)	------	NEC

Painting, Sandblast	------	SSPL, SP-6

LFG Specialties does on occasion subcontract fabrication of subassemblies for our equipment. All subcontract work is carried out under LFG Specialties direction and inspected in accordance with our quality control standards.

The nondestructive testing of our equipment includes:

Welding	------	100% visual inspection
Dimensional	------	All dimensions to drawings, correct position and sizing of all connects
Piping	------	100% visual inspection (in/out)
Painting	------	Visual inspection/instrument check using micro test coating thickness gauge
Wiring	------	Functional Check
Controls	------	Functional check, process simulation

LFG Specialties also supplies full submittal documentation on the equipment; including mechanical and electrical drawings and component cut sheets. For equipment support, a complete Operation & Maintenance Manual is included with each unit.

I. Scope of Work:

LFG Specialties will furnish all the Equipment and Services as described in this Agreement. Equipment will be fully fabricated, painted and tested as described herein at LFG Specialties facility, Findlay, Ohio.

This Agreement only covers the supply of Equipment and installation advisory service as defined. The following items are specifically excluded from the LFG Specialties scope of supply.

- Construction drawings: All equipment layout, interconnect details and foundations designs are the responsibilities of Purchaser.

  Note: LFG Specialties drawings will outline field installation connections (location and size) and loading data.

- All installation and civil work including foundations, equipment erection, main and interconnecting piping and wiring including required equipment and materials are the responsibilities of Purchaser.

- All permits/licenses required for installation and/or operation of the Equipment are the responsibility of Purchaser. LFG Specialties will provide necessary manufacturer’s data on the equipment as required for permit/license applications.

- All compliance/performance testing will be the responsibility of the Purchaser. LFG Specialties will have representative(s) present for tests at Purchaser's request and expense. LFG Specialties fully guarantees the Equipment to meet E.P.A. emission standards when operated within the specified conditions.

APPENDIX E

Supporting Calculations

Appendix E
Candlestick Flare Exhaust Calculations
Richmond Sanitary Landfill Site
Greater Napanee, Ontario

Inlet:	750	cfm LFG
	0.354	m^3/s LFG
	50%	CH_4 by volume
	0.177	m^3/s CH_4
	0.177	m^3/s inert CO_2
	25	degrees celsius
	298.15	K
	1	atm

Convert flowrate from volumetric to molar using ideal gas law:

7.23	mol CH_4/sec
7.23	mol inert CO_2/sec

Combustion: $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$ (g)

Assuming flue air flow is twice the amount needed for complete combustion:

28.93	mol O_2/sec total
14.47	mol O_2/sec needed for combustion
14.47	mol O_2/sec excess
108.8	mol N_2/sec inert

Exhaust:	760	degrees C
	1033.15	K
	1	atm

Total moles exhausted from flare:

7.23	mol CO_2/sec from combustion
14.47	mol H_2O/sec from combustion
14.47	mol O_2/sec excess
108.8	mol N_2/sec inert
7.23	mol inert CO_2/sec
152.25	total exhaust mol/sec

Convert flowrate from molar to volumetric using ideal gas law:

12.91	m^3/s
1	m exhaust cowling diameter
16.43	m/s exhaust velocity

Appendix E
Emission Rate Calculations
Richmond Sanitary Landfill Site
Greater Napanee, Ontario

Hydrogen Chloride

F_{LFG} = Landfill gas flow rate to the Candlestick Flare
= 0.354 m^3 LFG/s

UM_{Cl} = Uncontrolled mass emissions of total chloride ions

42.0 m^3 Cl	mol K	101325 Pa		35.453 g Cl	F_{LFG} m^3 LFG
10^6 m^3 LFG	8.3145 m^3 Cl Pa		298.15 K	mol	sec

= 0.0215 g Cl/sec

CM_{HCl} = Controlled mass emissions of hydrogen chloride
= UM_{Cl} x (Ratio of molecular weight of HCl to the molecular weight of Cl) x η_{cnt}/100

UM_{Cl} g Cl	1.03 g HCl/mol	98
sec	g Cl/mol	100

= 2.17E-02 g HCl/sec

Sulphur Dioxide

F_{LFG} = Landfill gas flow rate to the Candlestick Flare
= 0.354 m^3 LFG/s

UM_S = Uncontrolled mass emissions of reduced sulphur compounds

46.9 m^3 S	mol K	101325 Pa		32.1 g S	F_{LFG} m^3 LFG
10^6 m^3 LFG	8.3145 m^3 S Pa		298.15 K	mol	sec

= 0.0218 g S/sec

CM_{SO2} = Controlled mass emissions of sulphur dioxide
= UM_S x (Ratio of molecular weight of SO_2 to the molecular weight of S)

UM_S g S	2.0 g SO_2/mol
sec	g S/mol

= 4.36E-02 g SO_2/sec

Appendix E
Determination of Contaminant Significance
Richmond Sanitary Landfill Site
Greater Napanee, Ontario

Dispersion Factor

The candlestick flare will be located 270 m from the southern property boundary. Linear interpolation was used to determine the rural dispersion factor as per Table B-1 in the MOE's *Procedure for Preparing an ESDM Report*.

RDF (1 hr) = Rural Dispersion Factor at 270 metres and 1 hour averaging time

$$= \frac{(270 - 250) \times (1900 - 2300)}{(300 - 250)} + 2300$$

$$= 2140 \ (\mu g/m^3)/(g/s)$$

RDF (0.5 hr) = Rural Dispersion Factor at 344 metres and half hour averaging time

$$= 2140 \times (1/0.5)^{0.28}$$

$$= 2598 \ (\mu g/m^3)/(g/s)$$

RDF (24 hr) = Rural Dispersion Factor at 344 metres and 24 hour averaging time

$$= 2140 \times (1/24)^{0.28}$$

$$= 879 \ (\mu g/m^3)/(g/s)$$

Emission Threshold

Emission thresholds were calculated for contaminants on the List of MOE POI Limits using the equation presented in Section 7.1.2 in the MOE's *Procedure for Preparing an ESDM Report*. For example, using 1,1,1-Trichloroethane:

ET = Emission Threshold

$$= \frac{(0.5) \times (\text{MOE POI Limit})}{\text{RDF (24 hr)}}$$

$$= \frac{(0.5) \times (115{,}000)}{879}$$

$$= 65.4 \ g/s$$

Determination of Significance for Contaminants with a POI Limit

If the actual emission rate of a contaminant is less than the emission threshold, the contaminant can be considered insignificant.

Determination of Significance for Contaminants with no POI Limit

Contaminants not on the List of MOE POI Limits and not listed on Table B-2B of the MOE's *Procedure for Preparing an ESDM Report* were compared to a concentration threshold of 0.3 $\mu g/m^3$.

Contaminants not on the List of MOE POI Limits and on Table B-2B of the MOE's *Procedure for Preparing an ESDM Report* were compared to a concentration threshold of 0.03 $\mu g/m^3$.

If the actual ground level concentration of a contaminant is less than the concentration threshold, the contaminant can be considered insignificant.

APPENDIX F

USEPA AP-42 Compilation of Emission Factors
Section 2.4 – Municipal Solid Waste Landfills

2.4 MUNICIPAL SOLID WASTE LANDFILLS

2.4.1 General[1-4]

A municipal solid waste (MSW) landfill unit is a discrete area of land or an excavation that receives household waste, and that is not a land application unit, surface impoundment, injection well, or waste pile. An MSW landfill unit may also receive other types of wastes, such as commercial solid waste, nonhazardous sludge, and industrial solid waste. The municipal solid waste types potentially accepted by MSW landfills include (most landfills accept only a few of the following categories):

- MSW,
- Household hazardous waste,
- Municipal sludge,
- Municipal waste combustion ash,
- Infectious waste,
- Waste tires,
- Industrial non-hazardous waste,
- Conditionally exempt small quantity generator (CESQG) hazardous waste,
- Construction and demolition waste,
- Agricultural wastes,
- Oil and gas wastes, and
- Mining wastes.

In the United States, approximately 57 percent of solid waste is landfilled, 16 percent is incinerated, and 27 percent is recycled or composted. There were an estimated 2,500 active MSW landfills in the United States in 1995. These landfills were estimated to receive 189 million megagrams (Mg) (208 million tons) of waste annually, with 55 to 60 percent reported as household waste, and 35 to 45 percent reported as commercial waste.

2.4.2 Process Description[2,5]

There are three major designs for municipal landfills. These are the area, trench, and ramp methods. All of these methods utilize a three step process, which includes spreading the waste, compacting the waste, and covering the waste with soil. The trench and ramp methods are not commonly used, and are not the preferred methods when liners and leachate collection systems are utilized or required by law. The area fill method involves placing waste on the ground surface or landfill liner, spreading it in layers, and compacting with heavy equipment. A daily soil cover is spread over the compacted waste. The trench method entails excavating trenches designed to receive a day's worth of waste. The soil from the excavation is often used for cover material and wind breaks. The ramp method is typically employed on sloping land, where waste is spread and compacted similar to the area method, however, the cover material obtained is generally from the front of the working face of the filling operation.

Modern landfill design often incorporates liners constructed of soil (i.e., recompacted clay), or synthetics (i.e., high density polyethylene), or both to provide an impermeable barrier to leachate (i.e., water that has passed through the landfill) and gas migration from the landfill.

2.4.3 Control Technology[1,2,6]

The Resource Conservation and Recovery Act (RCRA) Subtitle D regulations promulgated on October 9, 1991 require that the concentration of methane generated by MSW landfills not exceed 25 percent of the lower explosive limit (LEL) in on-site structures, such as scale houses, or the LEL at the facility property boundary.

The New Source Performance Standards (NSPS) and Emission Guidelines for air emissions from MSW landfills for certain new and existing landfills were published in the Federal Register on March 1, 1996. The regulation requires that Best Demonstrated Technology (BDT) be used to reduce MSW landfill emissions from affected new and existing MSW landfills emitting greater than or equal to 50 Mg/yr (55 tons/yr) of non-methane organic compounds (NMOCs). The MSW landfills that are affected by the NSPS/Emission Guidelines are each new MSW landfill, and each existing MSW landfill that has accepted waste since November 8, 1987, or that has capacity available for future use. The NSPS/Emission Guidelines affect landfills with a design capacity of 2.5 million Mg (2.75 million tons) or more. Control systems require: (1) a well-designed and well-operated gas collection system, and (2) a control device capable of reducing NMOCs in the collected gas by 98 weight-percent.

Landfill gas (LFG) collection systems are either active or passive systems. Active collection systems provide a pressure gradient in order to extract LFG by use of mechanical blowers or compressors. Passive systems allow the natural pressure gradient created by the increase in pressure created by LFG generation within the landfill to mobilize the gas for collection.

LFG control and treatment options include (1) combustion of the LFG, and (2) purification of the LFG. Combustion techniques include techniques that do not recover energy (i.e., flares and thermal incinerators), and techniques that recover energy (i.e., gas turbines and internal combustion engines) and generate electricity from the combustion of the LFG. Boilers can also be employed to recover energy from LFG in the form of steam. Flares involve an open combustion process that requires oxygen for combustion, and can be open or enclosed. Thermal incinerators heat an organic chemical to a high enough temperature in the presence of sufficient oxygen to oxidize the chemical to carbon dioxide (CO_2) and water. Purification techniques can also be used to process raw landfill gas to pipeline quality natural gas by using adsorption, absorption, and membranes.

2.4.4 Emissions[2,7]

Methane (CH_4) and CO_2 are the primary constituents of landfill gas, and are produced by microorganisms within the landfill under anaerobic conditions. Transformations of CH_4 and CO_2 are mediated by microbial populations that are adapted to the cycling of materials in anaerobic environments. Landfill gas generation, including rate and composition, proceeds through four phases. The first phase is aerobic [i.e., with oxygen (O_2) available] and the primary gas produced is CO_2. The second phase is characterized by O_2 depletion, resulting in an anaerobic environment, where large amounts of CO_2 and some hydrogen (H_2) are produced. In the third phase, CH_4 production begins, with an accompanying reduction in the amount of CO_2 produced. Nitrogen (N_2) content is initially high in landfill gas in the first phase, and declines sharply as the landfill proceeds through the second and third phases. In the fourth phase, gas production of CH_4, CO_2, and N_2 becomes fairly steady. The total time and phase duration of gas generation varies with landfill conditions (i.e., waste composition, design management, and anaerobic state).

Typically, LFG also contains a small amount of non-methane organic compounds (NMOC). This NMOC fraction often contains various organic hazardous air pollutants (HAP), greenhouse gases (GHG), and compounds associated with stratospheric ozone depletion. The NMOC fraction also contains volatile organic compounds (VOC). The weight fraction of VOC can be determined by subtracting the weight fractions of individual compounds that are non-photochemically reactive (i.e., negligibly-reactive organic compounds as defined in 40 CFR 51.100).

Other emissions associated with MSW landfills include combustion products from LFG control and utilization equipment (i.e., flares, engines, turbines, and boilers). These include carbon monoxide (CO), oxides of nitrogen (NO_x), sulfur dioxide (SO_2), hydrogen chloride (HCl), particulate matter (PM) and other combustion products (including HAPs). PM emissions can also be generated in the form of fugitive dust created by mobile sources (i.e., garbage trucks) traveling along paved and unpaved surfaces. The reader should consult AP-42 Volume I Sections 13.2.1 and 13.2.2 for information on estimating fugitive dust emissions from paved and unpaved roads.

The rate of emissions from a landfill is governed by gas production and transport mechanisms. Production mechanisms involve the production of the emission constituent in its vapor phase through vaporization, biological decomposition, or chemical reaction. Transport mechanisms involve the transportation of a volatile constituent in its vapor phase to the surface of the landfill, through the air boundary layer above the landfill, and into the atmosphere. The three major transport mechanisms that enable transport of a volatile constituent in its vapor phase are diffusion, convection, and displacement.

2.4.4.1 Uncontrolled Emissions — To estimate uncontrolled emissions of the various compounds present in landfill gas, total landfill gas emissions must first be estimated. Uncontrolled CH_4 emissions may be estimated for individual landfills by using a theoretical first-order kinetic model of methane production developed by the EPA.[8] This model is known as the Landfill Air Emissions Estimation model, and can be accessed from the Office of Air Quality Planning and Standards Technology Transfer Network Website (OAQPS TTN Web) in the Clearinghouse for Inventories and Emission Factors (CHIEF) technical area (URL http://www.epa.gov/ttn/chief). The Landfill Air Emissions Estimation model equation is as follows:

$$Q_{CH_4} = L_o \, R \, (e^{-kc} - e^{-kt}) \qquad (1)$$

where:

Q_{CH_4}	=	Methane generation rate at time t, m^3/yr;
L_o	=	Methane generation potential, m^3 CH_4/Mg refuse;
R	=	Average annual refuse acceptance rate during active life, Mg/yr;
e	=	Base log, unitless;
k	=	Methane generation rate constant, yr^{-1};
c	=	Time since landfill closure, yrs (c = 0 for active landfills); and
t	=	Time since the initial refuse placement, yrs.

It should be noted that the model above was designed to estimate LFG generation and not LFG emissions to the atmosphere. Other fates may exist for the gas generated in a landfill, including capture and subsequent microbial degradation within the landfill's surface layer. Currently, there are no data that adequately address this fate. It is generally accepted that the bulk of the gas generated will be emitted through cracks or other openings in the landfill surface.

Site-specific landfill information is generally available for variables R, c, and t. When refuse acceptance rate information is scant or unknown, R can be determined by dividing the refuse in place by the age of the landfill. If a facility has documentation that a certain segment (cell) of a landfill received *only* nondegradable refuse, then the waste from this segment of the landfill can be excluded from the calculation of R. Nondegradable refuse includes concrete, brick, stone, glass, plaster, wallboard, piping, plastics, and metal objects. The average annual acceptance rate should only be estimated by this method when there is inadequate information available on the actual average acceptance rate. The time variable, t, includes the total number of years that the refuse has been in place (including the number of years that the landfill has accepted waste and, if applicable, has been closed).

Values for variables L_o and k must be estimated. Estimation of the potential CH_4 generation capacity of refuse (L_o) is generally treated as a function of the moisture and organic content of the refuse. Estimation of the CH_4 generation constant (k) is a function of a variety of factors, including moisture, pH, temperature, and other environmental factors, and landfill operating conditions. Specific CH_4 generation constants can be computed by the use of EPA Method 2E (40 CFR Part 60 Appendix A).

The Landfill Air Emission Estimation model includes both regulatory default values and recommended AP-42 default values for L_o and k. The regulatory defaults were developed for compliance purposes (NSPS/Emission Guideline). As a result, the model contains conservative L_o and k default values in order to protect human health, to encompass a wide range of landfills, and to encourage the use of site-specific data. Therefore, different L_o and k values may be appropriate in estimating landfill emissions for particular landfills and for use in an emissions inventory.

Recommended AP-42 defaults include a k value of 0.04/yr for areas recieving 25 inches or more of rain per year. A default k of 0.02/yr should be used in drier areas (<25 inches/yr). An L_o value of 100 m^3/Mg (3,530 ft^3/ton) refuse is appropriate for most landfills. Although the recommended default k and L_o are based upon the best fit to 21 different landfills, the predicted methane emissions ranged from 38 to 492% of actual, and had a relative standard deviation of 0.85. It should be emphasized that in order to comply with the NSPS/Emission Guideline, the regulatory defaults for k and L_o must be applied as specified in the final rule.

When gas generation reaches steady state conditions, LFG consists of approximately 40 percent by volume CO_2, 55 percent CH_4, 5 percent N_2 (and other gases), and trace amounts of NMOCs. Therefore, the estimate derived for CH_4 generation using the Landfill Air Emissions Estimation model can also be used to represent CO_2 generation. Addition of the CH_4 and CO_2 emissions will yield an estimate of total landfill gas emissions. If site-specific information is available to suggest that the CH_4 content of landfill gas is not 55 percent, then the site-specific information should be used, and the CO_2 emission estimate should be adjusted accordingly.

Most of the NMOC emissions result from the volatilization of organic compounds contained in the landfilled waste. Small amounts may be created by biological processes and chemical reactions within the landfill. The current version of the Landfill Air Emissions Estimation model contains a proposed regulatory default value for total NMOC of 4,000 ppmv, expressed as hexane. However, available data show that there is a range of over 4,400 ppmv for total NMOC values from landfills. The proposed regulatory default value for NMOC concentration was developed for regulatory compliance purposes and to provide the most cost-effective default values on a national basis. For emissions inventory purposes, site-specific information should be taken into account when determining the total NMOC concentration. In the absence of site-specific information, a value of 2,420 ppmv as hexane is suggested for landfills known to have co-disposal of MSW and non-residential waste. If the landfill is known to contain only MSW or have very little organic commercial/industrial wastes, then a total NMOC value of 595 ppmv as hexane should be used. In addition, as with the landfill model defaults, the regulatory default value for NMOC content must be used in order to comply with the NSPS/Emission Guideline.

If a site-specific total pollutant concentration is available (i.e., as measured by EPA Reference Method 25C), it must be corrected for air infiltration which can occur by two different mechanisms: LFG sample dilution, and air intrusion into the landfill. These corrections require site-specific data for the LFG CH_4,

CO_2, nitrogen (N_2), and oxygen (O_2) content. If the ratio of N_2 to O_2 is less than or equal to 4.0 (as found in ambient air), then the total pollutant concentration is adjusted for sample dilution by assuming that CO_2 and CH_4 are the primary (100 percent) constituents of landfill gas, and the following equation is used:

$$C_P \text{ (ppmv) (corrected for air infiltration)} = \frac{C_P \text{ (ppmv) } (1 \times 10^6)}{C_{CO_2} \text{ (ppmv)} + C_{CH_4} \text{ (ppmv)}} \qquad (2)$$

where:

C_P	=	Concentration of pollutant P in landfill gas (i.e., NMOC as hexane), ppmv;
C_{CO_2}	=	CO_2 concentration in landfill gas, ppmv;
C_{CH_4}	=	CH_4 Concentration in landfill gas, ppmv; and
1×10^6	=	Constant used to correct concentration of P to units of ppmv.

If the ratio of N_2 to O_2 concentrations (i.e., C_{N_2}, C_{O_2}) is greater than 4.0, then the total pollutant concentration should be adjusted for air intrusion into the landfill by using equation 2 and adding the concentration of N_2 (i.e., C_{N_2}) to the denominator. Values for C_{CO_2}, C_{CH_4}, C_{N_2}, C_{O_2}, can usually be found in the source test report for the particular landfill along with the total pollutant concentration data.

To estimate emissions of NMOC or other landfill gas constituents, the following equation should be used:

$$Q_P = 1.82\ Q_{CH_4} * \frac{C_P}{(1 \times 10^6)} \qquad (3)$$

where:

Q_P	=	Emission rate of pollutant P (i.e. NMOC), m^3/yr;
Q_{CH_4}	=	CH_4 generation rate, m^3/yr (from the Landfill Air Emissions Estimation model);
C_P	=	Concentration of P in landfill gas, ppmv; and
1.82	=	Multiplication factor (assumes that approximately 55 percent of landfill gas is CH_4 and 45 percent is CO_2, N_2, and other constituents).

Uncontrolled mass emissions per year of total NMOC (as hexane), CO_2, CH_4, and speciated organic and inorganic compounds can be estimated by the following equation:

$$UM_P = Q_P * \left[\frac{MW_P * 1 \text{ atm}}{(8.205 \times 10^{-5} \text{ m}^3\text{-atm/gmol-}^\circ\text{K})(1000\text{g/kg})(273 + T\ ^\circ\text{K})}\right] \qquad (4)$$

where:

UM_P	=	Uncontrolled mass emissions of pollutant P (i.e., NMOC), kg/yr;
MW_P	=	Molecular weight of P, g/gmol (i.e., 86.18 for NMOC as hexane);
Q_P	=	NMOC emission rate of P, m^3/yr; and
T	=	Temperature of landfill gas, ^{o}C.

This equation assumes that the operating pressure of the system is approximately 1 atmosphere. If the temperature of the landfill gas is not known, a temperature of 25^{o}C (77^{o}F) is recommended.

Uncontrolled default concentrations of speciated organics along with some inorganic compounds are presented in Table 2.4-1. These default concentrations have already been corrected for air infiltration and can be used as input parameters to equation 3 or the Landfill Air Emission Estimation model for estimating speciated emissions from landfills when site-specific data are not available. An analysis of the data, based on the co-disposal history (with non-residential wastes) of the individual landfills from which the concentration data were derived, indicates that for benzene, NMOC, and toluene, there is a difference in the uncontrolled concentrations. Table 2.4-2 presents the corrected concentrations for benzene, NMOC, and toluene to use based on the site's co-disposal history.

It is important to note that the compounds listed in Tables 2.4-1 and 2.4-2 are not the only compounds likely to be present in LFG. The listed compounds are those that were identified through a review of the available literature. The reader should be aware that additional compounds are likely present, such as those associated with consumer or industrial products. Given this information, extreme caution should be exercised in the use of the default VOC weight fractions and concentrations given at the bottom of Table 2.4-2. These default VOC values are heavily influenced by the ethane content of the LFG. Available data have shown that there is a range of over 1,500 ppmv in LFG ethane content among landfills.

2.4.4.2 Controlled Emissions — Emissions from landfills are typically controlled by installing a gas collection system, and combusting the collected gas through the use of internal combustion engines, flares, or turbines. Gas collection systems are not 100 percent efficient in collecting landfill gas, so emissions of CH_4 and NMOC at a landfill with a gas recovery system still occur. To estimate controlled emissions of CH_4, NMOC, and other constituents in landfill gas, the collection efficiency of the system must first be estimated. Reported collection efficiencies typically range from 60 to 85 percent, with an average of 75 percent most commonly assumed. Higher collection efficiencies may be achieved at some sites (i.e., those engineered to control gas emissions). If site-specific collection efficiencies are available (i.e., through a comprehensive surface sampling program), then they should be used instead of the 75 percent average.

Controlled emission estimates also need to take into account the control efficiency of the control device. Control efficiencies based on test data for the combustion of CH_4, NMOC, and some speciated organics with differing control devices are presented in Table 2.4-3. Emissions from the control devices need to be added to the uncollected emissions to estimate total controlled emissions.

Controlled CH_4, NMOC, and speciated emissions can be calculated with equation 5. It is assumed that the landfill gas collection and control system operates 100 percent of the time. Minor durations of system downtime associated with routine maintenance and repair (i.e., 5 to 7 percent) will not appreciably effect emission estimates. The first term in equation 5 accounts for emissions from uncollected landfill gas, while the second term accounts for emissions of the pollutant that were collected but not combusted in the control or utilization device:

$$CM_P = \left[UM_P * \left(1 - \frac{\eta_{col}}{100} \right) \right] + \left[UM_P * \frac{\eta_{col}}{100} * \left(1 - \frac{\eta_{cnt}}{100} \right) \right] \quad (5)$$

where:

CM_P	=	Controlled mass emissions of pollutant P, kg/yr;
UM_P	=	Uncontrolled mass emissions of P, kg/yr (from equation 4 or the Landfill Air Emissions Estimation Model);
η_{col}	=	Collection efficiency of the landfill gas collection system, percent; and
η_{cnt}	=	Control efficiency of the landfill gas control or utilization device, percent.

Emission factors for the secondary compounds, CO and NO_x, exiting the control device are presented in Tables 2.4-4 and 2.4-5. These emission factors should be used when equipment vendor guarantees are not available.

Controlled emissions of CO_2 and sulfur dioxide (SO_2) are best estimated using site-specific landfill gas constituent concentrations and mass balance methods.[68] If site-specific data are not available, the data in tables 2.4-1 through 2.4-3 can be used with the mass balance methods that follow.

Controlled CO_2 emissions include emissions from the CO_2 component of landfill gas (equivalent to uncontrolled emissions) and additional CO_2 formed during the combustion of landfill gas. The bulk of the CO_2 formed during landfill gas combustion comes from the combustion of the CH_4 fraction. Small quantities will be formed during the combustion of the NMOC fraction, however, this typically amounts to less than 1 percent of total CO_2 emissions by weight. Also, the formation of CO through incomplete combustion of landfill gas will result in small quantities of CO_2 not being formed. This contribution to the overall mass balance picture is also very small and does not have a significant impact on overall CO_2 emissions.[68]

The following equation which assumes a 100 percent combustion efficiency for CH_4 can be used to estimate CO_2 emissions from controlled landfills:

$$CM_{CO_2} = UM_{CO_2} + \left[UM_{CH_4} * \frac{\eta_{col}}{100} * 2.75 \right] \quad (6)$$

where:

CM_{CO_2}	=	Controlled mass emissions of CO_2, kg/yr;
UM_{CO_2}	=	Uncontrolled mass emissions of CO_2, kg/yr (from equation 4 or the Landfill Air Emission Estimation Model);
UM_{CH_4}	=	Uncontrolled mass emissions of CH_4, kg/yr (from equation 4 on the Landfill Air Emission Estimation Model);
η_{col}	=	Efficiency of the landfill gas collection system, percent; and
2.75	=	Ratio of the molecular weight of CO_2 to the molecular weight of CH_4.

To prepare estimates of SO_2 emissions, data on the concentration of reduced sulfur compounds within the landfill gas are needed. The best way to prepare this estimate is with site-specific information on the total reduced sulfur content of the landfill gas. Often these data are expressed in ppmv as sulfur (S). Equations 3 and 4 should be used first to determine the uncontrolled mass emission rate of reduced sulfur compounds as sulfur. Then, the following equation can be used to estimate SO_2 emissions:

$$CM_{SO_2} = UM_S * \frac{\eta_{col}}{100} * 2.0 \quad (7)$$

where:

CM_{SO_2}	=	Controlled mass emissions of SO_2, kg/yr;
UM_S	=	Uncontrolled mass emissions of reduced sulfur compounds as sulfur, kg/yr (from equations 3 and 4);
η_{col}	=	Efficiency of the landfill gas collection system, percent; and
2.0	=	Ratio of the molecular weight of SO_2 to the molecular weight of S.

The next best method to estimate SO_2 concentrations, if site-specific data for total reduced sulfur compounds as sulfur are not available, is to use site-specific data for speciated reduced sulfur compound concentrations. These data can be converted to ppmv as S with equation 8. After the total reduced sulfur as S has been obtained from equation 8, then equations 3, 4, and 7 can be used to derive SO_2 emissions.

$$C_S = \sum_{i=1}^{n} C_P * S_P \quad (8)$$

where:

C_S	=	Concentration of total reduced sulfur compounds, ppmv as S (for use in equation 3);
C_P	=	Concentration of each reduced sulfur compound, ppmv;
S_P	=	Number of moles of S produced from the combustion of each reduced sulfur compound (i.e., 1 for sulfides, 2 for disulfides); and
n	=	Number of reduced sulfur compounds available for summation.

If no site-specific data are available, a value of 46.9 ppmv can be assumed for C_S (for use in equation 3). This value was obtained by using the default concentrations presented in Table 2.4-1 for reduced sulfur compounds and equation 8.

Hydrochloric acid [Hydrogen Chloride (HCl)] emissions are formed when chlorinated compounds in LFG are combusted in control equipment. The best methods to estimate emissions are mass balance methods that are analogous to those presented above for estimating SO_2 emissions. Hence, the best source of data to estimate HCl emissions is site-specific LFG data on total chloride [expressed in ppmv as the chloride ion (Cl^-)]. If these data are not available, then total chloride can be estimated from data on individual chlorinated species using equation 9 below. However, emission estimates may be underestimated, since not every chlorinated compound in the LFG will be represented in the laboratory report (i.e., only those that the analytical method specifies).

$$C_{Cl} = \sum_{i=1}^{n} C_P * Cl_P \quad (9)$$

where:

C_{Cl}	=	Concentration of total chloride, ppmv as Cl^- (for use in equation 3);
C_P	=	Concentration of each chlorinated compound, ppmv;
Cl_P	=	Number of moles of Cl^- produced from the combustion of each chlorinated compound (i.e., 3 for 1,1,1-trichloroethane); and
n	=	Number of chlorinated compounds available for summation.

After the total chloride concentration (C_{Cl}) has been estimated, equations 3 and 4 should be used to determine the total uncontrolled mass emission rate of chlorinated compounds as chloride ion (UM_{Cl}). This value is then used in equation 10 below to derive HCl emission estimates:

$$CM_{HCl} = UM_{Cl} * \frac{\eta_{col}}{100} * 1.03 * \left(\frac{\eta_{cnt}}{100}\right) \quad (10)$$

where:

CM_{HCl}	=	Controlled mass emissions of HCl, kg/yr;
UM_{Cl}	=	Uncontrolled mass emissions of chlorinated compounds as chloride, kg/yr (from equations 3 and 4);
η_{col}	=	Efficiency of the landfill gas collection system, percent;
1.03	=	Ratio of the molecular weight of HCl to the molecular weight of Cl^-; and
η_{cnt}	=	Control efficiency of the landfill gas control or utilization device, percent.

In estimating HCl emissions, it is assumed that all of the chloride ion from the combustion of chlorinated LFG constituents is converted to HCl. If an estimate of the control efficiency, η_{cnt}, is not available, then the high end of the control efficiency range for the equipment listed in Table 9 should be used. This assumption is recommended to assume that HCl emissions are not under-estimated.

If site-specific data on total chloride or speciated chlorinated compounds are not available, then a default value of 42.0 ppmv can be used for C_{Cl}. This value was derived from the default LFG constituent concentrations presented in Table 2.4-1. As mentioned above, use of this default may produce underestimates of HCl emissions since it is based only on those compounds for which analyses have been performed. The constituents listed in Table 2.4-1are likely not all of the chlorinated compounds present in LFG.

The reader is referred to Sections 11.2-1 (Unpaved Roads, SCC 50100401), and 11-2.4 (Heavy Construction Operations) of Volume I, and Section II-7 (Construction Equipment) of Volume II, of the AP-42 document for determination of associated fugitive dust and exhaust emissions from these emission sources at MSW landfills.

2.4.5 Updates Since the Fifth Edition

The Fifth Edition was released in January 1995. Supplemnt D (8/98) is a major revision of the text and recommended emission factors conained in the section. The most significant revisions to this section since publication in the Fifth Edition are summarized below.

- The equations to calculate the CH_4, CO_2 and other constituents were simplified.
- The default L_0 and k were revised based upon an expanded base of gas generation data.
- The default ratio of CO_2 to CH_4 was revised based upon averages observed in available source test reports.
- The default concentrations of LFG constituents were revised based upon additional data.
- Additional control efficiencies were included and existing efficiencies were revised based upon additional emission test data.
- Revised and expanded the recommended emission factors for secondary compounds emitted from typical control devices.

Supplement E (11/98) includes correction in equation 10 and a very minor change in the molecular weights for 1,1,1-Trichloroethane (methyl chloroform), 1,1-Dichloroethane, 1,2-Dichloropropane and Trichloroethylene (trichloroethene) presented in Table 2.4-1 to agree with values presented in Perry's Handbook.

Table 2.4-1. DEFAULT CONCENTRATIONS FOR LFG CONSTITUENTS[a]

(SCC 50100402, 50300603)

Compound	Molecular Weight	Default Concentration (ppmv)	Emission Factor Rating
1,1,1-Trichloroethane (methyl chloroform)[a]	133.41	0.48	B
1,1,2,2-Tetrachloroethane[a]	167.85	1.11	C
1,1-Dichloroethane (ethylidene dichloride)[a]	98.97	2.35	B
1,1-Dichloroethene (vinylidene chloride)[a]	96.94	0.20	B
1,2-Dichloroethane (ethylene dichloride)[a]	98.96	0.41	B
1,2-Dichloropropane (propylene dichloride)[a]	112.99	0.18	D
2-Propanol (isopropyl alcohol)	60.11	50.1	E
Acetone	58.08	7.01	B
Acrylonitrile[a]	53.06	6.33	D
Bromodichloromethane	163.83	3.13	C
Butane	58.12	5.03	C
Carbon disulfide[a]	76.13	0.58	C
Carbon monoxide[b]	28.01	141	E
Carbon tetrachloride[a]	153.84	0.004	B
Carbonyl sulfide[a]	60.07	0.49	D
Chlorobenzene[a]	112.56	0.25	C
Chlorodifluoromethane	86.47	1.30	C
Chloroethane (ethyl chloride)[a]	64.52	1.25	B
Chloroform[a]	119.39	0.03	B
Chloromethane	50.49	1.21	B
Dichlorobenzene[c]	147	0.21	E
Dichlorodifluoromethane	120.91	15.7	A
Dichlorofluoromethane	102.92	2.62	D
Dichloromethane (methylene chloride)[a]	84.94	14.3	A
Dimethyl sulfide (methyl sulfide)	62.13	7.82	C
Ethane	30.07	889	C
Ethanol	46.08	27.2	E
Ethyl mercaptan (ethanethiol)	62.13	2.28	D
Ethylbenzene[a]	106.16	4.61	B
Ethylene dibromide	187.88	0.001	E
Fluorotrichloromethane	137.38	0.76	B
Hexane[a]	86.18	6.57	B
Hydrogen sulfide	34.08	35.5	B
Mercury (total)[a,d]	200.61	2.92×10^{-4}	E

Table 2.4-1. (Concluded)

Compound	Molecular Weight	Default Concentration (ppmv)	Emission Factor Rating
Methyl ethyl ketone[a]	72.11	7.09	A
Methyl isobutyl ketone[a]	100.16	1.87	B
Methyl mercaptan	48.11	2.49	C
Pentane	72.15	3.29	C
Perchloroethylene (tetrachloroethylene)[a]	165.83	3.73	B
Propane	44.09	11.1	B
t-1,2-dichloroethene	96.94	2.84	B
Trichloroethylene (trichloroethene)[a]	131.40	2.82	B
Vinyl chloride[a]	62.50	7.34	B
Xylenes[a]	106.16	12.1	B

NOTE: This is not an all-inclusive list of potential LFG constituents, only those for which test data were available at multiple sites. References 10-67. Source Classification Codes in parentheses.

[a] Hazardous Air Pollutants listed in Title III of the 1990 Clean Air Act Amendments.

[b] Carbon monoxide is not a typical constituent of LFG, but does exist in instances involving landfill (underground) combustion. Therefore, this default value should be used with caution. Of 18 sites where CO was measured, only 2 showed detectable levels of CO.

[c] Source tests did not indicate whether this compound was the para- or ortho- isomer. The para isomer is a Title III-listed HAP.

[d] No data were available to speciate total Hg into the elemental and organic forms.

Table 2.4-2. DEFAULT CONCENTRATIONS OF BENZENE, NMOC, AND TOLUENE BASED ON WASTE DISPOSAL HISTORY[a]

(SCC 50100402, 50300603)

Pollutant	Molecular Weight	Default Concentration (ppmv)	Emission Factor Rating
Benzene[b]	78.11		
Co-disposal		11.1	D
No or Unknown co-disposal		1.91	B
NMOC (as hexane)[c]	86.18		
Co-disposal		2420	D
No or Unknown co-disposal		595	B
Toluene[b]	92.13		
Co-disposal		165	D
No or Unknown co-disposal		39.3	A

[a] References 10-54. Source Classification Codes in parentheses.
[b] Hazardous Air Pollutants listed in Title III of the 1990 Clean Air Act Amendments.
[c] For NSPS/Emission Guideline compliance purposes, the default concentration for NMOC as specified in the final rule must be used. For purposes not associated with NSPS/Emission Guideline compliance, the default VOC content at co-disposal sites = 85 percent by weight (2,060 ppmv as hexane); at No or Unknown sites = 39 percent by weight 235 ppmv as hexane).

Table 2.4-3. CONTROL EFFICIENCIES FOR LFG CONSTITUENTS[a]

Control Device	Constituent[b]	Control Efficiency (%)		
		Typical	Range	Rating
Boiler/Steam Turbine (50100423)	NMOC	98.0	96-99+	D
	Halogenated Species	99.6	87-99+	D
	Non-Halogenated Species	99.8	67-99+	D
Flare[c] (50100410) (50300601)	NMOC	99.2	90-99+	B
	Halogenated Species	98.0	91-99+	C
	Non-Halogenated Species	99.7	38-99+	C
Gas Turbine (50100420)	NMOC	94.4	90-99+	E
	Halogenated Species	99.7	98-99+	E
	Non-Halogenated Species	98.2	97-99+	E
IC Engine (50100421)	NMOC	97.2	94-99+	E
	Halogenated Species	93.0	90-99+	E
	Non-Halogenated Species	86.1	25-99+	E

[a] References 10-67. Source Classification Codes in parentheses.
[b] Halogenated species are those containing atoms of chlorine, bromine, fluorine, or iodine. For any equipment, the control efficiency for mercury should be assumed to be 0. See section 2.4.4.2 for methods to estimate emissions of SO_2, CO_2, and HCl.
[c] Where information on equipment was given in the reference, test data were taken from enclosed flares. Control efficiencies are assumed to be equally representative of open flares.

Table 2.4-4. (Metric Units) EMISSION FACTORS FOR SECONDARY COMPOUNDS EXITING CONTROL DEVICES[a]

Control Device	Pollutant[b]	$kg/10^6$ dscm Methane	Emission Factor Rating
Flare[c] (50100410) (50300601)	Nitrogen dioxide	650	C
	Carbon monoxide	12,000	C
	Particulate matter	270	D
IC Engine (50100421)	Nitrogen dioxide	4,000	D
	Carbon monoxide	7,500	C
	Particulate matter	770	E
Boiler/Steam Turbine[d] (50100423)	Nitrogen dioxide	530	D
	Carbon monoxide	90	E
	Particulate matter	130	D
Gas Turbine (50100420)	Nitrogen dioxide	1,400	D
	Carbon monoxide	3,600	E
	Particulate matter	350	E

[a] Source Classification Codes in parentheses. Divide $kg/10^6$ dscm by 16,700 to obtain kg/hr/dscmm.
[b] No data on PM size distributions were available, however for other gas-fired combustion sources, most of the particulate matter is less than 2.5 microns in diameter. Hence, this emission factor can be used to provide estimates of PM-10 or PM-2.5 emissions. See section 2.4.4.2 for methods to estimate CO_2, SO_2, and HCl.
[c] Where information on equipment was given in the reference, test data were taken from enclosed flares. Control efficiencies are assumed to be equally representative of open flares.
[d] All source tests were conducted on boilers, however emission factors should also be representative of steam turbines. Emission factors are representative of boilers equipped with low-NO_x burners and flue gas recirculation. No data were available for uncontrolled NO_x emissions.

Table 2.4-5. (English Units) EMISSION RATES FOR SECONDARY COMPOUNDS EXITING CONTROL DEVICES[a]

Control Device	Pollutant[b]	$lb/10^6$ dscf Methane	Emission Factor Rating
Flare[c] (50100410) (50300601)	Nitrogen dioxide	40	C
	Carbon monoxide	750	C
	Particulate matter	17	D
IC Engine (50100421)	Nitrogen dioxide	250	D
	Carbon monoxide	470	C
	Particulate matter	48	E
Boiler/Steam Turbine[d] (50100423)	Nitrogen dioxide	33	E
	Carbon monoxide	5.7	E
	Particulate matter	8.2	E
Gas Turbine (50100420)	Nitrogen dioxide	87	D
	Carbon monoxide	230	D
	Particulate matter	22	E

[a] Source Classification Codes in parentheses. Divide $lb/10^6$ dscf by 16,700 to obtain lb/hr/dscfm.
[b] Based on data for other combustion sources, most of the particulate matter will be less than 2.5 microns in diameter. Hence, this emission rate can be used to provide estimates of PM-10 or PM-2.5 emissions. See section 2.4.4.2 for methods to estimate CO_2, SO_2, and HCl.
[c] Where information on equipment was given in the reference, test data were taken from enclosed flares. Control efficiencies are assumed to be equally representative of open flares.
[d] All source tests were conducted on boilers, however emission factors should also be representative of steam turbines. Emission factors are representative of boilers equipped with low-NO_x burners and flue gas recirculation. No data were available for uncontrolled NO_x emissions.

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APPENDIX G

Zoning Maps

SCHEDULE '4'
TO BY-LAW No. 02-22
TOWN OF GREATER NAPANEE

SCALE = 1:50,000

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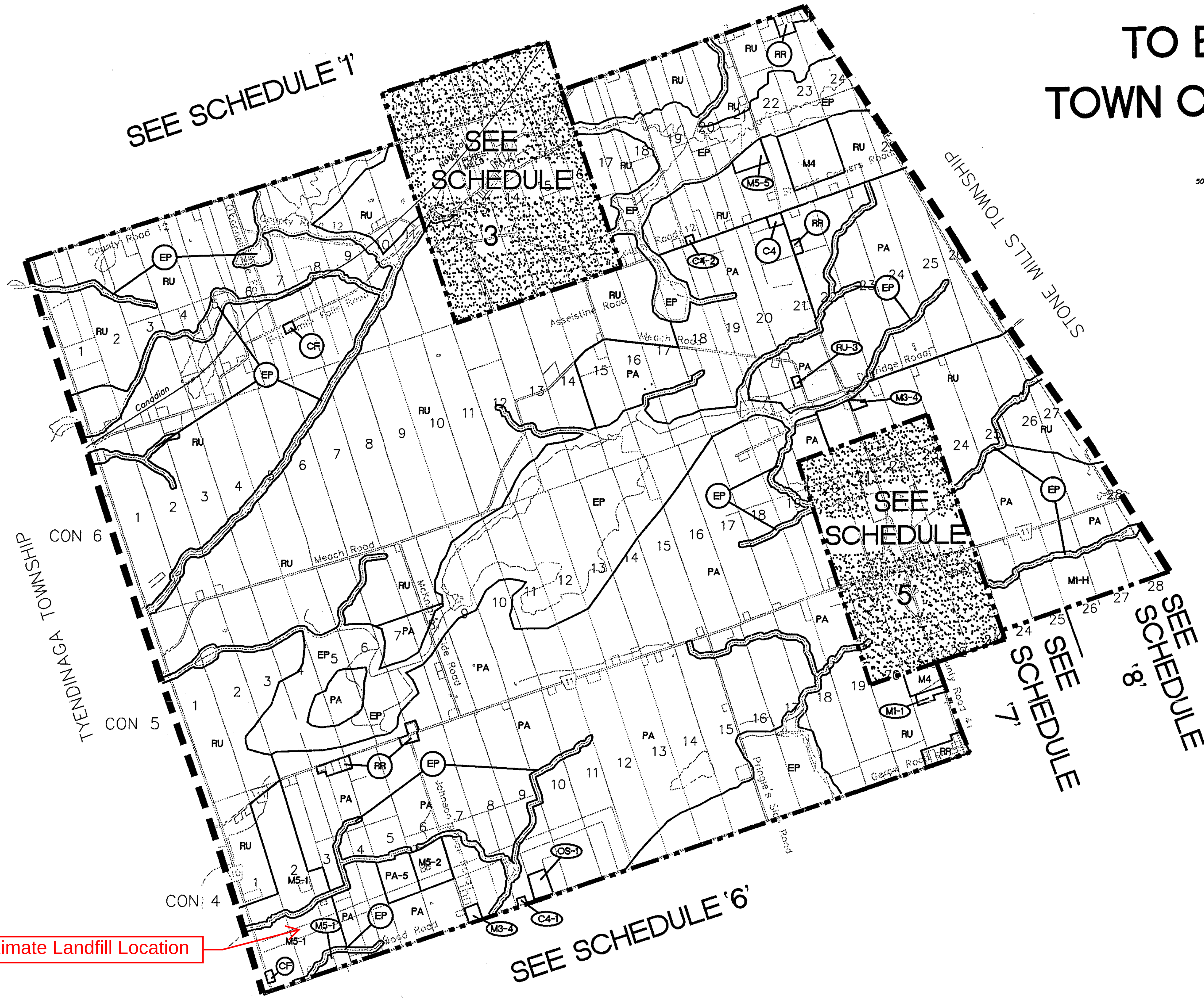

ZONE LEGEND

EP	ENVIRONMENTAL PROTECTION
OS	OPEN SPACE
PA	PRIME AGRICULTURE
RU	RURAL
RR	RURAL RESIDENTIAL
CF	COMMUNITY FACILITY
C2	ARTERIAL COMMERCIAL
C4	RURAL COMMERCIAL
M1	LIGHT INDUSTRIAL
M3	RURAL INDUSTRIAL
M4	EXTRACTIVE INDUSTRIAL
M5	WASTE MANAGEMENT INDUSTRIAL
— · · —	SCHEDULE BOUNDARY
— — —	MUNICIPAL BOUNDARY

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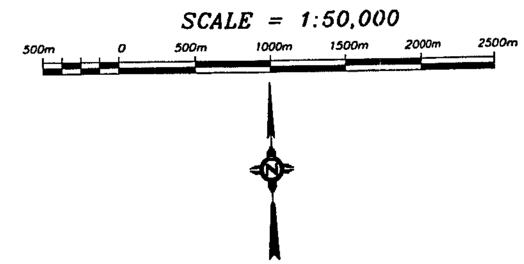
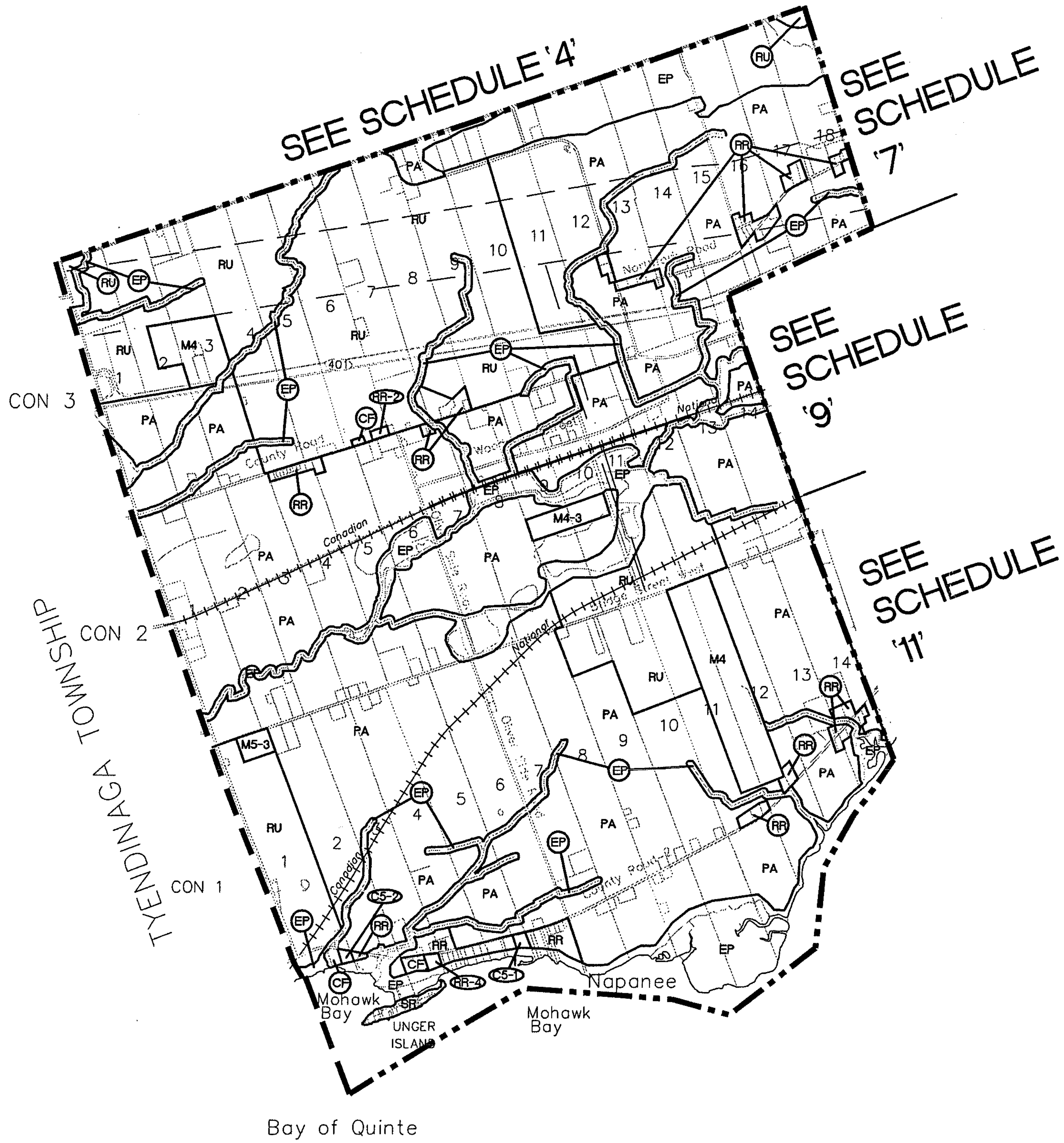
FAX(613)531-7789

Project No. 8692-P | Cad File: 8692-SCHED04a | Date Issued: 01/11/07

SCHEDULE '6'
TO BY-LAW No. 02-22
TOWN OF GREATER NAPANEE





ZONE LEGEND

EP	ENVIRONMENTAL PROTECTION
OS	OPEN SPACE
PA	PRIME AGRICULTURE
RU	RURAL
SR	SHORELINE RESIDENTIAL
RR	RURAL RESIDENTIAL
CF	COMMUNITY FACILITY
C5	RECREATION COMMERCIAL
M3	RURAL INDUSTRIAL
M4	EXTRACTIVE INDUSTRIAL
M5	WASTE MANAGEMENT INDUSTRIAL
— · · · —	SCHEDULE BOUNDARY
— —	MUNICIPAL BOUNDARY

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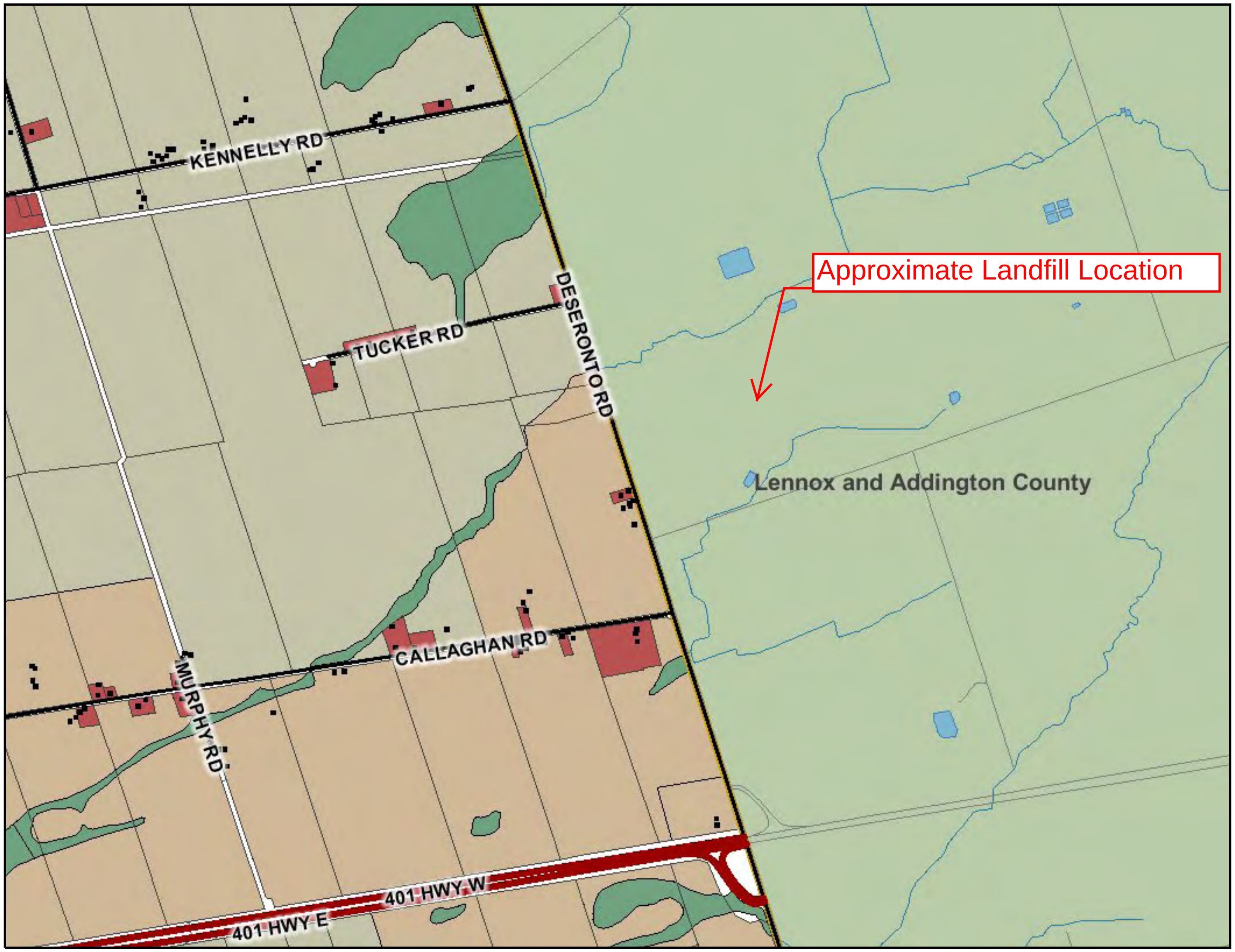
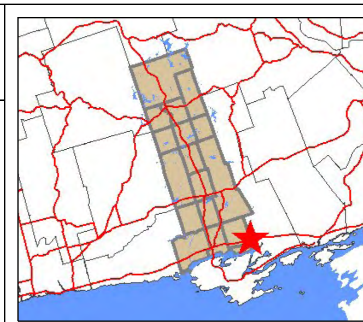
Staff GIS

Empey Hill Area West





Legend

- Highway 401
- Road
- Ontario Road Network
- Structure
- Land Parcel
- Environmentally Sensitive Lands
- Tyendinaga Hamlet
- Aggregate Resource Area (Extractive Active)

Environmental Protection

- EP/Hazard Land
- EPW

Tyendinaga Zoning

- Unknown
- CF - Community Facility
- GH - Group Home
- LSR - Limited Service Residential
- MA - Marginal Agriculture
- MX - Mineral Extractive
- OS - Open Space
- PA - Permanent Agriculture
- R2 - Residential Second Density
- RA - Road Allowance
- RC - Rural Commercial
- RE - Rural Exception
- R1 - Residential Second Density
- RR - Rural Residential
- RRC - Recreation/Resort Commercial
- UC - Urban Commercial
- UI - Urban Industrial
- WD - Waste Disposal
- WR - Waterfront Residential
- Permanent Water

N

Scale: 1:27,676

0 800 1600 2400 m.

Map center: 334696, 4902621

APPENDIX H

Dispersion Modelling Input and Output

07/28/11
13:38:38

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 96043 ***

C:\Users\Jonathan\Desktop\RichmondScreen3\Richmond.scr

SIMPLE TERRAIN INPUTS:

SOURCE TYPE	=	POINT
EMISSION RATE (G/S)	=	1.00000
STACK HEIGHT (M)	=	6.7056
STK INSIDE DIAM (M)	=	1.0000
STK EXIT VELOCITY (M/S)	=	16.4300
STK GAS EXIT TEMP (K)	=	1033.1500
AMBIENT AIR TEMP (K)	=	293.0000
RECEPTOR HEIGHT (M)	=	0.0000
URBAN/RURAL OPTION	=	RURAL
BUILDING HEIGHT (M)	=	0.0000
MIN HORIZ BLDG DIM (M)	=	0.0000
MAX HORIZ BLDG DIM (M)	=	0.0000

THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

BUOY. FLUX = 28.856 M**4/S**3; MOM. FLUX = 19.139 M**4/S**2.

*** FULL METEOROLOGY ***

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*** SCREEN DISCRETE DISTANCES ***
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*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)	DWASH
1.	0.000	1	1.0	1.0	320.0	273.45	2.09	2.06	NO
50.	0.7812E-01	6	1.0	1.0	10000.0	82.36	19.15	19.08	NO
100.	0.5092	6	1.0	1.0	10000.0	82.36	21.99	21.74	NO
150.	4.907	4	20.0	20.0	6400.0	18.69	12.10	6.91	NO
200.	12.20	4	20.0	20.0	6400.0	18.69	15.75	8.83	NO
250.	16.72	4	20.0	20.0	6400.0	18.69	19.32	10.69	NO
300.	18.24	4	20.0	20.0	6400.0	18.69	22.83	12.49	NO
350.	17.88	4	20.0	20.0	6400.0	18.69	26.29	14.14	NO
400.	16.83	4	20.0	20.0	6400.0	18.69	29.70	15.74	NO
450.	15.53	4	20.0	20.0	6400.0	18.69	33.04	17.23	NO
500.	14.21	4	20.0	20.0	6400.0	18.69	36.35	18.69	NO
600.	12.55	4	15.0	15.0	4800.0	23.68	43.02	21.81	NO
700.	10.98	4	15.0	15.0	4800.0	23.68	49.45	24.57	NO
800.	9.934	4	10.0	10.0	3200.0	33.38	56.09	27.85	NO
900.	9.192	4	10.0	10.0	3200.0	33.38	62.35	30.44	NO
1000.	8.447	4	8.0	8.0	2560.0	40.05	68.79	33.48	NO
1250.	7.156	4	8.0	8.0	2560.0	40.05	84.03	38.26	NO
1500.	6.062	4	8.0	8.0	2560.0	40.05	99.00	42.74	NO

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 DWASH=   MEANS NO CALC MADE (CONC = 0.0)
 DWASH=NO MEANS NO BUILDING DOWNWASH USED
 DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
 DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
 DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

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     *** SUMMARY OF SCREEN MODEL RESULTS ***
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 CALCULATION         MAX CONC    DIST TO   TERRAIN
  PROCEDURE         (UG/M**3)    MAX (M)    HT (M)
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SIMPLE TERRAIN      18.24          300.        0.


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** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
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