Golder Associates Ltd.

1796 Courtwood Crescent
Ottawa, Ontario, Canada K2C 2B5
Telephone (613) 224-5864
Fax (613) 224-9928

REPORT ON

2000 OPERATIONS AND DEVELOPMENT AND 2000 GROUNDWATER AND SURFACE WATER MONITORING PROGRAM CALEDONIA LANDFILL SITE CORPORATION OF THE NATION MUNICIPALITY ONTARIO

Submitted to:

Corporation of the Nation Municipality
958 Road 500 West
R.R. #3
Casselman, Ontario
K0A 1M0

Prepared by:

Stantec Consulting Ltd.
400 – 1505 Laperriere Avenue
Ottawa, Ontario
K1Z 7T1

Golder Associates Ltd.
1796 Courtwood Crescent
Ottawa, Ontario
K2C 2B5

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March 2001

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OPERATIONS AND DEVELOPMENT

STANTEC CONSULTING LTD.

Stantec

Nation Municipality
Caledonia Landfill Site
2000 Annual Report

Prepared by:

Stantec Consulting Ltd.
400-1505 Laperriere Avenue
Ottawa, ON K1Z 7T1

And

Golder Associates
1796 Courtwood Cr.
Ottawa, Ontario
K2C 2B5

March 31, 2001

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1.0 INTRODUCTION

The Nation Municipality was formed through the amalgamation of four surrounding municipalities (Figure 1) in January 1998. As part of that process, the Nation Municipality assumed ownership of the Caledonia landfill located on the east half of Lot 23, Concession 6 (Figure 2) of the former Township of Caledonia, United Counties of Prescott and Russell.

The landfill is operated under the Certificate of Approval No. A 471003 and has a total site area of 14.57 hectares and an approved footprint of 4.0 hectares. It provides disposal services to the former Township of Caledonia residents only and accepts municipal and non-hazardous solid industrial waste, white goods, tires and wood waste. The site is approximately 192 metres wide (E-W) and 760 metres (N-S). The site is located in rural area and is surrounded by bush on the west and north sides, by agricultural land on the east side and the Concession 7 road on the South side. The Municipality's zoning map identifies the property as being zoned Solid Waste Disposal Site (SRD) within a General Rural zone (RU1).

Most of the landfill is situated on flat land with less than 1 meter difference in elevation throughout most of the site, except for the north end which is transected by a 7-8 metres escarpment. The site is underlain by the deposit of silty sand which overlies glacial till and bedrock. Generally, groundwater flow direction is towards the north with a gradient less than 0.01. As shown in Figure 2, there exists three main discharge points within the landfill; 1) a 300 meter long ditch that parallels the west side of the access road and discharges to the north; 2), a 60 meter long ditch along the east side of the landfill that also discharges to the north; and 3) a 7-8 meter high escarpment that transects the north end of the landfill. A natural drainage course, some 2-3 metres wide and up to 1 metre deep, flows westward at the base of the escarpment and discharges to a larger surface water course, Paxton Creek, towards the north west corner of the landfill. Paxton Creek appears to be the main receptor for all groundwater and surface water generated at the landfill.

A legal survey was prepared for the site during 1999 by David Shultz and has been registered at the registry office as plan 46R-6108.

2.0 PURPOSE OF ANNUAL REPORT

This 2000 annual report was prepared to satisfy Condition 35 of the provisional Certificate of Approval (COA) for a waste disposal site No. A471003, dated October 1st 1999. Condition 35 specifies the information that must be presented in the annual report and requires the report to be submitted to the Ministry of the Environment (MOE) District Manager by March 31 of each year for the previous year's operation.

3.0 SUMMARY OF SITE OPERATIONS

3.1 Guidelines for Operations (COA)

The Provisional Certificate of Approval No. A471003 dated October 1, 1999 for the Caledonia landfill site allows for the use and operation of a 14.57 hectares landfill with an approved waste footprint of 4.0 hectares. The Certificate of Approval contains a total of 37 conditions and is reproduced in Appendix A.

There have been no Notices issued since October 1, 1999 to amend the Certificate of Approval.

The conditions that can have an impact on the physical operations at the site are reviewed below to ensure that the site operates in compliance with the Certificate of Approval. All other conditions which are considered administrative in nature were not reviewed (Conditions 1-8, 12,14 and 32) but are provided in Appendix A for reference purposes.

Condition 9 requires that all communications and correspondence made pursuant to this Certificate make reference to the Certificate of Approval No. A 471003.

Discussion:

The letter of transmittal that accompanies this monitoring report makes reference to the Certificate of Approval No A471003.

Condition 10 requires that applicant notify the Director in writing if there is a change within 30 days in the name, address, or change of partners of the Corporation.

Discussion:

The Certificate of Approval reflects the current owner and operator of the site (Corporation of the Nation Municipality) and lists its current address (958 Highway 500 West, Casselman, ON)

Condition 11 requires that the applicant notify in writing any succeeding owner of the site of the existence of this Certificate and provide proof of this to the Director.

Discussion:

There has been no change in ownership of the site.

Condition 13 requires that all records and monitoring data required by the conditions of the certificate be maintained on the owners premises for a period of two years from the date of their creation.

Discussion:

This report shall be filed with Corporation on the Nation Municipality and will be maintained on its premises for a period of two years.

Condition 15 requires that the Certificate of Approval be registered on title to the property using a completed certificate of prohibition. Upon receiving the signed certificate of prohibition from the Ministry, the applicant shall register the certificate in the appropriate land Registry office.

Discussion:

The Municipality forwarded a Certificate of Prohibition for the Ministry of the Environment's signature (Toronto) in January 2000.

Condition 16 specifies that only municipal non hazardous solid industrial waste and wood waste be accepted at this site. No hazardous or liquid industrial waste shall be accepted. The total amount of tires received and stored on the site shall not exceed 3000 tires and any one time. The site is approved to accept white goods and white goods containing refrigerant.

Discussion:

The Municipality only accepts municipal non hazardous solid industrial waste. As stated in section 5 of this report, the total number of tires has not exceeded 3000. In this same section, the diversion of white goods and white goods containing refrigerant is specified.

Condition 17 specifies that the waste received at this site may be only from the boundaries of the former geographic Township of Caledonia.

Discussion:

During the reporting period, all waste deposited at the landfill site has been generated from the former geographic Township of Caledonia.

Condition 18 requires that within six months of the issuance of the Certificate, the applicant shall submit a revised Development Operation and Closure addendum report which provides details of final design and operational plans for the site.

Discussion:

The Nation Municipality has prepared an addendum report dated February 2000 which was submitted to the Ministry of the Environment, Toronto, in March 2000.

Condition 19 requires that the Municipality operate the landfill according to item Nos. 3 and 11 of Schedule A, provided that all requirements of Condition 18 have been addressed in the report.

Discussion:

The Municipality operates the site following the site development, operation and closure report listed in Schedule A of the Certificate of Approval.

Condition 20 requires that the Municipality submit to the Director for approval a detailed monitoring program for surface water, groundwater, and leachate.

Discussion:

The Municipality has included a monitoring program for surface water and groundwater as part of the annual monitoring reports which it must submit according to condition 35 prior to the end of March 31st, 2000, and annually thereafter.

Condition 21 requires that an impact assessment report be submitted with the annual monitoring report to describe surface water and groundwater quality and quantity, and establish trigger values for remedial and corrective actions.

Discussion:

The Municipality has provided an assessment of the impact of landfilling on groundwater and surface water resources within the annual monitoring report required by condition 35. Trigger levels would be established once an adequate monitoring database has been gathered.

Condition 22 requires that the Municipality submit a contingency plan and schedule dealing with remedial measures that are to be undertaken if Reasonable Use Guidelines and Provincial Water Quality Objectives are exceeded.

Discussion:

The Municipality shall prepare a contingency plan to respond to any exceedance to the trigger level (yet to be established), PWQO or RUPO as a part of its annual monitoring report.

Condition 23 requires that all monitoring wells which are no longer required for monitoring or which need to be closed due to operational changes shall be abandoned according to Ontario Regulation 903.

Discussion:

The groundwater and surface water monitoring report contained in Part B shows that all wells within the landfill site are operational.

Condition 24 states that approvals are required for any storm water management and landfill gas management programs that are to be implemented at this site.

Discussion:

The design drawings submitted with the operational report do not contain any storm water management or landfill gas management programs. Due to the rural setting of the landfill, these programs are not considered necessary at this time.

Condition 25 contains many subsections a) through r) which specify operational issues regarding landfilling. The most significant issues are summarized as follows;

- the burning of wood waste shall cease on October 1st 2000
- the custodian must maintain a detailed log for all white goods containing refrigerant that enters the site, ensure that white goods are stored within a security fence and are removed within six months from the time of receipt at the site,
- site custodian shall conduct weekly inspections of the site and maintain records of such inspections. The site custodian must be aware of the types of waste to be disposed at this site, be knowledgeable about the requirements of this Certificate and the site operational plans,
- the site custodian must ensure that waste that is deposited at the working face is properly compacted before cover material is applied, and that the waste is covered on a weekly basis

Discussion:

The Township no longer burns wood at the site. The site custodian maintains a log of the number of users at the site. The site custodian has been provided with a copy of the Certificate of Approval and provided a copy of the 2000 annual monitoring report so that the above conditions are enforced.

Condition 26 requires that the Municipality delimit the landfill site boundaries with permanent markers.

Discussion:

During the year 2000, the Township has demarked the 2.1 hectare footprint with four permanent markers. Only the waste to be placed by the area method (2.1 ha) will be delineated since the remaining area of the approved 4 ha. footprint has buried waste from the previous trench method.

Condition 27 restricts the service area to the former Township of Caledonia

Discussion:

Only waste from the former Township of Caledonia was accepted at this landfill.

Condition 28 specifies that all waste shall be deposited within the four hectare landfill footprint defined in the Operation and Development plan, that the total capacity shall not exceed 122,386 cubic metres and the contours described in Condition 28 c).

Discussion:

As shown in the plan and cross section provided in the figures to this report, the waste deposited during the period of this monitoring report has been placed within the footprint and approved contours.

Condition 29 specifies that the operating hours for the site shall be posted on the entrance sign and include other information such as waste types, service area, Certificate of Approval No., name and telephone number for emergencies.

Discussion:

The existing sign at entrance to the landfill contains all of the above information.

Condition 30 requires that a litter fence be installed, on an as need basis, to minimize litter.

Discussion:

A litter fence shall be installed as required.

Condition 31 requires that the Municipality inspect all lands and roads in the vicinity of this site and remove any litter found on those lands and roads.

Discussion:

The site custodian duties shall include this activity.

Condition 33 specifies that the Municipality maintain a complaint procedure by recording each complaint in a log book and action taken to respond to it.

Discussion:

The Municipality has established a complaint procedure that has been followed by the site custodian.

Condition 34 requires that the Municipality call the Ministry of the Environment Spills Action Center in the event of an emergency.

Discussion:

All emergencies such as fires or spills are reported to the Ministry of the Environment office in Cornwall. Fortunately, no such events were recorded during this monitoring period.

Condition 35 specifies the information that shall be provided in the annual monitoring report that is to be submitted to be Ministry of the Environment prior to March 31st of each year, for the previous year's monitoring.

Discussion:

Part A of the annual monitoring report contains a summary of the information requested in Condition 35. A copy of Condition 35 can be found in the Certificate of Approval reproduced in Appendix A.

Condition 36 requires that the annual report the available in the municipal office for viewing by the general public.

Discussion:

The Municipality shall keep a copy of the annual monitoring report at their municipal office for a period of two years following the adoption of the report by Municipal Council.

Condition 37 specifies that Municipality shall submit a detailed site closure plan to the Ministry for approval two years prior to the closing of the site.

Discussion:

Given that there is approximately 45 years remaining capacity at this location, no immediate action is required at this time.

3.2 Waste Deposited During 2000 and Waste Contours

Figure 4 shows the waste contours, as measured in November 2000, in relation to the design contours approved in the Certificate of Approval. We observe that only 174 c.m. of waste has been deposited at the site during 2000 and has been deposited within the approved footprint within Lifts 1A and 2A. The cross-section shown in Figure 5 identifies the existing waste in relation to the approved design cross-section.

3.3 Site Capacity and Remaining Lifts

The 1999 Certificate of Approval identifies the theoretical capacity of the landfill to be 122,386 cubic metres. This capacity includes the volume consumed by the former trench (31,230 c.m.) method, by 10,254 c.m. deposited by the area method up to November 2000 and 80,900 c.m. airspace remaining for future use. The design contours shown in Figure 3 and cross-section reflect the total capacity of 91,150 c.m. that can be developed by the area method. This capacity will be developed in 4 Lifts (as shown in Figure 5 and Table 2) and provide for the disposal needs of the community for many more years. Table 2 presents the capacity of each lift and the estimated time to fill each lift.

TABLE 2 - LIFT CAPACITY

Lift	Volume c.m.	Cumulative capacity remaining c.m.	Anticipated Years	Life Ending
Lift 1	34,688	26,688 Note 1	17	2013
Lift 2	26,176	52,864	15	2028
Lift 3	18,688	71,552	11	2039
Lift 4	11,598	83,150	6	2045

Note 1 – Remaining capacity is counted starting December 1996 and for this reason the 8,000 c.m. already placed above ground is substracted from the volume in column 2.

Remaining Capacity

The previous survey completed for the period December 1996 to December 1999 measured an increase of 2,080 c.m. in the size of the waste pile. The November 2000 survey measured an increase of 174 c.m. This brings the total volume of waste deposited by the area method to 10,254 c.m. and the remaining capacity of 80,900 c.m..

Remaining Service Life

Table 1 (reproduced from Table 2 of the 1997 Operation and Development Report) presents the population and waste generation projections for the former Township of Caledonia for the period 1996-2045 and compares the waste projections to the actual measurements to date.

In comparing the 1997 to 1999 annual measured volume of 700 cubic metres to the estimates presented in Table 1, we observe that the actual generation rates are approximately 50 percent less than the projected rates. One reason for this is that a significant portion of the residential waste from the service area (Township of Caledonia) is diverted to the nearby South Plantagenet site because of the manner in which the garbage collection routes are serviced.

TABLE 1 - POPULATION & WASTE PROJECTIONS

Year	Design Population	Design Waste c.m./yr	Design total cum. c.m.	Actual c.m./yr	Actual Cum.total
1994	1441		0		
1995	1448	0	0		
1996	1456	1456	8000		8000
1997	1464	1464	9464	700	8,700
1998	1471	1471	10935	700	9,400
1999	1479	1479	12414	700	10,080
2000	1487	1487	13901	174	10,254
2001	1494	1494	15395		
2002	1502	1502	16897		
2003	1510	1510	18407		
2004	1518	1518	19925		
2005	1526	1526	21451		
2006	1534	1534	22985		
2007	1542	1542	24527		
2008	1550	1550	26077		
2009	1558	1558	27635		
2010	1566	1566	29201		
2011	1574	1574	30775		
2012	1582	1582	32357		
2013	1590	1590	33947		
2014	1599	1599	35546		
2015	1607	1607	37153		
2016	1615	1615	38768		
2045	1927	85951	83150		

3.4 Summary of Landfill Operations During 2000

During 2000, the Municipality continued with its previous practice of dumping waste over the top or south edge of the waste mound and advancing the face of the waste in a southerly direction within Lifts 1A and 2A. This method does not produce a high compaction of the waste but given the small volume of waste produced annually, it does not have a large impact on the remaining service life.

The Municipality imports the silty sand material for daily cover uses. The compaction of the waste and the spreading of cover material is done by Municipality staff and equipment (backhoe). The waste is covered on a monthly basis during the summer and as required during the winter period. Given that the Municipality accepts almost only dry waste at this location (construction waste, old furniture, scrap metal, white goods, tires, wood products), this compaction frequency does not create undesirable impacts such as odours and wind blown litter. If the Municipality deposits residential waste at this location, as it has done in the past, the compaction frequency should be increased to weekly, as required by the Certificate of Approval.

The landfill is open every second and fourth Saturday of the month between the hours of 9 a.m. and 1 p.m. and while open, is under the supervision of the custodian The site custodian records indicate that there are on average 5 users going to the landfill every second week or 10 users per month. Throughout the year, there has been only one occurrence when waste was refused at the landfill. At the date of survey, the segregated material stockpiles were as follows; wood – 173 c.m., tires – 12 c.m., metal – 49 c.m..

Table 3 provides an assessment of the condition of the facilities located at the landfill site and identifies the work required in 2001 to upgrade deficient items.

TABLE 3 - Condition of Facilities

Description of item	Condition 2000	Work to be done in 2001
Gate & signs	Good	None
Access road & traffic	Good	None
Screening	Good	Maintain trees on south side
Drainage ditches	Good	None
Security & fences	Good	Inspect and maintain fence along the east side.
Trafficability on cover	Good except during spring.	Provide additional cover to maintain trafficability as required.
Soil cover thickness and frequency of application	Frequency monthly.	None.
Waste side slopes	East and West sideslopes are acceptable but south slope is steep.	The Municipality should not increase the height of the waste any further.
Grading on cover	Good	Sufficient grade to promote runoff.
Grade/survey control	Permanent markers were installed at the four corners of the 2.1 ha. footprint during 2000.	Maintain corner posts so that they are not destroyed.
Custodian shelter	Small tin clad wooden shelter	Shelter adequate for this location.
Recycling	Blue box program started during 1995.	Continue with program.
Burn area	Certificate of Approval prohibits the burning of wood.	Burning no longer permitted after October 1, 2000.
Tire stockpile	Fewer than 500 tires on site.	# of tires to be restricted to less than 3000 to prevent impact from fires.
Metal stockpile	Scrap metal collected by local scrap metal dealer as required.	Continue with existing program.
Visual appearance and litter	Good	Conduct monthly inspections and provide cleanup as necessary.
Vegetation	Good	None
Scavenging	Not allowed	None
Waste types	Residential & commercial.	Custodian to maintain a record of the number of users.
Record keeping	COA requires weekly records to be kept.	Custodian to maintain records on days when site is open.
CFC handling	Only accept tagged appliances.	Continue with program.

The total cost for waste management services for 2000 was as follows;

Table 4 - Costs

DESCRIPTION	Year 2000
COSTS:	
- Waste Collection (Note 1)	-
- Waste Disposal	3,827
- Engineering & Monitoring	18,125
- Blue Box Recycling (Note 1)	20,031
- Other waste diversion (Note 1)	-
- Other (legal)	2,797
TOTAL COSTS	$ 44,780
REVENUES: Tipping fees	$ 524
NET COSTS	$44,256

Note 1 - Cost prorated based on population of Caledonia (1450) vs entire Nation Municipality (10,460) or 14 %.

Based on the above table, the cost to dispose of waste at this landfill is approximately $ 40 per c.m. ($ 44,256-20,031) ÷ 563 (2,245 c.m. ÷ 4 years).

3.5 Proposed Changes to Landfill Operations for 2001

During the year 2000, the height of the waste pile should not increase as the active face of the waste proceeds southerly within Lifts 1A and 2A. The active face can be advanced approximately 30 metres before reaching the south boundary of the approved footprint.

As shown in Table 3, the improvements to be made to operations during 2001 include:

- no further burning of wood waste ;
- maintain weekly site records of inspections and the number of users;
- plant trees within the 30 metres wide on site buffer along the east side to provide a visual buffer.
- the Municipality should finalize the purchase of the 30 metres wide buffer along the east side and amend their Certificate of Approval to incorporate the buffer.

4.0 HYDROGEOLOGICAL MONITORING - IMPACT ON OPERATIONS

A hydrogeological and surface water monitoring report for the Caledonia Landfill was completed by Golder Associates Ltd. for 2000 and is presented in Part B of this report. The results of the hydrogeological and surface water monitoring for 2000 is consistent with the previous findings and does not necessitate changes to the method of operation for the year 2001.

5.0 WASTE DIVERSION INITIATIVES

The MOEE established waste reduction targets of 25 % by 1992 and 50 % by the year 2000. Municipalities throughout Ontario should attempt to meet these same targets by establishing procedures that will promote waste reduction, reuse and recycling. The former Township of Caledonia, now Nation Municipality, implemented the following programs towards achieving the year 2000 waste reduction target;

- promotes backyard composting to divert organic material such as kitchen waste and yard waste.
- segregates scrap metal, CFC, natural wood products and tires at the landfill.
- operates a curbside multi material blue box program that was started during 1995.
- participates in household hazardous waste day events (not held every year).

During 1997, the Municipality established a procedure for the handling of metal goods containing CFC's that enter the landfill. Metal goods containing CFC's such as refrigerators, coolers, air conditioners, freezers, heat pumps and other similar objects must be tagged by an authorized technician before it is accepted at the landfill.

The Municipality blue box recycling program that was started during 1995 successfully diverted 95.8 tonnes of material from disposal during 2000. Table 5 identifies the type and total quantity of recyclable material collected by the blue box program within Caledonia. The recyclable material is processed at the RARE recycling plant in Alexandria.

TABLE 5 - Blue Box Recycling Program

Material	Tonnage 2000	Collection and Processing Costs
Newspaper & mixed OCC & boxboard Clear glass Coloured glass Steel & Al. Cans Plastics	34.5 27.7 6.4 6.1 12.2 8.8	
TOTAL	95.8 tonnes Note 1	$ 143,082 for entire municipality and prorated to $ 20,031 based on population.

Note 1 – entire municipality prorated at 14% for Caledonia based on population.

Based on the above tonnage, the blue box recycling program represents a diversion of approximately 913 c.m. from landfill and is more than the annual waste volumes measured for the year 2000 and 1999.

6.0 OTHER ISSUES

6.1 Long term planning for waste disposal

Given that there is a significant remaining capacity within the Caledonia landfill, the Nation Municipality does not need to undertake any long term planning to find additional waste disposal capacity to service the former Township of Caledonia residents.

6.2 Review of complaints, inspections and correspondence

The MOE did not conduct a compliance inspection of the landfill during 2000.
The Nation Municipality confirmed that there has been no complaints listed during 2000.
The only correspondence received from the Ministry was regarding the review of the 1999 monitoring report. These review comments are addressed in the Golder Associates monitoring report.

7.0 RECOMMENDATIONS

The following recommendations are made to improve operations during 2001. These recommendations are additional to the Golder Associates comments made elsewhere in this report.

.1 The municipality should finalize the purchase of the 30 metres wide buffer along the east side and amend the total site area of the Certificate of Approval.

.2 The municipality should plant trees between the edge of waste and the east fence line, as shown in Figure 3.

.3 The municipality should continue with the existing waste reduction initiatives (blue box, hazardous waste day, segregation of CFC, white goods, tires, metal, natural wood products).

.5 All wood products are to be chipped using the municipality's chipper or other equipment rented for this task. The frequency of chipping shall depend on the volume of wood stored.

.6 Provide training to site operator on conditions contained within the Certificate of Approval.

.7 If the municipality brings residential (household) waste into the site, the frequency of compaction and covering of the waste should be weekly, as specified in the Certificate of Approval.

.8 The municipality should not increase the height of the waste any further as the active face advances southward. The municipality can only advance the face another 30 metres southerly before reaching the south limit of the footprint.

APPENDIX A

CERTIFICATE OF APPROVAL

Ministry of the Environment

Ministère de l'Environnement

Ontario

Environmental Assessment and Approvals Branch
2 St. Clair Ave West, 12A Floor
Toronto ON M4V 1L5

Direction des évaluations environnementales et des autorisations
2, avenue St. Clair Ouest, 12A étage
Toronto ON M4V 1L5

Tel/Tél (416) 314-7967
Fax/Téléc (416) 314-8452

1 October 1999

Ms. Mary McCuaig, Clerk
The Corporation of the Nation Municipality
958 Highway 500 West
R.R. #3
Casselman, Ontario
K0A 1M0

Dear Ms. McCuaig:

Attached is a new Provisional Certificate of Approval No. A 471003 for the Caledonia Landfill Site is to accommodate the request by the former Township of Caledonia in their application and letter, both dated June 26, 1997, to incorporate the Operation, Development and Closure Report and a Hydrogeological Report, dated March 1997 into the Certificate and legal plan prepared by Schultz dated October 11, 1996, and to increase the total site area from 12 to 14.58 hectares and recognize a change from a trench to an area method of fill to develop the remaining approved capacity, and to recognize a change in name from the Town of Caledonia to Corporation of the Nation Municipality.

In addition, please note that we have also taken this opportunity to upgrade the Certificate so that eventually the landfill Site will meet the Ministry's current standards and procedures for operation. It is recommended that you review this Certificate in detail, so that the terms and conditions by which this Site may be operated are fully understood.

Reasons for the Conditions in this Certificate and procedures to be followed should you wish to appeal, are provided as part of the Certificate.

If you have any questions, please do not hesitate to contact Ms. Ellen R. Reed at (416) 314-8320.

Yours truly,

A. Dominski P. Eng., Supervisor
Waste Approvals

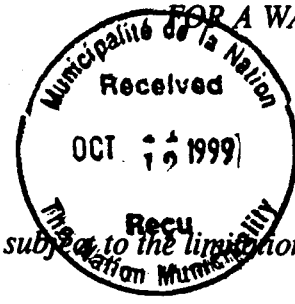
ER/lf
Encl.
c: District Manager, Kingston

Ontario

Ministry of the Environment

Ministère de l'Environnement

PROVISIONAL CERTIFICATE OF APPROVAL
FOR A WASTE DISPOSAL SITE
NO. A 471003



Under the Environmental Protection Act and the regulations and subject to the limitations thereof, this Provisional Certificate of Approval is issued to:

Corporation of the Nation Municipality
958 West Route 500
R.R. #3
Casselman, Ontario
K0A 1M0

for the use and operation of a 4.0 hectare landfill within a 14.57 hectare total Site area;

all in accordance with the following plans and specifications:

The application and supporting information as listed in Schedule "A", which is attached to this Provisional Certificate of Approval and forms part of this Certificate;

Located: Lot 23, Concession 6
within the former Township of Caledonia, now the Corporation of the Nation Municipality

which includes the use of the Site only for the receiving and disposal *of the following categories of waste (Note: Use of the Site for additional categories of wastes requires a new application and amendments to the Provisional Certificate of Approval)* municipal and non-hazardous solid industrial waste including white goods, tires and woodwaste.

and subject to the following conditions:

A. DEFINITIONS

For the purpose of this Provisional Certificate of Approval:

(a) "Act" and "EPA" mean the Environmental Protection Act, R.S.O. 1990, C. E-19 as amended;

(b) "Applicant", "Owner" and "Operator" mean the Corporation of the Nation Municipality, including its officers, employees, agents or contractors;

(c) "buffer area" means that part of a landfilling site that is not used as a waste fill area;

(d) "Certificate" means this entire Provisional Certificate of Approval including its schedules, if any, issued in accordance with Section 27, Part V of the Environmental Protection Act;

(e) "Director" means a Director, Environmental Assessment and Approvals Branch of the Ministry of the Environment;

(f) "District Manager" means the District Manager of the Kingston District Office, Eastern Region of the Ministry;

(g) "Ministry" means the Ontario Ministry of the Environment (MOE);

(h) "O. Reg 347" means Ontario Regulation 347, R.R.O. 1990, as amended;

(i) "PWQO's" means Provincial Water Quality Objectives;

(j) "Reasonable Use Guideline" means the Ministry Guideline No. B-7 entitled, "Incorporation of the Reasonable Use Concept into MOE Groundwater Management Activities", dated April 1994, or as amended;

(k) "Site" means the landfill site as described in this Certificate;

(l) "waste fill area" means the area on the surface of the landfilling site beneath which or above which waste is disposed by landfilling; and

(m) "woodwaste" is as defined in Ontario Regulation 347, R.R.O., 1990, as amended.

B. GENERAL

1. (a) The Provisional Certificate of Approval No. A 471003, dated April 16, 1980 is hereby revoked and replaced by this Certificate; and

   (b) Notwithstanding Condition 8, nothing in Condition 1(a) revokes any ongoing obligations and requirements imposed and initiated as the result of the issuance or existence of the previous Certificate for this Site unless specifically stated in this Certificate.

2. Except as otherwise provided by these Conditions, the Site shall be operated, in accordance with the Applications for a Certificate of Approval for a Waste Disposal Site, dated July 17, 1972 and June 26, 1997, and its supporting documents as listed in Schedule "A".

3. The requirements specified in this Certificate are the requirements under the Environmental Protection Act, R.S.O. 1990. The issuance of this Certificate in no way abrogates the Applicant's legal obligations to take all reasonable steps to avoid violating other applicable provisions of this legislation and other legislation and regulations.

4. The requirements of the Certificate are severable. If any requirement of this Provisional Certificate of Approval, or the application of any requirement of the Provisional Certificate of Approval to any circumstance, is held invalid, the application of such requirement to other circumstances and the remainder of the Provisional Certificate of Approval shall not be affected in any way.

5. The Applicant shall ensure compliance with all the terms and conditions of this Certificate. Any non-compliance constitutes a violation of the Environmental Protection Act, R.S.O. 1990 and its grounds for enforcement.

6. (a) The Applicant shall, forthwith upon request of the Director, District Manager, or Provincial Officer (as defined in the Act), furnish any information requested by such persons with respect to compliance with this Certificate, including but not limited to, any records required to be kept under this Certificate; and

(b) In the event, the Applicant provides the Ministry with information, records, documentation or notification in accordance with this Certificate (for the purposes of this condition referred to as "Information"),

i. the receipt of Information by the Ministry;
ii. the acceptance by the Ministry of the Information's completeness or accuracy; or
iii. the failure of the Ministry to prosecute the Applicant, or to require the Applicant to take any action, under this Certificate or any statute or regulation in relation to the Information;

shall not be construed as an approval, excuse or justification by the Ministry of any act or omission of the Applicant relating to the Information, amounting to non-compliance with this Certificate or any statute or regulation.

7. The Applicant shall allow Ministry personnel, or a Ministry authorized representative(s), upon presentation of credentials, to:

(a) carry out any and all inspections authorized by Section 156, 157 or 158 of the Environmental Protection Act, R.S.O. 1990, Section 15, 16 or 17 of the Ontario Water Resources Act, R.S.O. 1990, or Section 19 or 20 of the Pesticides Act, R.S.O. 1990, as amended from time to time, of any place to which this Certificate relates; and

without restricting the generality of the foregoing, to:

(b) i. enter upon the premises where the records required by the conditions of this Certificate are kept;

ii. have access to and copy, at reasonable times, any records required by the conditions of this Certificate;

iii. inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations required by the conditions of this Certificate; and

iv. sample and monitor at reasonable times for the purposes of assuring compliance with the conditions of this Certificate.

8. (a) Where there is a conflict between a provision of any document referred to in Schedule "A" and the conditions of this Certificate, the conditions in this Certificate shall take precedence; and

(b) Where there is a conflict between documents listed in Schedule "A", the document bearing the most recent date shall prevail.

9. The Applicant shall ensure that all communications/correspondence made pursuant to this Certificate includes reference to the Certificate approval number A 471003.

10. The Applicant shall notify the Director in writing of any of the following changes within thirty (30) days of the change occurring:

(a) change of Applicant or Operator of the Site or both;

(b) change of address or address of the new Applicant;

(c) change of partners where the Applicant or Operator is or at any time becomes a partnership, and a copy of the most recent declaration filed under the Business Names Act, 1991 shall be included in the notification to the Director; and

(d) any change of name of the corporation where the Applicant or Operator is or at any time becomes a corporation, and a copy of the most current "Initial Notice or Notice of Change" (form 1 or 2 of O. Reg. 182, Chapter C-39, R.R.O. 1990 as amended from time to time), filed under the Corporations Information Act shall be included in the notification to the Director.

11. In the event of any change in ownership of the Site, the Applicant shall notify, in writing, the succeeding owner of the existence of this Certificate, and a copy of such notice shall be forwarded to the Director.

12. Any information relating to this Certificate and contained in Ministry files may be made available to the public in accordance with the provisions of the Freedom of Information and Protection of Privacy Act, R.S.O. 1990, C. F-31.

13. All records and monitoring data required by the conditions of this Certificate shall be kept on the Owners's premises for a minimum period of two (2) years from the date of their creation.

14. The obligations imposed by the terms and conditions of this Certificate are obligations of due diligence.

C. PROHIBITION AND REGISTRATION ON TITLE

15. (a) Pursuant to Section 197 of the EPA, neither the Applicant nor any person having an interest in

the Site shall deal with the Site in any way without first giving a copy of the Provisional Certificate of Approval to each person acquiring an interest in the Site as a result of the dealing;

(b) Within sixty (60) calendar days of the date of this Certificate of Approval, submit to the Director for the Director's signature two (2) copies of a completed Certificate of Prohibition containing a registerable description of the Site, in accordance with Form 1 of O. Reg. 14/92; and

(c) Within ten (10) calendar days of receiving the Certificate of Prohibition, the Applicant shall register the Certificate of Prohibition in the appropriate Land Registry Office on title and immediately following registration, submit to the Director the duplicate registered copy.

D. WASTE TYPE

16. (a) Except as noted under Condition 16(c) and (d), only municipal, non-hazardous solid industrial waste and woodwastes as define under O. Reg 347, pursuant to the EPA, shall be accepted at this Site;

(b) No hazardous waste or liquid industrial waste, as defined in O. Reg 347, pursuant to the Environmental Protection Act, or any other waste not listed under Condition 16(a) shall be accepted or deposited at this Site;

(c) The total amount of tires received and stored on the Site shall not exceed 3000 tire units at any one time; and

(d) The Site is approved to accept white goods and white goods containing Refrigerant.

E. SERVICE AREA

17. Waste approved for disposal or use at this Site may only be received from, and as generated within, the boundaries of the former geographic Township of Caledonia.

F. DESIGN AND OPERATIONS REPORT

18. Within six (6) months of the issuance of this Certificate, the Applicant shall prepare and submit to the Director, for approval, a Development, Operation and Closure addendum report which details the final design and operational plans for the Site which will include, a surveyed plan, final design drawings and specifications for the Site for his/her approval. The report shall be prepared to reflect the conceptual design and operation of this Site as modified by the Conditions in the Certificate. The report shall include the following information:

(a) geographical area served, waste types and quantities received on daily/yearly basis including anticipated future types and quantities and waste diverted through on-site recycling programs initiated under Ontario Regulation 101, R.R.O. 1990 or in a similar manner;

(b) Site capacity (cubic metres), remaining capacity, historical volume, updated drawings showing the waste fill area (footprint), closed fill areas, buffer areas, and special usage areas (e.g. recycling facilities, burning areas, etc.);

(c) detailed operational and management plans for all special usage areas;

(d) a supplemental hydrogeological investigation to address the effect of landfilling with respect to compliance with the Reasonable Use Guideline;

(e) method of landfill operation;

(f) Site development stages and sequence;

(g) dimensions of working face, cells and lifts;

(h) cover material type, quantities required and quantities available for interim and final use, location and dimensions of stockpiles;

(i) daily and/or intermediate cover procedures;

(j) final cover and final contour design;

(k) buffer zones and landscaping details including buffer zones for existing fill areas;

(l) equipment and staffing requirements;

(m) Site fencing, gates, signs, security, and supervision;

(n) Site buildings, weigh scales, access roads and on-site roads;

(o) procedures for mitigation of environmental impacts from dust, litter, odour, noise, vector and vermin, and for the handling of complaints related to this Site;

(p) if applicable, design details of the leachate collection system (underdrains, toe drains, manholes, collector sewers, holding ponds, pumping station), leachate management and disposal;

(q) if applicable, details of a program for the inspection, maintenance, repair and replacement of all components of the leachate collection system, including estimates of service life of the system components, frequency and number of replacements, and procedures to ensure that the service life exceeds the contaminating life span of the landfill;

(r) if applicable, surface water control and management plans, specifications and descriptions of the design features, control facilities such as berms, drainage ditches, control ponds and operational

procedures to isolate, contain, convey, control and/or treat the surface water on and off site prior to its discharge to the receiving water course(s);

(s) where applicable, contingency plans for groundwater, surface water, leachate, and landfill (methane) gas management, including trigger mechanisms to determine if the contingency plan is to be implemented;

(t) inclement weather operations;

(u) annual reporting on Site operations and required monitoring;

(v) Site closure activities;

(w) post-closure maintenance, monitoring and reporting; and

(x) the addition, revision or deletion of other information agreed to, or as instructed, in writing, by the Director or the District Manager, prior to and after the issuance of this Certificate.

19. Notwithstanding Condition 18, the Site may be operated under the Site development and operating report in item #3 and #11 of Schedule "A" of this Certificate, except as otherwise noted in this Certificate, provided all the provisions in Condition 18 have been addressed in the report or the District Manager has agreed, in writing, to any omissions and revisions noted in those provisions.

G. MONITORING PROGRAMS

20. In conjunction with Condition 18, the Applicant shall submit, to the Director, for approval, detailed monitoring programs for surface water, groundwater, leachate. If warranted, at some later date or at the request of the District Manager, the Applicant shall submit, to the Director, for approval, detailed monitoring programs for landfill gas, and noise, as well as dust, odour and traffic. A sufficient number of monitoring wells shall be placed in such a manner to provide pertinent information with respect to the horizontal and vertical extent of the leachate contamination plume and compliance at the property boundary.

21. As part of the annual report, described in Condition 35, the Applicant shall provide the District Manager with an impact assessment report. The report shall, with respect to surface water and groundwater quality and quantity, include trigger values for remedial or corrective action due to surface and/or groundwater impacts associated with landfilling.

22. Dependant upon the results of the report referred to in Condition 21, the Applicant shall submit, along with the annual report, to the District Manager, for the approval of the Director, a contingency plan and schedule detailing the remedial measures which will be initiated for controlling and/or treating any water quality impacts above the Reasonable Use Guidelines (Policy B-7) and/or the PWQO's which are detected

or predicted to occur at or beyond the present property boundary. Implementation of the contingency plan shall be initiated no later than 60 days of approval by the Director.

H. EXISTING WELLS

23. Any wells or monitoring wells on the Site, which are no longer required for monitoring or which need to be closed due to operational changes on the Site, shall only be abandoned according to Ontario Regulation 903, R.R.O. 1990. Wells shall be sealed following the procedures outlined in the Ministry Information Sheet entitled, "Water Wells and Groundwater Supplies: Recommended Methods for Plugging Abandoned Water Wells", dated June 1994, or as revised.

L. STORMWATER MANAGEMENT AND LANDFILL GAS MANAGEMENT

24. (a) The Applicant must comply with the approval requirements of Section 53 of the Ontario Water Resources Act prior to the construction or modification of any element of a stormwater management system at this Site; and

(b) Any landfill gas release equipment shall not be installed unless a Certificate of Approval (Air) has been issued under the Environmental Protection Act.

J. LANDFILL OPERATIONS

25. Notwithstanding the requirements under other Conditions of this Certificate, the Applicant shall be responsible for the following:

(a) the burning of woodwaste on the Site for one year from the time of issuance of this Provisional Certificate of Approval provided that:

i. the burning of woodwaste is continuously supervised; carried out in compliance with the Ministry of the Environment "Guidelines for Burning at Landfill Sites in Ontario"; and adheres to any other burning regulations and restrictions in effect for the area, (example: burning restrictions by the MNR); that no other wastes are burned on the Site; and, that the location for burning is segregated from the areas used for landfilling and recycling and that the burning does not impede or cause risk to the landfilling operation or any recycling facilities on the Site; and

ii. at any time that the Ministry receives a complaint, and upon notice of the District Manager, the Applicant shall cease all burning activities at this Site;

(b) maintaining a detailed log for all white goods containing refrigerant received at this Site; as a minimum, the log shall include the date of the record, types, quantities and source of white goods received, details on removal of refrigerants as required by Ontario Regulation 189/94, and the quantities and destination of the white goods and/or refrigerant materials transferred from the Site;

(c) ensuring that the Refrigerant associated with white goods are removed within six (6) months from the time of receipt at the Site and by a licensed technician in accordance with Ontario Regulation 189/94; and transported and disposed in accordance with Ontario Regulation 347, R.R.O. 1990, as amended;

(d) ensuring that all white goods accepted at the Site, which have not been tagged by a licensed technician to verify that the refrigeration equipment no longer contains any refrigerant, are stored in an upright position, in an area with a security fence, so that the white goods containing refrigerant is segregated from all other waste, recycling and public access areas, and in such a manner to allow for the safe handling and removal of refrigerant;

(e) conducting a weekly inspections of the Site to ensure that there are no environmental or operational problems which may impact on the quality of the environment or cause an "adverse effect", as defined under the EPA;

(f) ensuring that each weekly inspection, as described in Condition 25(e), shall be recorded in an inspection book to be maintained by the Applicant and any deficiencies detected during these inspections, that might negatively impact the environment, are promptly corrected and recorded;

(g) ensuring that all necessary measures are taken to contain and minimize any air emissions (example: noise, odour, gas, dust, smoke, etc.) which may result from the operation of this Site; and, that the Site is operated in compliance with all applicable legislation governing these emissions;

(h) ensuring that personnel supervising the landfilling operation are aware of the types of waste which may be disposed at this Site; and that they are knowledgeable about the requirements of this Certificate and the Site operation;

(i) maintaining the fencing around the Site and ensuring that the Site gate is securely locked when the Site is not operational;

(j) ensuring that on-site roads are treated with water and/or dust suppression materials when necessary to minimize dust generation;

(k) ensuring that, if applicable, leachate collection systems are constructed, operated and maintained in a manner that minimizes the effects of leachate accumulation;

(l) ensuring that, if applicable, the leachate collection system is inspected and maintained regularly throughout the contaminating life span of the landfill;

(m) ensuring that waste is deposited in a manner that minimizes the size of the working face and that the waste is properly compacted before cover material is applied;

(n) ensuring that active fill area is covered on a regular weekly basis;

(o) ensuring that a final cover material layer of at least 750mm in depth is applied and vegetation initiated in any part of the landfill area that has reached its approved contour, unless otherwise approved by the Director;

(p) ensuring that cracked or eroded cover material is immediately repaired and re-vegetated;

(q) ensuring that surface ponding of water is kept to a minimum; and

(r) ensuring that erosion and sedimentation is kept to a minimum and that litter is cleaned up, as required.

26. Within 90 days of issuance of this Certificate, the Applicant shall mark the landfill site boundaries with permanent markers, that shall be erected so as to be visible throughout the year for the life of the landfill Site.

K. WASTE DELIVERY/REMOVAL

27. (a) Waste managed at this Site shall only be generated and received from residents within the approved service area for this Site; or under an approved Waste Management System, as defined under Ontario Regulation 347, R.R.O. 1990, hauling only waste which has been generated within the approved service area for this Site; and

(b) Unless otherwise exempted by legislation, waste recyclables, collected and sorted on the Site, shall be removed from the Site under an approved Waste Management System.

28. (a) Notwithstanding Condition 18(b), all waste received at this landfill Site under the authority of this Certificate shall be deposited within the 4 hectare landfill footprint shown on Figure No. 6B, dated March, 1997, defined in Schedule "A";

(b) Notwithstanding Condition 18(b), the total capacity or final volume of waste that can be deposited in this Site shall not exceed 122, 386 cubic metres:

(c) Notwithstanding Condition 18(b), once the final contour elevations identified on Figure No. 7, dated March, 1997, and subsequently revised in a letter dated June 17, 1999, defined in Schedule "A", have been attained no further waste shall be deposited on this landfill Site;

(d) The maximum elevation of waste, including final cover, shall not exceed the final contours, as described under Condition 28(c);

(e) Waste shall only be landfilled within the limits of the waste fill area and the boundary corners of the waste fill area shall be securely staked and the Operator shall ensure wastes are only placed within the boundaries of that area; and

(f) Conditions 28 (a) through (d) are contingent on the Applicant obtaining the acquired minimum 30 metre buffer zone around the perimeter of the waste fill area. The Applicant shall bring the Site into compliance with the required minimum 30 metre buffer zone within 2 years of the issuance of this Provisional Certificate of Approval.

M. ENTRANCE SIGN AND OPERATING HOURS

29. (a) The operating hours of this Site shall be posted on a permanent readable sign at the entrance to the Site. The sign shall include as a minimum, information on waste types which may be accepted at the Site, the area serviced by this Site, Waste Management System requirements for commercial haulers, the license number of the Site and the name of the Applicant's contact telephone number(s) for emergencies (e.g. fire), complaints and enquires; and

(b) Notwithstanding Condition 29(a), the operating hours and routing restrictions shall be in accordance with municipal by-laws.

N. LITTER CONTROL

30. Litter fencing shall be installed, on an as need basis, in order to minimize litter.

31. The Applicant shall inspect all lands and roads in the vicinity of the Site as necessary and shall take responsibility for the removal and disposal of any litter found on those lands and roads as soon as possible thereafter, which includes the cleanup of illegal dumping of waste outside the landfill gate.

O. NOISE CONTROL

32. Noise from or related to the Site shall be kept to a minimum.

P. COMPLAINT PROCEDURES

33. In the event the Applicant receives complaints regarding the Site operations, the Applicant shall respond to these complaints according to the following procedure:

(a) The Applicant shall record each complaint in a log book. The information recorded must include the nature of the complaint, the name, address and the telephone number of the complainant and the time and date of the complaint; and

(b) The Applicant, upon notification of the complaint, must determine the cause(s) of the complaint and , if appropriate, take action to remove the cause(s).

Q. EMERGENCIES

34. In case of a emergency (example: fire) at this Site, the Applicant shall forthwith call the Ministry of the Environment Spills Action Centre **(1-800-268-6060)**. All emergencies shall be recorded in the annual report described in Condition 35.

R. REPORT SUBMISSIONS

35. Notwithstanding the requirements under other Conditions of this Certificate, the Applicant shall submit an annual report on the operation, development and monitoring of the Site to the District Manager, for his information, by March 31st of each year. The report shall cover the calendar year ending the preceding December 31st and shall include the following information as a minimum, where applicable:

    (a) an updated site contour plan(s) showing the fill area, buffer zones, access and on-site roads, berms, buildings, cover material stockpiles, monitoring locations, leachate holding pond(s), leachate collection system, surface water control works, areas that have been filled with waste, and areas to be filled with waste during the next reporting period;

    (b) a summary of weekly quantities of waste received, waste landfilled, and cover materials used;

    (c) the results of any other inspections initiated under Conditions 18;

    (d) an estimate of the remaining Site capacity and Site life;

    (e) an assessment of the operation and performance of all leachate collection facilities;

    (f) any operational or environmental problems, that might negatively impact the environment, encountered and any mitigative actions taken;

    (g) the data and interpretive analyses of the data from all monitoring programs;

    (h) an assessment of the need for any remedial measures;

    (i) the status of compliance with all Conditions of this Certificate, including inspection and reporting requirements;

    (j) any recommendations for changes to the operation, development and monitoring of the Site; and

    (k) any other information required under this Certificate or which the Director or the District Manager may require from time to time.

36. The annual report described in Condition 35 shall be available in the municipal office of the Corporation of the Nation Municipality for viewing by the general public.

S. CLOSURE PLAN

37. Notwithstanding Condition 18, two (2) years prior to the time when the applicant expects the Site to be at capacity, the Applicant shall submit to the Director, for approval, a detailed Site closure plan pertaining to the termination of landfilling operations at this Site, post-closure inspection, maintenance and monitoring, and end use, or the Applicant shall submit a application for the expansion of the Site.

SCHEDULE "A"

This Schedule "A" forms part of Provisional Certificate of Approval No. A 451003:

1. Application from the Township of Caledonia, dated July 17, 1972.

2. Provisional Certificate of Approval A 471003, dated April 16, 1980.

3. Letter from Joanne Bougie-Normand, the Township of Caledonia to the Ministry of the Environment (MOE) enclosing an Application for an amendment for a Waste Disposal Site, dated June 26, 1997, and two reports titled "Landfill Development, Operation and Closure Report for Waste Disposal Site" and "Hydrogeological Assessment", both dated March, 1997.

4. Memo from V. Castro, MOE to J. Mulder, MOE, dated October 22, 1997 providing comments on the proposed application for an amendment dated June 26, 1997.

5. Memo from F. Crossley MOE to J. Mulder, MOE, dated December 22, 1997 providing comments on the proposed application for an amendment dated June 26, 1997.

6. Facsimile from Jim Mulder, MOE to Gerry Lalonde, Stanley Consulting Group Ltd., dated April 29, 1998, requesting additional information.

7. Letter from H. Francois, Corporation of the Nation Municipality, to M. Robert, MOE, dated July 16, 1998 confirming that site is zoned appropriately.

8. Letter from Gerry Lalonde, Stanley Consulting Group Ltd., to Marc Robert, MOE, dated July 24, 1998 responding to the request for additional information in item #6 of Schedule "A".

9. Letter from Gerry Lalonde, Stantec Consulting Ltd., to A. Dominski, MOE, dated April 19, 1999, providing an update with respect to pursuing the purchase of additional lands and implementation of a revised groundwater and surface water monitoring program.

10. Letter from Gerry Lalonde, Stantec Consulting Ltd., to M. Robert, MOE, dated May 28, 1999, providing copies of correspondence per the Ministry's request.

11. Letter from Gerry Lalonde, Stantec Consulting Ltd., to E. Reed, MOE, dated June 17, 1999, revising the calculation for the theoretical capacity of the landfill.

12. Letter from M. McCuaig, Corporation of the Nation Municipality to A. Dominski, MOE, dated June 17, 1999, requesting that the owner's name be changed from the Township of Caledonia to the Nation Municipality.

13. Facsimile from M. McCuaig, The Nation Municipality to E. Reed, MOE, dated June 23, 1999, confirming that the legal name is Corporation of the Nation Municipality.

The reason for the imposition of these changes is:

To bring the Site into compliance with current operating procedures for landfill Sites and to accommodate the request by the Township of Caledonia in their application and letter, both dated June 26, 1997, to incorporate the Operation, Development and Closure Report and a Hydrogeological Report, dated March 1997 into the Certificate and legal plan prepared by Schultz dated October 11, 1996, and to increase the total site area from 12 to 14.58 hectares and recognize a change from a trench to an area method of fill to develop the remaining approved capacity, and to recognize a change in name from the Town of Caledonia to Corporation of the Nation Municipality.

Specific reasons for the conditions are as follows:

1. Conditions 1, 3, 4, 5, 8, 9, 10, 11, 12, 13 and 15 are to clarify the legal rights and obligations of this Certificate.

2. Condition 7 is to ensure that the appropriate Ministry staff have ready access to the waste Site to inspect the operations that are approved under this Certificate. The condition is supplementary to the powers of entry afforded a Provincial Officer pursuant to the Environmental Protection Act, as amended.

3. Conditions 2 and 6 are to ensure that the waste disposal Site is operated in accordance with the application for this Certificate and supporting information and not in any way or under any name which the Director has not been asked to consider; and to ensure the property is cleaned up and restored to the satisfaction of the Ministry.

4. Condition 14 is required to clarify that the terms and conditions of this Certificate impose a standard of due diligence and not absolute liability.

5. Conditions 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, and 34 are to ensure that the Site is used only for the wastes and quantities specified; that the Site is properly supervised, monitored, operated and closed in an organized and secure manner by trained persons in order to prevent environmental detriment and to ensure the safety of the general public and site personnel; that the collection, handling, and transportation of all waste materials are conducted in an environmentally acceptable manner in accordance with Provincial regulations; and that emergencies are properly recorded.

6. Conditions 35, 36 and 37 are to provide the Operator and the Ministry of the Environment with an assessment of waste landfill Site operation.

In accordance with Section 139 of the Environmental Protection Act, R.S.O. 1990 c. E-19, you may by written notice served upon me and the Environmental Appeal Board within 15 days after receipt of this Notice, require a hearing by the Board. Section 142 of the Environmental Protection Act, as amended provides that the Notice requiring a hearing shall state:

1. The portions of the approval or each term or condition in the approval in respect of which the hearing is required, and;
2. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

In addition to these legal requirements, the Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The Certificate of Approval number;
6. The date of the Certificate of Approval;
7. The name of the Director;
8. The municipality within which the waste disposal site is located;

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

The Secretary,
Environmental Appeal Board,
2300 Yonge St., 12th Floor,
P.O. Box 2382
Toronto, Ontario.
M4P 1E4

AND

The Director,
Section 39, Environmental Protection Act,
Ministry of the Environment,
2 St. Clair Avenue, 12A Floor,
Toronto, Ontario.
M4V 1L5

DATED AT TORONTO this 1st *day of* October, 1999.

A. Dominski, P. Eng.,
Director,
Section 39,
Environmental Protection Act

ER/lf
c: District Manager, Kingston

PART B

2000 GROUNDWATER AND SURFACE WATER MONITORING PROGRAM

GOLDER ASSOCIATES LTD.

Golder Associates Ltd.

1796 Courtwood Crescent
Ottawa, Ontario, Canada K2C 2B5
Telephone (613) 224-5864
Fax (613) 224-9928

REPORT ON

2000 GROUNDWATER AND SURFACE WATER MONITORING PROGRAM CALEDONIA LANDFILL SITE CORPORATION OF THE NATION MUNICIPALITY ONTARIO

Submitted to:

Corporation of the Nation Municipality
958 Road 500 West
R.R. #3
Casselman, Ontario
K0A 1M0

DISTRIBUTION:

7 copies - Corporation of the Nation Municipality
2 copies - Stantec Consulting Ltd.
2 copies - Golder Associates Ltd.

March 2001

001-2783

EXECUTIVE SUMMARY

Golder Associates Ltd. (Golder Associates) was retained by the Corporation of the Nation Municipality to conduct the 2000 groundwater and surface water monitoring program at the Caledonia Landfill Site located immediately north of Concession Road 7, between Caledonia Road and County Road 22 (St. Bernadin Road), on Part 1 of Lot 23, Concession VI, in the Nation Municipality, Ontario.

The field investigation activities included water level measurements and sampling of groundwater monitoring wells in August and November of 2000; and the sampling of surface water monitoring stations in August, November and December of 2000.

Based on the borehole data from previous hydrogeological investigations, the most common geological unit underlying the site consists of a silty sand deposit. Groundwater elevations measured during the August 2000 and November 2000 monitoring sessions indicate that the direction of groundwater flow in the silty sand at the site is interpreted to be to the north/ northeast (i.e., similar to that reported previously).

Based on an interpretation of the existing groundwater quality data, it is concluded that the landfill site is in compliance with MOE Guideline B-7 (the "Reasonable Use Guideline") with the exception of the east property boundary. The proposed addition of a 30 metre buffer along the east side of the landfill site will address this non-compliance issue.

Based on the 2000 surface water quality data, it is concluded that the landfill site is not impacting adversely on surface water quality in Paxton Creek.

A proposed groundwater and surface water monitoring program for 2001 is also provided.

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1.0 INTRODUCTION

This report summarizes the 2000 groundwater and surface water monitoring program carried out at the Caledonia Landfill Site in the Nation Municipality, Ontario. The scope of work was described in the Golder Associates letter dated July 25, 2000.

The site is located immediately north of Concession Road 7, between Caledonia Road and County Road 22 (St. Bernadin Road), on Part 1 of Lot 23, Concession VI, in the Nation Municipality (see Key Plan, Figure 1). The landfill is located in a rural setting approximately four kilometres southwest of the Village of St. Bernadin. The site, which is owned and operated by the Corporation of the Nation Municipality, comprises an area of 14.57 hectares and currently operates under Provisional Certificate of Approval A471003. The landfill, which is licensed for the disposal of "municipal and non-hazardous solid industrial wastes including white goods, tires and woodwastes", occupies a 4.0 hectare area of the site. This area is bounded by an escarpment to the north, the property line to the east, and tree stands to west and south of the cleared area of the property (Beatty Franz and Associates Ltd., 1997). Both the former area of landfilling (defined by an area of replanted pine trees) and the area currently being landfilled are located on the Site Plan (see Figure 2).

The site is bounded by agricultural land to the east and west, a point just north of Paxton Creek to the north, and Concession Road 7 to the south. The nearest point of the Nation River is located almost four kilometres northwest of the site. Surface water drainage observations are consistent with those made in the past. Surface water flows north following the surface topography of the site. Surface water from the east side of the property flows north into a stream which empties into Paxton Creek. Paxton Creek then flows in a northwest direction. Surface water from the west side of the property flows north into a small ephemeral stream which drains through a swampy area, which likely discharges into Paxton Creek.

A previous site investigation was performed by Beatty Franz and Associates Ltd. in 1996. As part of that hydrogeological assessment, four boreholes were drilled and completed with monitoring wells in November 1996. Additional monitoring wells were installed in May 1999 by Golder Associates as part of the 1999 hydrogeological investigation and groundwater and surface water monitoring program (Golder Associates, 2000).

1.1 Project Objectives

The objectives of the 2000 groundwater and surface water monitoring program (as described in the Golder Associates letter dated July 25, 2000) are summarized as follows:

- Measurement of groundwater levels in the summer and fall of 2000;
- Collection of groundwater samples from monitoring wells in the summer and fall of 2000;
- Establish a surface water monitoring station in Paxton Creek during the August 2000 monitoring session as a downstream point of compliance at the western site boundary;
- Collection of samples from surface water monitoring locations in the summer, fall and winter of 2000; and
- Preparation of an annual groundwater and surface water monitoring report consistent with the relevant sections of Condition 35 on Provisional Certificate of Approval A471003.

2.0 FIELD MONITORING PROCEDURES

The scope of the 2000 monitoring program for the Caledonia Landfill Site in the Nation Municipality was described in the Golder Associates letter dated July 25, 2000. The groundwater and surface water components of the monitoring program are described in the following sections.

2.1 Groundwater Monitoring Program

The groundwater monitoring and sampling program was carried out at the Caledonia Landfill Site in two sessions: August 2000 (summer session) and November 2000 (fall session). The August 2000 monitoring session was performed on August 9, 2000. The November 2000 monitoring session was performed on November 29, 2000.

Prior to each sampling session, groundwater levels were measured in all existing monitoring wells. The groundwater monitoring wells which were included in the groundwater monitoring program, along with their rationale for their inclusion, are described as follows:

Monitoring Well	Rationale
BH96-4	• to monitor background (unimpacted) groundwater quality in the vicinity of the landfill
BH99-6	• to monitor leachate-impacted groundwater quality in close proximity to the present and former landfilling areas
BH96-1	• to monitor groundwater quality at the eastern property boundary of the landfill site
BH96-2, BH96-3, BH99-5	• to monitor groundwater quality downgradient of present and former landfilling areas
BH99-7	• to monitor groundwater quality west of the landfill site

Monitoring wells were developed by the removal of at least three standing volumes of water using the dedicated samplers which consist of a length of high density polyethylene (HDPE) tubing and a Waterra™ Model D-25 foot valve. Sampling of groundwater was performed immediately after well development.

The locations of the monitoring wells established to date in the area of the landfill site are shown on Figure 2.

The temperature, pH and conductivity of the groundwater samples were measured in the field at the time of sample collection. The field conductivity measurements were obtained using a Myron L Conductivity Meter Model EP which was calibrated in the field prior to use. Two field blanks were prepared during the August 2000 monitoring session and one field blank was prepared during the November 2000 monitoring session as part of the project Quality Control/Quality Assurance

(QA/QC) program. All samples were entered on a Chain of Custody form and placed in coolers with ice packs until they were delivered in person to the private analytical laboratory. The groundwater samples were collected, prepared and preserved in the field as follows:

- one 125 millilitre plastic bottle, field filtered to 0.45 microns and preserved to pH<2 with nitric acid for analysis of calcium, magnesium, sodium, potassium, aluminum, barium, beryllium, boron, cadmium, chromium, cobalt, copper, iron, lead, manganese, molybdenum, nickel, phosphorus, silicon, silver, strontium, sulphur, thallium, tin, titanium, vanadium and zinc;

- one 1000 millilitre plastic bottle, unfiltered and unpreserved for analysis of alkalinity, total dissolved solids (TDS), chloride, nitrate, nitrite, phosphate and sulphate;

- one 1000 millilitre plastic bottle, unfiltered and preserved to pH<2 with sulphuric acid for analysis of ammonia, dissolved organic carbon (DOC) and chemical oxygen demand (COD); and

- one 250 millilitre amber glass bottle with foil lined cap, unfiltered and preserved with sulphuric acid (to pH<4) and copper sulphate for analysis of phenols.

In addition to these parameters, monitoring wells BH96-3, BH96-4 and BH99-6 had a US EPA Method 624 VOC (volatile organic compound) analysis performed. The samples for the VOC analysis were collected, prepared and preserved in the field as follows:

- one 40 millilitre amber glass bottle with a Teflon lined septum for the analysis of US EPA Method 624 (1,1,1,2-tetrachloroethane, 1,1,1-trichloroethane, 1,1,2,2-tetrachloroethane, 1,1,2-trichloroethane, 1,1-dichloroethane, 1,1-dichloroethylene, 1,2-dibromomethane, 1,2-dichlorobenzene, 1,2-dichloroethane, 1,2-dichloropropane, 1,3,5-trimethylbenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, benzene, bromodichloromethane, bromoform, bromomethane, cis-1,3-dichlopropylene, carbon tetrachloride, chlorobenzene, chloroethane, chloroform, chloromethane, cis-1,2-dichloroethylene, dibromochloromethane, ethylbenzene, m/p-xylenes, methylene chloride, o-xylene, styrene, trans-1,2-dichloroethylene, trans-1,3-dichloropropylene, tetrachloroethylene, trichlorofluoromethane, vinyl chloride)

All laboratory chemical and physical analyses on groundwater samples were performed by Accutest Laboratories Ltd. in Nepean, Ontario. The Report of Analysis from Accutest Laboratories Ltd. are provided in Appendix A.

2.2 Surface Water Monitoring Program

The surface water monitoring and sampling program was carried out at the Caledonia Landfill Site in three sessions: August 2000 (summer session), November 2000 (fall session) and December 2000 (winter session). The August 2000 surface water monitoring session was performed on August 8, 2000. The November 2000 monitoring session was performed on November 29, 2000 and the December 2000 monitoring session was carried out on December 23, 2000.

As part of the 2000 surface water monitoring program, a surface water monitoring station was established, SW8, as a downstream "point of compliance" in Paxton Creek at the western site boundary (refer to Figure 2).

Surface water samples were collected from surface water monitoring locations SW2, SW3, SW4, SW5, SW6, SW7 and SW8 as located on Figure 2. The surface water monitoring stations which were included in the surface water monitoring program, along with their rationale for their inclusion, are described as follows:

Surface Water Monitor	Rationale
SW6	• to monitor background surface water quality in Paxton Creek upgradient of the landfill site
SW7	• to monitor background surface water conditions in the east drainage stream upgradient of the landfill site
SW3 and SW5	• to monitor the surface water quality in the east drainage stream downgradient of the landfill site
SW2	• to monitor surface water quality in the ephemeral west drainage stream downgradient of the landfill site
SW4	• to monitor surface water quality in the swamp area downgradient of the landfill site
SW8	• to monitor the surface water quality in Paxton Creek at the west property boundary downgradient of the landfill site

Samples could not be collected from monitoring location SW2 during the November 2000 sampling session as this location was found to be dry. All surface water monitoring stations were found to be frozen during the December 2000 sampling session and, as such, no surface water samples could be collected during this sampling session.

The temperature, pH, conductivity and dissolved oxygen (DO) of the surface water samples were measured in the field at the time of sample collection. The field conductivity measurements were obtained using a Myron L Conductivity Meter Model EP which was calibrated in the field prior to use. The field DO measurements were obtained using a YSI Model 51B Dissolved Oxygen Meter, which was calibrated in the field prior to use. All samples were entered on a Chain of

Custody form and placed in coolers with ice packs until they were delivered in person to the private analytical laboratory. The surface water samples were collected, prepared and preserved in the field as follows:

- one 125 millilitre plastic bottle, unfiltered and preserved to pH<2 with nitric acid for analysis of calcium, magnesium, sodium, potassium, barium, beryllium, boron, cadmium, chromium, cobalt, copper, iron, lead, manganese, molybdenum, nickel, phosphorus, silicon, silver, strontium, sulphur, thallium, tin, titanium, vanadium and zinc;

- one 125 millilitre plastic bottle, field filtered to 0.45 microns and preserved to pH<2 with nitric acid for analysis of aluminum;

- one 1000 millilitre plastic bottle, unfiltered and unpreserved for analysis of alkalinity, total dissolved solids (TDS), chloride, nitrate, nitrite, phosphate and sulphate;

- one 1000 millilitre plastic bottle, unfiltered and preserved to pH<2 with sulphuric acid for analysis of ammonia, dissolved organic carbon (DOC) and chemical oxygen demand (COD); and

- one 250 millilitre amber glass bottle with foil lined cap, unfiltered and preserved with sulphuric acid (to pH<4) and copper sulphate for analysis of phenols.

In addition to these parameters, surface water monitoring stations SW6 and SW8 had a US EPA Method 624 VOC (volatile organic compound) analysis performed. The samples for the VOC analysis were collected, prepared and preserved in the field as follows:

- one 40 millilitre amber glass bottle with a Teflon lined septum for the analysis of US EPA Method 624 (1,1,1,2-tetrachloroethane, 1,1,1-trichloroethane, 1,1,2,2-tetrachloroethane, 1,1,2-trichloroethane, 1,1-dichloroethane, 1,1-dichloroethylene, 1,2-dibromomethane, 1,2-dichlorobenzene, 1,2-dichloroethane, 1,2-dichloropropane, 1,3,5-trimethylbenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, benzene, bromodichloromethane, bromoform, bromomethane, cis-1,3-dichlopropylene, carbon tetrachloride, chlorobenzene, chloroethane, chloroform, chloromethane, cis-1,2-dichloroethylene, dibromochloromethane, ethylbenzene, m/p-xylenes, methylene chloride, o-xylene, styrene, trans-1,2-dichloroethylene, trans-1,3-dichloropropylene, tetrachloroethylene, trichlorofluoromethane, vinyl chloride)

All laboratory chemical and physical analyses on surface water samples were performed by Accutest laboratories Ltd. in Nepean, Ontario. The Report of Analyses from Accutest Laboratories Ltd. of Nepean, Ontario are provided in Appendix A.

3.0 GEOLOGICAL CONDITIONS

This section is a brief summary of the geological conditions in the vicinity of the landfill site based on the data available from the boreholes drilled and sampled by Golder Associates in 1999 and Beatty Franz and Associates Ltd. in 1996.

A log of the geological conditions encountered in each borehole drilled during the 1996 and 1999 investigation programs together with details of the monitoring well installations are provided in the Record of Boreholes in Appendix B. It is noted that the boundaries between strata on the Record of Borehole Sheets have been inferred from observations during drilling and non-continuous sampling and, as such, their positions should be considered as transitional in nature rather than an exact plane of geologic change. Natural variations other than those encountered in the boreholes are expected to exist in the area of the landfill site.

3.1 Overburden Geology

Overburden deposits native to the site occur at all boreholes and are fairly consistent throughout the site. Silty sand was encountered to depth at all boreholes with sand present in boreholes BH99-6 and BH99-7 at depths greater than 3.7 metres below ground surface. Topsoil was encountered at boreholes BH99-5, BH99-6 and BH99-7 with an average thickness of approximately 0.2 metres.

Regional surficial geological maps indicate that the silty sand loam is a Champlain Sea deposit. The silty sands are deltaic or estuarine deposits developed as the water level of the Champlain Sea dropped forming residual lakes and streams (Beatty Franz and Associates Ltd., 1997).

Boreholes were terminated in the overburden at a maximum depth of 6.1 metres below ground surface. Bedrock was not encountered at any of the borehole locations.

3.2 Bedrock Geology

Regional geological maps indicate that the bedrock is grey shale with limestone interbeds or grey and black shale.

Ministry of Environment Water Well records indicate that the nearest water well in the vicinity of the landfill encountered bedrock at a depth of approximately 33 metres below ground surface.

4.0 PHYSICAL HYDROGEOLOGY

The water level data obtained during the August 2000 and November 2000 monitoring sessions are presented in Table 1.

Based on the 2000 groundwater elevation data, the groundwater flow direction within the overburden at the site is interpreted to be generally toward the north as indicated on Figure 2. This implies that groundwater flows toward the swamp located to the north of the landfill and toward Paxton Creek. Similar groundwater flow directions were reported in Golder Associates (2000) and Beatty Franz and Associates (1997).

The groundwater levels were found to be slightly lower for the November 2000 monitoring session compared to the August 2000 monitoring session, with the exception of BH96-4. The groundwater elevations for this monitoring well were comparable between annual monitoring programs and between monitoring sessions in 2000.

5.0 GROUNDWATER QUALITY

The groundwater quality in the vicinity of the Caledonia Landfill site was assessed by collecting groundwater samples from existing monitoring wells and submitting them for chemical analyses. The results of the field and laboratory chemical analyses conducted during the 2000 monitoring program are presented in Appendix C-I, along with relevant Ontario Drinking Water Standards (MOE, 2000) and data from previous site investigations (Golder Associates, 2000 and Beatty and Franz Associates, 1997).

Discussions relating to compliance with the Ontario Drinking Water Standards (ODWS) relate specifically to non-health related aesthetic objectives (AO) and health related parameters for which there are established Maximum Acceptable Concentrations (MAC) and/or Interim Maximum Acceptable Concentrations (IMAC).

5.1 Background Conditions

For the purpose of this site assessment, background conditions are assumed to be represented by data collected from monitoring well BH96-4. This monitoring well is located upgradient (south) of the current and former areas of landfilling (Figure 2). This monitoring well is therefore presumed to be unimpacted by landfill leachate.

5.1.1 Inorganic Background Groundwater Quality

The inorganic groundwater quality in the background monitoring well BH96-4 has been generally consistent over time with the exception of slightly variable COD, iron and TDS concentrations. Parameters which are typically elevated in landfill leachate impacted groundwater such as ammonia, chloride, boron, manganese, strontium and sodium have low or non-detectable concentrations in BH96-4.

5.1.2 VOC Concentrations in Background Groundwater

A US EPA Method 624 VOC analysis was performed on groundwater sampled from monitoring well BH96-4 during the August 2000 monitoring session to determine the background groundwater VOC concentrations in the vicinity of the Caledonia Landfill site. No VOCs were detected in the groundwater sampled from BH96-4.

5.2 Leachate Conditions

Leachate conditions at the site are assumed to be represented by water quality from monitoring well BH99-6. This monitoring well is located between the active (immediately downgradient) and former landfill areas.

5.2.1 Inorganic Parameter Concentrations in Leachate-Impacted Groundwater

The inorganic groundwater quality at monitoring well BH99-6 is characterized by elevated concentrations of alkalinity, ammonia, barium, boron, chloride, cobalt, COD, DOC, hardness, iron, manganese, phenols, total phosphorus, potassium, sodium, strontium, sulphate, TDS and vanadium relative to background groundwater quality represented by monitoring well BH96-4. The concentrations of DOC, iron, manganese and TDS exceeded their respective ODWS for the 2000 monitoring program.

5.2.2 VOC Concentrations in Leachate-Impacted Groundwater

A US EPA Method 624 VOC analysis was performed on monitoring well BH96-4 during the August 2000 monitoring session to determine if landfill leachate impacts were resulting in elevated VOC concentrations above the background groundwater quality represented by monitoring well BH96-4.

Several VOCs were detected in the groundwater at monitoring well BH99-6 (refer to Table 2). Of these VOCs, only 1,4-dichlorobenzene, benzene, ethylbenzene, m/p/o-xylenes have an ODWS. Ethylbenzene was the only VOC present at a concentration exceeding its ODWS.

5.3 Discussion

The physical and chemical parameters with reported levels exceeding their respective ODWS, a comparison of the groundwater quality to background conditions at monitoring well BH96-4, observable trends in groundwater quality over time, and an interpretation of the groundwater quality data are summarized in Table 2.

Based on a review of the available data, the following summarizes the interpretation/assessment of the 2000 groundwater quality data at the site.

- Groundwater quality at monitoring wells BH96-1, BH96-3 and BH99-5 (located on-site in the north and northeast areas of the site) is interpreted to be impacted by landfill leachate.

- Groundwater quality at monitoring well BH96-2 (located on the north part of the site) is interpreted to possibly be impacted from landfill leachate.

- Groundwater quality at monitoring well BH99-7 (located west of the active landfill) does not appear to be impacted by landfill leachate and is considered representative of natural groundwater quality in the vicinity of the landfill.

- The most significant changes in groundwater quality during 2000 was observed at monitoring well BH99-5 where appreciable increases in the levels of barium, chloride, hardness, sulphate and TDS were measured.

- No VOCs were detected in downgradient leachate-impacted monitoring well BH96-3.

6.0 GROUNDWATER COMPLIANCE ASSESSMENT

MOE Guideline B-7, the "Reasonable Use Guideline" (MOE, 1994a), addresses the level of off-site leachate impact on groundwater considered acceptable by the MOE and defines the level of impact on groundwater beyond which some form of mitigation measures would be warranted.

Under MOE Guideline B-7, a change in the quality of groundwater on adjacent properties will only be acceptable if the quality is not degraded in excess of fifty percent of the difference between background concentrations and established water quality criteria for aesthetic related parameters (ODWS), and twenty-five percent of the difference between background conditions and established water quality criteria for health related parameters (ODWS).

For the purpose of this compliance evaluation under MOE Guideline B-7, the groundwater quality reported at monitor BH96-4 (current and historical) is assumed to represent background groundwater quality. Monitoring well BH96-4 is screened in the overburden material.

MOE Guideline B-7 applies to groundwater quality impact at the existing site boundary, and is therefore directly applicable to monitoring well BH96-1. This monitor is located a few metres within the eastern site boundary in the area of former landfilling (Figure 2). The groundwater compliance assessment under MOE Guideline B-7 for the site is also applied to on-site downgradient monitoring wells BH96-2, BH96-3, BH99-5 and BH99-7.

The historical range in natural groundwater quality at background monitor BH96-4 with respect to ODWS for which a Maximum Acceptable Concentration (MAC), Interim Maximum Acceptable Concentration (IMAC) or Aesthetic Objective (AO) has been established is provided in the following table, along with the Reasonable Use Performance Objectives under MOE Guideline B-7:

Parameter	ODWS	Range in Background Concentrations	Reasonable Use Performance Objectives
Barium	1 (MAC)	0.03 – 0.041	0.28
Boron	5 (IMAC)	< 0.01	1.26
Cadmium	0.005 (MAC)	< 0.005	0.005
Chloride	250 (AO)	1.0 – 2.0	126.0
Chromium	0.05 (MAC)	< 0.01	0.02
Copper	1.0 (AO)	< 0.01	0.51
DOC	5 (AO)	1.7 – 2.2	3.6
Iron	0.30 (AO)	< 0.01 – 2.31	2.31
Lead	0.01 (MAC)	< 0.002	0.004
Manganese	0.05 (AO)	0.01 – 0.07	0.07

Parameter	ODWS	Range in Background Concentrations	Reasonable Use Performance Objectives
Nitrate	10 (MAC)	< 0.10	2.58
Nitrite	1.0 (MAC)	< 0.10	0.33
Sodium	200 (AO)	6 – 7.9	104
Sulphate	500 (AO)	24 – 26	263
TDS	500 (AO)	172 – 236	368
Zinc	5.0 (AO)	< 0.005 – 0.02	2.51

Notes: All concentrations are provided in milligrams/litre (mg/L)
<0.01 – below laboratory method detection limit (Accutest Laboratories Ltd.)
ODWS – Ontario Drinking Water Standards (MOE, 2000)
AO – ODWS Aesthetic Objective
MAC – ODWS Maximum Acceptable Concentration
IMAC – ODWS Interim Maximum Acceptable Concentration

A summary of the parameters with concentrations exceeding the maximum allowable under MOE Guideline B-7 at each monitoring well location selected for use in the groundwater compliance assessment based on the results of the 2000 monitoring program is provided in Table 3.

No monitors exist along the north (downgradient) boundary of the landfill site. Based on the results of the compliance assessment, leachate impact in excess of MOE Guideline B-7 extends at least as far as groundwater monitors BH99-5 and BH96-2, located between the landfill and the northern site boundary. The Reasonable Use Performance Objectives are exceeded at BH96-2 for manganese and at BH99-5 for chloride and TDS. These boreholes are located approximately 90 and 80 metres south (upgradient) of Paxton Creek respectively. Paxton Creek is understood to be within the landfill property and south of the north site boundary. It is likely that leachate-impacted groundwater detected downgradient of the landfill areas at monitoring wells BH99-5 and BH96-2 is intercepted by Paxton Creek, rather than migrating further north towards the northern property boundary. Based on the available data, the landfill site is likely in compliance with MOE Guideline B-7 in terms of groundwater impacts at its northern boundary. However, the changes in groundwater quality in 2000 at monitoring well BH99-5 should be monitored closely.

The groundwater quality at the eastern boundary monitoring well BH96-1 is characterized by concentrations of DOC, manganese and TDS which exceed the Reasonable Use Performance Objectives, and is interpreted to be impacted by landfill leachate.

Groundwater at monitor BH99-7, located east of the western property boundary, is interpreted not to be impacted by landfill leachate. The western property boundary is therefore interpreted to be in compliance with MOE Guideline B-7.

7.0 SURFACE WATER QUALITY

Surface water enters the Caledonia Landfill site from two sources. The first source is the drainage stream at the east end of the site which flows from the southeast to the northwest. This stream empties into Paxton Creek, which is the second source of surface water. Paxton Creek is located between the north property boundary and the landfill area. Paxton Creek is the main surface water course in the immediate area of the Caledonia Landfill site.

Two drainage ditches are located to the east and west of the landfill, respectively. The west ditch of the landfill site flows into the swamp area of the landfill site. The west ditch behaves as an ephemeral drainage stream for the landfill site. The east ditch of the landfill site intersects the east drainage stream prior to the stream joining with Paxton Creek.

Surface water sampling stations are shown on Figure 2. Because of its location in Paxton Creek at the downstream western property boundary, SW8 is considered to represent the "point of compliance" for the surface water quality compliance assessment (refer to Section 8.0).

The results of the field and laboratory chemical and physical analyses conducted during the 2000 monitoring program are presented in Appendix A-II along with relevant Provincial Water Quality Objectives (PWQO) (MOE, 1994b) and the data from previous monitoring sessions (Beatty and Franz Associates, 1997 and Golder Associates, 2000).

7.1 Background Surface Water Quality

The background surface water quality in the eastern drainage stream is represented by the data available from SW7, located off-site and east of the Caledonia Landfill site. The background surface water quality for Paxton Creek is represented by the data available from surface water station SW6 which is located on-site and upstream of the point where the east drainage stream intersects with Paxton Creek.

7.1.1 Inorganic Background Surface Water Quality

Surface water quality at SW7 is characterized by exceedences of the PWQO for copper, iron, phenols, and total phosphorus for the August 2000 monitoring session and aluminum and total phosphorus for the November 2000 monitoring session. The surface water quality displays probable impacts from agricultural activities in the area, based on the elevated nitrate and total phosphorus concentrations.

Surface water quality at SW6 is characterized by PWQO exceedences of aluminum, iron, phenols and total phosphorus for the August 2000 monitoring session and aluminum, iron and total phosphorus for the November 2000 monitoring session. The surface water quality displays probable impacts from agricultural activities in the area, based on the elevated nitrate, total phosphorus and possibly TDS concentrations.

The surface water quality for the Paxton Creek monitoring station SW6 typically displays higher concentrations of most of the measured inorganic parameters compared to SW7. This is likely due to Paxton Creek being a local discharge point for several drainage streams in the area.

7.1.2 VOC Concentrations in Background Surface Water

A US EPA Method 624 volatile organic compound (VOC) analysis was performed during the August 2000 monitoring session on surface water sampled from surface water monitoring station SW6 to determine the background surface water VOC concentrations in the vicinity of the Caledonia Landfill site.

No VOCs were detected in the surface water sampled from SW6 in August 2000.

7.2 Discussion

The physical and chemical parameters with reported levels exceeding their respective PWQO; trends in surface water quality over time; a comparison of the surface water quality to background conditions; and, an interpretation of the surface water quality data are summarized in Table 4.

Based on a review of the available data, the following summarizes the interpretation of the surface water quality data at the site.

- Surface water quality at station SW2 (located on-site at the west ditch in the north flowing ephemeral stream) is interpreted to not be impacted by landfill leachate.

- Surface water quality at stations SW3 and SW5 (located on-site in the east drainage stream) is interpreted to not be impacted from landfill leachate.

- Surface water quality at station SW4 (located on-site and in the swamp area north of the landfilling area) is not considered to be representative of the surface water quality regime in this area due to the stagnant nature of this location (swamp).

- Surface water quality at station SW8 (located in Paxton Creek at the west property boundary) is interpreted not to be impacted by landfill leachate based on the similar chloride (and boron) concentrations at SW8 and background station SW6. No VOCs were detected at station SW8 for the August 2000 monitoring session. The surface water quality at stations SW6 and SW8 is generally similar during each monitoring session with the exception of total phosphorus which was higher at station SW8 during both the August and November 2000 sampling sessions.

8.0 SURFACE WATER COMPLIANCE ASSESSMENT

Based on the interpretation of the 2000 surface water quality data, it is concluded that the leachate originating from the landfill site is not impacting adversely on surface water quality in Paxton Creek (refer to Section 7.2).

9.0 PROPOSED 2001 GROUNDWATER AND SURFACE WATER MONITORING PROGRAM

The proposed groundwater and surface water monitoring program for 2001 is summarized in Table 5. The monitoring program is similar to that conducted during 2000 with the elimination of the analyses for volatile organic compounds.

10.0 LIMITATIONS AND USE OF REPORT

This report was prepared for the exclusive use of the Corporation of the Nation Municipality. The report, which specifically includes all tables, figures and appendices, is based on data and information collected by Golder Associates and is based solely on the conditions of the properties at the time of the work, supplemented by historical information and data obtained by Golder Associates as described in this report, and in the previous reports prepared by Golder Associates (see *References* for list of previous reports) and other consultants. Each of these reports must be read and understood collectively, and can only be relied upon in their totality.

Golder Associates has relied in good faith on all information provided and does not accept responsibility for any deficiency, misstatements, or inaccuracies contained in the reports as a result of omissions, misinterpretation, or fraudulent acts of the persons contacted or errors or omissions in the reviewed documentation.

The assessment of environmental conditions and possible hazards at this site has been made using the results of physical measurements and chemical analyses of liquids from a number of locations. The site conditions between sampling locations have been inferred based on conditions observed at borehole and monitoring well locations. Subsurface conditions may vary from these sampled locations.

The services performed, as described in this report, were conducted in a manner consistent with that level of care and skill normally exercised by other members of the engineering and science professions currently practising under similar conditions, subject to the time limits and financial and physical constraints applicable to the services.

Any use which a third party makes of this report, or any reliance on, or decisions to be made based on it, are the responsibilities of such third parties. Golder Associates accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

The findings and conclusions of this report are valid only as of the date of this report. If new information is discovered in future work, including excavations, borings, or other studies, Golder Associates should be requested to re-evaluate the conclusions of this report, and to provide amendments as required. The groundwater monitors installed during previous investigations by Golder Associates and other consultants have been left in place. These groundwater monitors are the property of the Corporation of the Nation Municipality and not Golder Associates.

11.0 CLOSURE

We trust that the information presented in this report meets your current requirements. Should you have any questions or comments on the report, please contact the undersigned.

GOLDER ASSOCIATES LTD.
Environmental Division

for: J. D. Miller, M.Sc.
Hydrogeologist

K.A. Marentette, M.Sc.
Senior Hydrogeologist/Associate

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TABLE 1

2000 GROUNDWATER ELEVATIONS

Monitoring Location	Ground Surface Elevation	Top of Casing Elevation	Depth of Groundwater Below Top of Casing		Groundwater Elevation	
			08/09/00	11/28/00	08/09/00	11/28/00
BH96-1	64.70	65.58	3.43	3.95	62.15	61.63
BH96-2	63.94	64.89	5.86	5.90	59.03	58.99
BH96-3	64.02	64.88	4.76	5.04	60.12	59.84
BH96-4	64.90	66.04	2.67	2.06	63.37	63.98
BH99-5	57.72	58.59	0.68	0.69	57.91	57.90
BH99-6	65.22	66.07	3.31	3.83	62.76	62.24
BH99-7	65.16	66.05	2.99	3.42	63.06	62.63

Notes: All depths and elevations are provided in metres.

All elevations are referred to geodetic datum.

TABLE 2

INTERPRETATION OF 2000 GROUNDWATER QUALITY DATA

Monitoring Well	Parameters Exceeding ODWS	Trend(s)	Parameters Exceeding Background Conditions[1]	Interpretation
BH96-1 Silty Sand	iron, manganese*, TDS	• increase in chloride concentration in 2000 (29 and 19 mg/L) over 1999 chloride concentration (4 and 5 mg/L) • aluminum, COD, DOC, hardness, iron, manganese, potassium, strontium, sulphate and TDS concentrations are variable over time	alkalinity, barium, boron, chloride, copper, COD, DOC, hardness, manganese, phenols, potassium, sodium, strontium, sulphate, TDS	• monitoring well BH96-1 is located within the past area of landfilling, northeast of the area presently being landfilled. This monitor is considered to be a site boundary monitor for the eastern boundary (see Figure 2). • groundwater quality at monitoring well BH96-1 is interpreted to be **impacted by landfill leachate** based primarily on elevated concentrations of boron, chloride, DOC, manganese, sodium, sulphate and TDS
BH96-2 Silty Sand	iron, manganese*	• slightly decreasing chloride, DOC, hardness, nitrate, sulphate and TDS concentrations over time • variable concentrations of COD, iron, manganese and strontium over time	alkalinity, boron, COD, copper, DOC, manganese, nitrate, strontium, sulphate and TDS	• monitoring well BH96-2 is located south (upgradient) of the northern site boundary but downgradient of areas past and presently landfilled (see Figure 2). • groundwater quality at monitoring well BH96-2 is interpreted to be possibly impacted from landfill leachate, based primarily on elevated levels of boron, manganese, sulphate and TDS
BH96-3 Silty Sand	manganese*, TDS*	• variable concentrations of aluminum, boron, chloride, COD, DOC, hardness, iron, manganese, nitrate, sulphate and TDS over time	alkalinity, barium, boron, chloride, COD, copper, DOC, hardness, manganese, nitrate, total phosphorus, sodium, strontium, sulphate, TDS	• borehole BH96-3 is located within the past area of landfilling, downgradient (north) of the area presently being landfilled (see Figure 2). • groundwater quality at monitoring well BH96-3 is interpreted to be **impacted by landfill leachate** based primarily on elevated concentrations of boron, chloride, DOC, manganese, sodium, strontium, sulphate and TDS

TABLE 2 - continued

Monitoring Well	Parameters Exceeding ODWS	Trend(s)	Parameters Exceeding Background Conditions(1)	Interpretation
BH99-5 Silty Sand	TDS*	• increase in barium, chloride, hardness, sodium, strontium, sulphate and TDS concentrations from 1999 • decrease in nitrate and total phosphorus concentrations from 1999	barium, boron, chloride, hardness, total phosphorus, sodium, strontium, sulphate, TDS	• borehole BH99-5 is located south (upgradient) of the northern site boundary but downgradient of areas past and presently landfilled (see Figure 2) • groundwater quality at monitoring well BH99-5 is interpreted to be **impacted by landfill leachate** based primarily on elevated concentrations of chloride, sodium, strontium, sulphate and TDS.
BH99-6 Silty Sand / Sand	DOC*, ethylbenzene, iron*, manganese*, TDS*	• slight decrease in alkalinity, ammonia, COD, DOC and zinc concentrations from 1999	alkalinity, ammonia, barium, boron, chloride, cobalt, COD, DOC, hardness, iron, manganese, phenols, total phosphorus, potassium, sodium, strontium, sulphate, TDS, vanadium, 1,1-Dichloroethane, 1,3,5-Trimethylbenzene, 1,3-Dichlorobenzene, 1,4-Dichlorobenzene, cis-1,2-Dichloroethylene, ethylbenzene, m/p/o-xylenes	• borehole BH99-6 is located between the active landfilling area (immediately downgradient) and the former landfill area (see Figure 2). • leachate conditions at the site are represented by groundwater quality at monitoring well BH99-6, which is **interpreted to be impacted by landfill leachate**.
BH99-7 Silty Sand / Sand	[none]	• groundwater quality is consistent from 1999 to 2000 with the exception of variable TDS concentrations	chloride, total phosphorus	• borehole BH99-7 is located northwest of the active landfill. This borehole is situated west of the access road but east of the western site boundary (see Figure 2). • groundwater quality at monitoring well BH99-7 does not appear to be impacted by landfill leachate and is considered representative of natural groundwater quality in the overburden.

Notes: ODWS – Ontario Drinking Water Standards (MOE, 2000)
(1) – defined based on groundwater quality data available for background monitoring well BH96-4
* indicates that the ODWS were exceeded during both 2000 sampling sessions.

TABLE 3

SUMMARY OF PARAMETERS EXCEEDING REASONABLE USE PERFORMANCE OBJECTIVES

Monitoring Well	Monitoring Sessions			
	August 2000		November 2000	
	Parameter	Concentration (mg/L)	Parameter	Concentration (mg/L)
BH96-1	Manganese TDS	0.28 464	DOC Manganese TDS	3.8 1.86 568
BH96-2	Manganese	2.720	Manganese	1.51
BH96-3	DOC Manganese Sulphate TDS	4.5 1.62 278 872	Manganese TDS	1.27 656
BH99-5	Chloride TDS	149 728	Chloride TDS	195 716
BH99-6	DOC Iron Manganese TDS	22.20 56.20 14.80 688	DOC Iron Manganese TDS	23.40 39.00 11.60 528
BH99-7	[none]	---	[none]	---

Note: Reasonable use performance objectives based on background groundwater quality conditions at monitoring well BH96-4

TABLE 4
INTERPRETATION OF 2000 SURFACE WATER QUALITY DATA

Surface Water Monitoring Station	Parameters Exceeding PWQO[1]	Trend(s)	Parameters Exceeding Background Conditions[2]	Interpretation
SW-2	iron, total phosphorus	• insufficient data	[none]	• north flowing ephemeral stream located north of landfill and at the base of the north slope • surface water quality at SW-2 is interpreted to not be impacted by landfill leachate
SW-3	aluminum, iron, phenols, total phosphorus	• variable concentrations of alkalinity, ammonia, boron, chloride, COD, DOC, hardness, iron, manganese, nitrate, strontium, sulphate and TDS over time	phenols	• surface water drainage stream leading from the east side of the landfill flowing north into Paxton Creek • monitoring station is located just north of the landfill and at the base of the north slope • surface water quality at SW-3 is interpreted to not be impacted by landfill leachate
SW-4	boron, iron, phenols, total phosphorus	• insufficient data	boron, COD, DOC, iron, manganese, strontium, sulphate, TDS	• surface water monitoring station is located in the marsh between Paxton Creek and the landfill • surface water quality from this location is not considered to be representative of the surface water regime in the area due to the stagnant nature of this location (swamp)
SW-5	aluminum, iron, total phosphorus	• slightly decreasing iron and manganese over time • variable concentrations of alkalinity, aluminum, chloride, COD, DOC, hardness, nitrate, total phosphorus, sulphate and TDS over time	phenols	• surface water monitoring station is located in drainage stream leading from the east side of the landfill flowing north into Paxton Creek • monitoring station is located in stream just prior to entering Paxton Creek • surface water quality at SW-5 is interpreted to not be impacted by landfill leachate
SW-8	aluminum, copper, iron, phenols, total phosphorus, vanadium	• insufficient data	alkalinity, strontium, sulphate, TDS	• surface water monitoring station is located in Paxton Creek at the western property boundary • monitoring station was established in 2000 • surface water quality at SW-8 is interpreted to not be impacted by landfill leachate

Notes: PWQO – Provincial Water Quality Objectives (MOE, 1994b)
(1) -- indicates that the PWQO were exceeded for at least one 2000 sampling session.
(2) – defined based on surface water quality data available for background monitoring stations SW-6 and SW-7

TABLE 5

PROPOSED 2001 GROUNDWATER AND SURFACE WATER MONITORING PROGRAM CALEDONIA LANDFILL SITE NATION MUNICIPALITY, ONTARIO

1.0 MONITORING SESSIONS

1.1 Water Level and Groundwater Quality Monitoring
Spring (April/May)
Fall (October)

1.2 Surface Water Quality Monitoring
Spring (April/May)
Summer (July/August)
Fall (October)
Winter (December)

2.0 SAMPLING LOCATIONS

2.1 Groundwater Monitoring Wells
BH96-1, BH96-2, BH96-3, BH96-4, BH99-5, BH99-6, BH99-7

2.2 Surface Water Stations
SW2, SW3, SW4, SW5, SW6, SW7, SW8

2.3 Field Blank
one per monitoring session

3.0 FIELD MEASURED PARAMETERS

Groundwater levels in all monitoring wells
Temperature, conductivity, pH for all groundwater samples
Temperature, conductivity, pH, dissolved oxygen for all surface water samples

4.0 LABORATORY MEASURED PARAMETERS

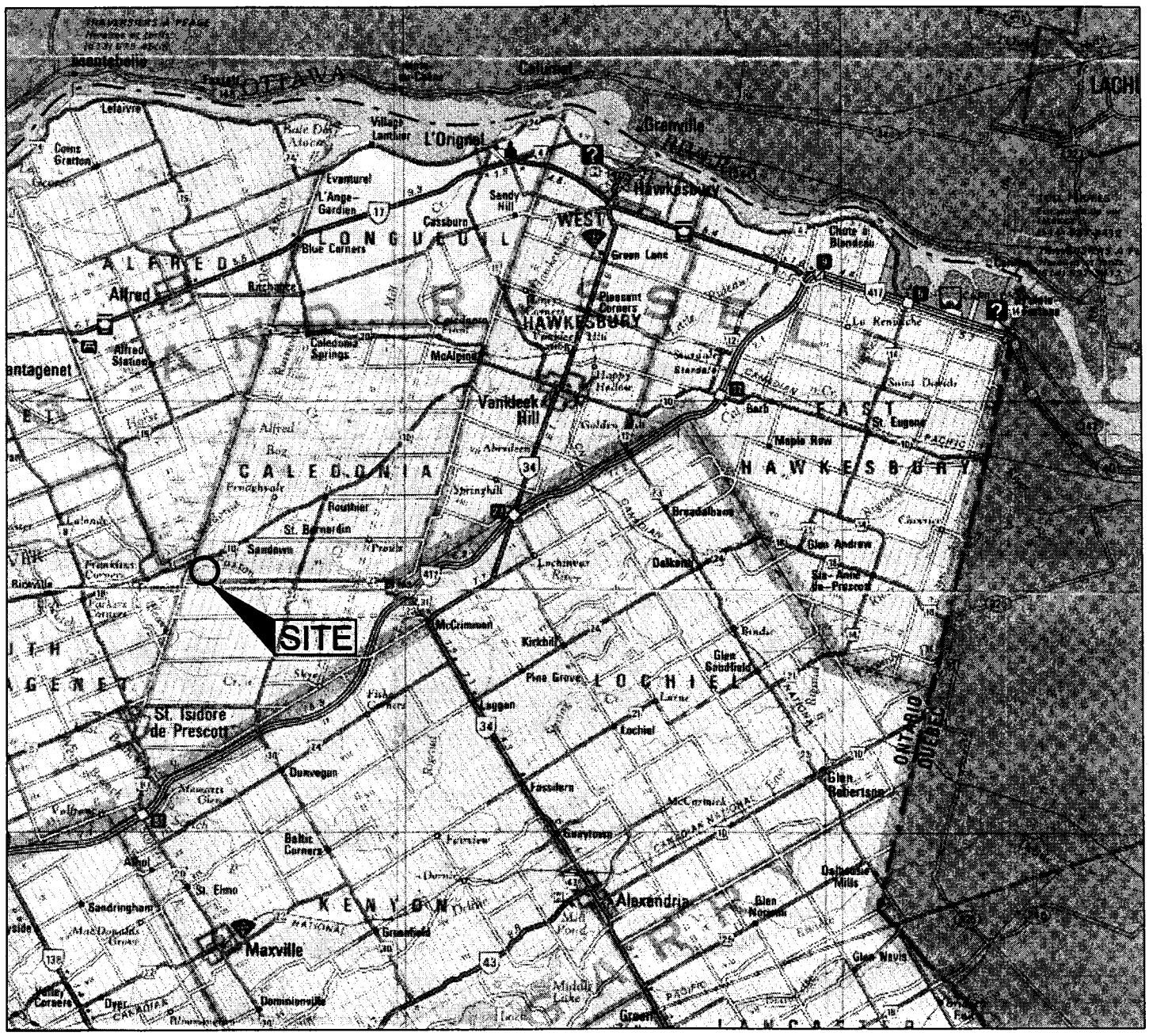
calcium, magnesium, sodium, potassium, aluminum, barium, beryllium, boron, cadmium, chromium, cobalt, copper, iron, lead, manganese, molybdenum, nickel, total phosphorus, silicon, silver, strontium, sulphur, thallium, tin, titanium, vanadium, zinc (ICP Scan)
hardness (calculated from laboratory calcium and magnesium analyses)
alkalinity, TDS, chloride, sulphate, nitrate, nitrite, ortho-phosphate
ammonia, DOC, COD
phenols

Special Note For Parameters with Established Provincial Water Quality Criteria - All laboratory analyses on groundwater and surface water samples will be performed by a private analytical laboratory and the method detection limits (MDLs) for the specific analyses should be commensurate with the standards established in the Provincial Water Quality Objectives (surface water) or the Ontario Drinking Water Objectives (surface water), whichever is lower.

Tbl 005.doc

KEY PLAN

FIGURE 1



SCALE 1 : 250,000

SPECIAL NOTE
THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT

Date: Feb. 27, 2001

Project: 001-2783

Golder Associates

Drawn: S.L.

Chkd: AMM

APPENDIX A

REPORT OF ANALYSIS
ACCUTEST LABORATORIES LTD.

APPENDIX A-I

AUGUST 2000 MONITORING SESSION

Notes:

BH-8 = FIELD BLANK

SW-42 = FIELD BLANK

ACCUTEST LABORATORIES LTD.

REPORT OF ANALYSIS

Client: Golder Associates Ltd.

ATT: Mr. John Miller

Report Number: 2008814
Date: 2000-09-06
Date Submitted: 2000-08-09
Date Collected: 2000-08-09
Project: 001-2783

P.O. Number:
Matrix: Water

PARAMETER	UNITS	MDL	82591 BH 96-1	82592 BH 96-2	82593 BH 96-3	82594 BH 96-4	82595 BH 99-5
Alkalinity as CaCO3	mg/L	5	244	269	397	158	155
COD	mg/L	4	15	15	18	10	10
Ag	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Al	mg/L	0.05	0.13	0.22	0.16	0.36	0.05
B	mg/L	0.01	0.25	0.14	0.46	<0.01	0.04
Ba	mg/L	0.01	0.07	0.04	0.07	0.04	0.16
Be	mg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Ca	mg/L	1	120	78	214	44	117
Cd	mg/L	0.0001	<0.0001	0.0002	0.0002	<0.0001	<0.0001
Cl	mg/L	1	29	3	33	1	149
Co	mg/L	0.0001	0.0005	0.0006	0.0008	0.0007	0.0006
Cr	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cu	mg/L	0.01	<0.01	0.02	0.01	<0.01	<0.01
DOC	mg/L	0.4	3.4	2.8	4.5	1.7	0.9
Fe	mg/L	0.01	0.11	0.17	0.20	0.35	0.11
Hardness as CaCO3	mg/L	1	378	286	687	168	441
Pb	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Mg	mg/L	1	19	22	37	14	36
Mn	mg/L	0.01	0.28	2.72	1.62	0.03	0.02
Mo	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Ni	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
N-NH3	mg/L	0.02	0.05	0.03	0.03	0.06	0.03
N-NO2	mg/L	0.10	<0.10	<0.10	<0.10	<0.10	<0.10
N-NO3	mg/L	0.10	<0.10	0.19	0.56	<0.10	<0.10
Phenols	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
K	mg/L	1	8	1	2	2	2
Si	mg/L	0.01	2.96	7.21	3.59	12.6	8.45
Na	mg/L	2	12	4	22	6	26
Sr	mg/L	0.005	0.653	0.656	1.38	0.103	0.246
S	mg/L	1	51	15	101	10	44

MDL = Method Detection Limit INC = Incomplete

Comment:

APPROVAL: _____

146 Colonnade Road, Unit 8, Nepean, Ontario, K2E 7Y1 Tel:(613)727-5692 Fax:(613)727-5222

ACCUTEST LABORATORIES LTD.

REPORT OF ANALYSIS

Client: Golder Associates Ltd.

ATT: Mr. John Miller

Report Number: 2008814
Date: 2000-09-06
Date Submitted: 2000-08-09
Date Collected: 2000-08-09
Project: 001-2783

P.O. Number:
Matrix: Water

PARAMETER	UNITS	MDL	82591 BH 96-1	82592 BH 96-2	82593 BH 96-3	82594 BH 96-4	82595 BH 99-5
SO4	mg/L	3	138	36	278	24	122
Tl	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Sn	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Ti	mg/L	0.01	<0.01	<0.01	<0.01	0.01	<0.01
TDS	mg/L	2	464	304	872	236	728
Total P	mg/L	0.01	0.83	2.70	2.84	31.7	0.54
V	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Zn	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
O-PO4	mg/L	0.01	0.02	0.04	0.03	0.11	0.06

MDL = Method Detection Limit INC = Incomplete
Comment:

APPROVAL: _____

146 Colonnade Road, Unit 8, Nepean, Ontario, K2E 7Y1 Tel:(613)727-5692 Fax:(613)727-5222

ACCUTEST LABORATORIES LTD.

REPORT OF ANALYSIS

Client: Golder Associates Ltd.

ATT: Mr. John Miller

Report Number: 2008814
Date: 2000-09-07
Date Submitted: 2000-08-09
Date Collected: 2000-08-09
Project: 001-2783

P.O. Number:
Matrix: Water

PARAMETER	UNITS	MDL	82593 BH 96-3	82594 BH 96-4	82596 BH 99-6		
BTEX / 624 / PURGEABLE HYDROCARBONS							
Benzene	µg/L	0.5	<0.5	<0.5	2.1		
Toluene	µg/L	0.5	<0.5	<0.5	<0.5		
Ethylbenzene	µg/L	0.5	<0.5	<0.5	28.9		
m/p-Xylene	µg/L	0.5	<0.5	<0.5	44.4		
o-Xylene	µg/L	0.5	<0.5	<0.5	2.3		
Bromodichloromethane	µg/L	0.3	<0.3	<0.3	<0.3		
Bromoform	µg/L	0.4	<0.4	<0.4	<0.4		
Bromomethane	µg/L	0.5	<0.5	<0.5	<0.5		
Carbon Tetrachloride	µg/L	0.9	<0.9	<0.9	<0.9		
Chlorobenzene	µg/L	0.2	<0.2	<0.2	<0.2		
Chloroethane	µg/L	1.0	<1.0	<1.0	<1.0		
Chloroform	µg/L	0.5	<0.5	<0.5	<0.5		
Chloromethane	µg/L	1.0	<1.0	<1.0	<1.0		
Dibromochloromethane	µg/L	0.3	<0.3	<0.3	<0.3		
1,2-Dibromoethane	µg/L	1.0	<1.0	<1.0	<1.0		
1,2-Dichlorobenzene	µg/L	1.0	<1.0	<1.0	<1.0		
1,3-Dichlorobenzene	µg/L	1.0	<1.0	<1.0	2.0		
1,4-Dichlorobenzene	µg/L	1.0	<1.0	<1.0	2.0		
1,1-Dichloroethane	µg/L	0.4	<0.4	<0.4	0.5		
1,2-Dichloroethane	µg/L	0.7	<0.7	<0.7	<0.7		
1,1-Dichloroethylene	µg/L	0.5	<0.5	<0.5	<0.5		
c-1,2-Dichloroethylene	µg/L	0.4	<0.4	<0.4	1.9		
t-1,2-Dichloroethylene	µg/L	0.4	<0.4	<0.4	<0.4		
1,2-Dichloropropane	µg/L	0.7	<0.7	<0.7	<0.7		
c-1,3-Dichloropropylene	µg/L	0.2	<0.2	<0.2	<0.2		
t-1,3-Dichloropropylene	µg/L	0.2	<0.2	<0.2	<0.2		
Methylene Chloride	µg/L	4.0	<4.0	<4.0	<4.0		
Styrene	µg/L	0.5	<0.5	<0.5	<0.5		
1,1,1,2-Tetrachloroethane	µg/L	0.6	<0.6	<0.6	<0.6		

MDL = Method Detection Limit INC = Incomplete

Comment:

APPROVAL:

146 Colonnade Road, Unit 8, Nepean, Ontario, K2E 7Y1 Tel:(613)727-5692 Fax:(613)727-5222

ACCUTEST LABORATORIES LTD.

REPORT OF ANALYSIS

Client: Golder Associates Ltd.

ATT: Mr. John Miller

Report Number: 2008814
Date: 2000-09-07
Date Submitted: 2000-08-09
Date Collected: 2000-08-09
Project: 001-2783

P.O. Number:
Matrix: Water

PARAMETER	UNITS	MDL	82593 BH 96-3	82594 BH 96-4	82596 BH 99-6		
1,1,2,2-Tetrachloroethane	µg/L	0.6	<0.6	<0.6	<0.6		
Tetrachloroethylene	µg/L	0.3	<0.3	<0.3	<0.3		
1,1,1-Trichloroethane	µg/L	0.4	<0.4	<0.4	<0.4		
1,1,2-Trichloroethane	µg/L	0.4	<0.4	<0.4	<0.4		
Trichlorethylene	µg/L	0.3	<0.3	<0.3	<0.3		
Trichlorofluoromethane	µg/L	0.5	<0.5	<0.5	<0.5		
1,3,5-Trimethylbenzene	µg/L	0.3	<0.3	<0.3	0.6		
Vinyl Chloride	µg/L	0.5	<0.5	<0.5	<0.5		
BTEX / 624 Surrogate Recoveries							
Toluene-d8	%		100	100	100		
1,2-Dichloroethane-d4	%		100	100	101		
4-Bromofluorobenzene	%		101	101	110		

MDL = Method Detection Limit INC = Incomplete

Comment:

APPROVAL:

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ACCUTEST LABORATORIES LTD.

REPORT OF ANALYSIS

Client: Golder Associates Ltd.

ATT: Mr. John Miller

Report Number: 2008814
Date: 2000-09-06
Date Submitted: 2000-08-09
Date Collected: 2000-08-09
Project: 001-2783

P.O. Number:
Matrix: Water

PARAMETER	UNITS	MDL	82596 BH 99-6	82597 BH 99-7	82598 BH -8		
Alkalinity as CaCO3	mg/L	5	452	28	7		
COD	mg/L	4	75	8	5		
Ag	mg/L	0.0001	<0.0001	<0.0001	<0.0001		
Al	mg/L	0.05	0.10	0.06	<0.05		
B	mg/L	0.01	0.22	<0.01	<0.01		
Ba	mg/L	0.01	0.24	<0.01	<0.01		
Be	mg/L	0.002	<0.002	<0.002	<0.002		
Ca	mg/L	1	114	8	<1		
Cd	mg/L	0.0001	<0.0001	<0.0001	<0.0001		
Cl	mg/L	1	88	6	<1		
Co	mg/L	0.0001	0.0153	<0.0001	<0.0001		
Cr	mg/L	0.01	<0.01	<0.01	<0.01		
Cu	mg/L	0.01	<0.01	<0.01	<0.01		
DOC	mg/L	0.4	22.2	0.4	0.4		
Fe	mg/L	0.01	56.2	0.11	0.01		
Hardness as CaCO3	mg/L	1	384	28	8		
Pb	mg/L	0.001	<0.001	<0.001	<0.001		
Mg	mg/L	1	24	2	2		
Mn	mg/L	0.01	14.8	<0.01	<0.01		
Mo	mg/L	0.01	<0.01	<0.01	<0.01		
Ni	mg/L	0.01	<0.01	<0.01	<0.01		
N-NH3	mg/L	0.02	17.8	0.03	0.02		
N-NO2	mg/L	0.10	<0.10	<0.10	<0.10		
N-NO3	mg/L	0.10	<0.10	<0.10	<0.10		
Phenols	mg/L	0.001	0.007	<0.001	0.001		
K	mg/L	1	27	<1	<1		
Si	mg/L	0.01	10.5	6.85	0.20		
Na	mg/L	2	57	3	<2		
Sr	mg/L	0.005	1.09	0.086	<0.005		
S	mg/L	1	18	4	<1		

MDL = Method Detection Limit INC = Incomplete

Comment:

APPROVAL: _____

146 Colonnade Road, Unit 8, Nepean, Ontario, K2E 7Y1 Tel:(613)727-5692 Fax:(613)727-5222

ACCUTEST LABORATORIES LTD.

REPORT OF ANALYSIS

Client: Golder Associates Ltd.

ATT: Mr. John Miller

Report Number: 2008814
Date: 2000-09-06
Date Submitted: 2000-08-09
Date Collected: 2000-08-09
Project: 001-2783

P.O. Number:
Matrix: Water

PARAMETER	UNITS	MDL	82596 BH 99-6	82597 BH 99-7	82598 BH -8		
SO4	mg/L	3	39	10	<3		
Tl	mg/L	0.001	<0.001	<0.001	<0.001		
Sn	mg/L	0.01	<0.01	<0.01	<0.01		
Ti	mg/L	0.01	<0.01	<0.01	<0.01		
TDS	mg/L	2	688	68	<2		
Total P	mg/L	0.01	0.45	0.40	<0.01		
V	mg/L	0.01	0.01	<0.01	<0.01		
Zn	mg/L	0.01	<0.01	<0.01	<0.01		
O-PO4	mg/L	0.03	<0.03	0.04	<0.03		

MDL = Method Detection Limit INC = Incomplete

Comment:

APPROVAL: _____

146 Colonnade Road, Unit 8, Nepean, Ontario, K2E 7Y1 Tel:(613)727-5692 Fax:(613)727-5222

ACCUTEST LABORATORIES LTD.

REPORT OF ANALYSIS

Client: Golder Associates Ltd.

ATT: Mr. John Miller

Report Number: 2008802
Date: 2000-08-31
Date Submitted: 2000-08-09
Date Collected: 2000-08-08
Project: 001-2783

P.O. Number:
Matrix: Surfacewater

PARAMETER	UNITS	MDL	82536 SW-2	82537 SW-3	82538 SW-4	82539 SW-5	82540 SW-6
Alkalinity as CaCO3	mg/L	5	52	87	164	96	173
COD	mg/L	4	10	21	33	23	26
Ag	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Al	mg/L	0.05	0.05	<0.05	<0.05	<0.05	0.09
B	mg/L	0.01	0.01	0.03	0.21	0.04	0.03
Ba	mg/L	0.01	0.01	0.03	0.03	0.03	0.04
Be	mg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Ca	mg/L	1	18	29	70	32	55
Cd	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Cl	mg/L	1	5	12	31	14	23
Co	mg/L	0.0001	0.0006	0.0003	0.0003	0.0003	0.0006
Cr	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cu	mg/L	0.001	<0.001	<0.001	0.001	<0.001	0.003
DOC	mg/L	0.4	4.8	7.1	10.8	7.6	7.7
Fe	mg/L	0.01	0.39	0.46	4.36	0.52	0.92
Hardness as CaCO3	mg/L	1	57	110	253	117	183
Pb	mg/L	0.001	0.001	<0.001	<0.001	<0.001	0.001
Mg	mg/L	1	3	9	19	9	11
Mn	mg/L	0.01	0.13	0.12	0.18	0.09	0.09
Mo	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Ni	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
N-NH3	mg/L	0.02	0.06	0.08	0.20	0.07	0.19
N-NO2	mg/L	0.10	<0.10	<0.10	<0.10	<0.10	<0.10
N-NO3	mg/L	0.10	0.11	0.45	<0.10	0.40	0.43
Phenols	mg/L	0.001	0.001	0.003	0.002	0.003	0.002
K	mg/L	1	<1	1	1	1	6
Si	mg/L	0.01	6.47	7.98	7.13	8.06	4.09
Na	mg/L	2	4	8	22	9	16
Sr	mg/L	0.005	0.139	0.153	0.500	0.177	0.258
S	mg/L	1	6	12	41	14	9

MDL = Method Detection Limit INC = Incomplete

Comment:

APPROVAL: _____

146 Colonnade Road, Unit 8, Nepean, Ontario, K2E 7Y1 Tel:(613)727-5692 Fax:(613)727-5222

ACCUTEST LABORATORIES LTD.

REPORT OF ANALYSIS

Client: Golder Associates Ltd.

ATT: Mr. John Miller

Report Number: 2008802
Date: 2000-08-31
Date Submitted: 2000-08-09
Date Collected: 2000-08-08
Project: 001-2783

P.O. Number:
Matrix: Surfacewater

PARAMETER	UNITS	MDL	82536 SW-2	82537 SW-3	82538 SW-4	82539 SW-5	82540 SW-6
SO4	mg/L	3	14	30	99	35	21
Tl	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Sn	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Ti	mg/L	0.01	0.02	<0.01	0.02	<0.01	0.02
TDS	mg/L	2	104	204	400	192	288
Total P	mg/L	0.01	0.08	0.05	0.27	0.27	0.14
V	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Zn	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
O-PO4	mg/L	0.03	0.03	0.09	0.36	0.09	0.48

MDL = Method Detection Limit INC = Incomplete
Comment:

APPROVAL: _____

146 Colonnade Road, Unit 8, Nepean, Ontario, K2E 7Y1 Tel:(613)727-5692 Fax:(613)727-5222

ACCUTEST LABORATORIES LTD.

REPORT OF ANALYSIS

Client: Golder Associates Ltd.

ATT: Mr. John Miller

Report Number: 2008802
Date: 2000-08-31
Date Submitted: 2000-08-09
Date Collected: 2000-08-08
Project: 001-2783

P.O. Number:
Matrix: Surfacewater

PARAMETER	UNITS	MDL	82541 SW-7	82542 SW-8	82543 SW-42		
Alkalinity as CaCO3	mg/L	5	62	173	5		
COD	mg/L	4	28	23	5		
Ag	mg/L	0.0001	<0.0001	<0.0001	<0.0001		
Al	mg/L	0.05	0.07	0.12	<0.05		
B	mg/L	0.01	<0.01	0.03	<0.01		
Ba	mg/L	0.01	0.02	0.04	<0.01		
Be	mg/L	0.002	<0.002	<0.002	<0.002		
Ca	mg/L	1	16	54	<1		
Cd	mg/L	0.0001	0.0001	<0.0001	<0.0001		
Cl	mg/L	1	7	23	<1		
Co	mg/L	0.0001	0.0005	0.0006	<0.0001		
Cr	mg/L	0.01	<0.01	<0.01	<0.01		
Cu	mg/L	0.001	0.006	0.003	<0.001		
DOC	mg/L	0.4	8.1	7.7	<0.4		
Fe	mg/L	0.01	0.37	0.97	0.01		
Hardness as CaCO3	mg/L	1	61	176	<1		
Pb	mg/L	0.001	<0.001	<0.001	<0.001		
Mg	mg/L	1	5	10	<1		
Mn	mg/L	0.01	0.13	0.08	<0.01		
Mo	mg/L	0.01	<0.01	<0.01	<0.01		
Ni	mg/L	0.01	<0.01	<0.01	<0.01		
N-NH3	mg/L	0.02	0.14	0.19	0.16		
N-NO2	mg/L	0.10	<0.10	<0.10	<0.10		
N-NO3	mg/L	0.10	0.51	0.43	<0.10		
Phenols	mg/L	0.001	0.002	0.002	0.002		
K	mg/L	1	1	6	<1		
Si	mg/L	0.01	8.22	4.43	<0.01		
Na	mg/L	2	5	16	<2		
Sr	mg/L	0.005	0.091	0.256	<0.005		
S	mg/L	1	3	9	<1		

MDL = Method Detection Limit INC = Incomplete

Comment:

APPROVAL: _____

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ACCUTEST LABORATORIES LTD.

REPORT OF ANALYSIS

Client: Golder Associates Ltd.

ATT: Mr. John Miller

Report Number: 2008802
Date: 2000-08-31
Date Submitted: 2000-08-09
Date Collected: 2000-08-08
Project: 001-2783

P.O. Number:
Matrix: Surfacewater

PARAMETER	UNITS	MDL	82541 SW-7	82542 SW-8	82543 SW-42		
SO4	mg/L	3	9	21	<3		
Tl	mg/L	0.001	<0.001	<0.001	<0.001		
Sn	mg/L	0.01	<0.01	<0.01	<0.01		
Ti	mg/L	0.01	<0.01	0.03	<0.01		
TDS	mg/L	2	108	264	<2		
Total P	mg/L	0.01	0.08	0.26	<0.01		
V	mg/L	0.01	<0.01	0.01	<0.01		
Zn	mg/L	0.01	<0.01	<0.01	<0.01		
O-PO4	mg/L	0.03	0.09	0.39	<0.03		

MDL = Method Detection Limit INC = Incomplete
Comment:

APPROVAL: _____

146 Colonnade Road, Unit 8, Nepean, Ontario, K2E 7Y1 Tel:(613)727-5692 Fax:(613)727-5222

ACCUTEST LABORATORIES LTD.

REPORT OF ANALYSIS

Client: Golder Associates Ltd.

ATT: Mr. John Miller

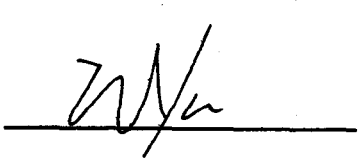
Report Number: 2008802
Date: 2000-08-31
Date Submitted: 2000-08-09
Date Collected: 2000-08-08
Project: 001-2783

P.O. Number:
Matrix: Surfacewater

PARAMETER	UNITS	MDL	82540 SW-6	82542 SW-8			
BTEX / 624 / PURGEABLE HYDROCARBONS							
Benzene	ug/L	0.5	<0.5	<0.5			
Toluene	ug/L	0.5	<0.5	<0.5			
Ethylbenzene	ug/L	0.5	<0.5	<0.5			
m/p-Xylene	ug/L	0.5	<0.5	<0.5			
o-Xylene	ug/L	0.5	<0.5	<0.5			
Bromodichloromethane	ug/L	0.3	<0.3	<0.3			
Bromoform	ug/L	0.4	<0.4	<0.4			
Bromomethane	ug/L	0.5	<0.5	<0.5			
Carbon Tetrachloride	ug/L	0.9	<0.9	<0.9			
Chlorobenzene	ug/L	0.2	<0.2	<0.2			
Chloroethane	ug/L	1	<1.0	<1.0			
Chloroform	ug/L	0.5	<0.5	<0.5			
Chloromethane	ug/L	1	<1.0	<1.0			
Dibromochloromethane	ug/L	0.3	<0.3	<0.3			
1,2-Dibromoethane	ug/L	1	<1.0	<1.0			
1,2-Dichlorobenzene	ug/L	1	<1.0	<1.0			
1,3-Dichlorobenzene	ug/L	1	<1.0	<1.0			
1,4-Dichlorobenzene	ug/L	1	<1.0	<1.0			
1,1-Dichloroethane	ug/L	0.4	<0.4	<0.4			
1,2-Dichloroethane	ug/L	0.7	<0.7	<0.7			
1,1-Dichloroethylene	ug/L	0.5	<0.5	<0.5			
c-1,2-Dichloroethylene	ug/L	0.4	<0.4	<0.4			
t-1,2-Dichloroethylene	ug/L	0.4	<0.4	<0.4			
1,2-Dichloropropane	ug/L	0.7	<0.7	<0.7			
c-1,3-Dichloropropylene	ug/L	0.2	<0.2	<0.2			
t-1,3-Dichloropropylene	ug/L	0.2	<0.2	<0.2			
Methylene Chloride	ug/L	4	<4.0	<4.0			
Styrene	ug/L	0.5	<0.5	<0.5			
1,1,1,2-Tetrachloroethane	ug/L	0.6	<0.6	<0.6			

MDL = Method Detection Limit INC = Incomplete

Comment:

APPROVAL: 

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ACCUTEST LABORATORIES LTD.

REPORT OF ANALYSIS

Client: Golder Associates Ltd.

ATT: Mr. John Miller

Report Number: 2008802
Date: 2000-08-31
Date Submitted: 2000-08-09
Date Collected: 2000-08-08
Project: 001-2783

P.O. Number:
Matrix: Surfacewater

PARAMETER	UNITS	MDL	82540 SW-6	82542 SW-8			
1,1,2,2-Tetrachloroethane	ug/L	0.6	<0.6	<0.6			
Tetrachloroethylene	ug/L	0.3	<0.3	<0.3			
1,1,1-Trichloroethane	ug/L	0.4	<0.4	<0.4			
1,1,2-Trichloroethane	ug/L	0.4	<0.4	<0.4			
Trichlorethylene	ug/L	0.3	<0.3	<0.3			
Trichlorofluoromethane	ug/L	0.5	<0.5	<0.5			
1,3,5-Trimethylbenzene	ug/L	0.3	<0.3	<0.3			
Vinyl Chloride	ug/L	0.5	<0.5	<0.5			
BTEX / 624 Surrogate Recoveries							
Toluene-d8	%	1	100	100			
1,2-Dichloroethane-d4	%	1	100	100			
4-Bromofluorobenzene	%	1	101	101			

MDL = Method Detection Limit INC = Incomplete
Comment:

APPROVAL:

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APPENDIX A-II

NOVEMBER 2000 MONITORING SESSION

Notes:

SW1 = Station SW8

SW2 = Station SW4

SW3 = Station SW3

SW4 = Station SW7

SW5 = Station SW5

SW6 = Station SW6

GW1 = BH96-4

GW2 = BH99-7

GW3 = BH99-6

GW4 = BH96-1

GW5 = BH96-3

GW6 = BH96-2

GW7 = BH99-5

GW8 = FIELD BLANK

ACCUTEST LABORATORIES LTD.

REPORT OF ANALYSIS

Client: Golder Associates Ltd.

ATT: Mr. Andrew Harwood

Report Number: 2014107
Date: 2000-12-15
Date Submitted: 2000-11-29
Date Collected: 2000-11-29
Project: 001-2783

P.O. Number:
Matrix: Surfacewater

PARAMETER	UNITS	MDL	103259 SW1 SW8	103260 SW2 SW4	103261 SW3 SW3	103262 SW4 SW7	103263 SW5 SW5
Alkalinity as CaCO3	mg/L	5	281	96	77	79	79
COD	mg/L	4	10	8	5	<4	5
Ag	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Al	mg/L	0.05	<0.05	<0.05	0.14	0.16	0.16
B	mg/L	0.01	0.05	0.10	<0.01	<0.01	<0.01
Ba	mg/L	0.01	0.04	0.01	0.04	0.05	0.04
Be	mg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Ca	mg/L	2	85	44	36	37	37
Cd	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Cl	mg/L	1	35	26	23	24	24
Co	mg/L	0.0002	0.0008	0.0003	0.0003	0.0003	0.0003
Cr	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cu	mg/L	0.001	0.006	<0.001	0.001	0.001	0.002
DOC	mg/L	0.3	5.7	7.1	4.0	3.6	3.5
Fe	mg/L	0.01	0.95	0.85	0.23	0.21	0.33
Hardness as CaCO3	mg/L	1	311	164	135	142	138
Pb	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Mg	mg/L	1	24	13	11	12	11
Mn	mg/L	0.01	0.05	0.20	0.03	0.03	0.04
Mo	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	0.02
Ni	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
N-NH3	mg/L	0.02	0.17	0.05	<0.02	0.02	<0.02
N-NO2	mg/L	0.10	<0.10	<0.10	<0.10	<0.10	<0.10
N-NO3	mg/L	0.10	5.48	<0.10	9.69	11.4	9.77
Phenols	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
K	mg/L	1	6	1	1	2	1
Si	mg/L	0.01	5.24	4.70	9.23	9.56	9.19
Na	mg/L	2	43	14	8	8	9
Sr	mg/L	0.003	0.347	0.328	0.173	0.175	0.177
SO4	mg/L	1	81	82	21	18	24

MDL = Method Detection Limit INC = Incomplete

Comment:

APPROVAL:

146 Colonnade Road, Unit 8, Nepean, Ontario, K2E 7Y1 Tel:(613)727-5692 Fax:(613)727-5222

ACCUTEST LABORATORIES LTD.

REPORT OF ANALYSIS

Client: Golder Associates Ltd.

ATT: Mr. Andrew Harwood

Report Number: 2014107
Date: 2000-12-15
Date Submitted: 2000-11-29
Date Collected: 2000-11-29
Project: 001-2783

P.O. Number:
Matrix: Surfacewater

PARAMETER	UNITS	MDL	103259 SW1	103260 SW2	103261 SW3	103262 SW4	103263 SW5
Ti	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Sn	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Ti	mg/L	0.01	0.02	<0.01	<0.01	<0.01	0.02
TDS	mg/L	2	512	244	248	208	172
Total P	mg/L	0.01	0.18	0.07	0.05	0.06	0.04
V	mg/L	0.001	0.003	<0.001	0.001	<0.001	0.002
Zn	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
O-PO4	mg/L	0.03	0.23	0.04	0.04	0.04	0.04

MDL = Method Detection Limit INC = Incomplete
Comment:

APPROVAL:

146 Colonnade Road, Unit 8, Nepean, Ontario, K2E 7Y1 Tel:(613)727-5692 Fax:(613)727-5222

ACCUTEST LABORATORIES LTD.

REPORT OF ANALYSIS

Client: Golder Associates Ltd.

ATT: Mr. Andrew Harwood

Report Number: 2014107
Date: 2000-12-15
Date Submitted: 2000-11-29
Date Collected: 2000-11-29
Project: 001-2783

P.O. Number:
Matrix: Surfacewater

PARAMETER	UNITS	MDL	103264 SW6 SW6				
Alkalinity as CaCO3	mg/L	5	225				
COD	mg/L	4	11				
Ag	mg/L	0.0001	<0.0001				
Al	mg/L	0.05	0.10				
B	mg/L	0.01	0.04				
Ba	mg/L	0.01	0.04				
Be	mg/L	0.002	<0.002				
Ca	mg/L	2	73				
Cd	mg/L	0.0001	0.0001				
Cl	mg/L	1	32				
Co	mg/L	0.0002	0.0003				
Cr	mg/L	0.01	<0.01				
Cu	mg/L	0.001	0.003				
DOC	mg/L	0.3	5.2				
Fe	mg/L	0.01	0.68				
Hardness as CaCO3	mg/L	1	257				
Pb	mg/L	0.001	<0.001				
Mg	mg/L	1	18				
Mn	mg/L	0.01	0.04				
Mo	mg/L	0.01	<0.01				
Ni	mg/L	0.01	<0.01				
N-NH3	mg/L	0.02	0.13				
N-NO2	mg/L	0.10	<0.10				
N-NO3	mg/L	0.10	6.62				
Phenols	mg/L	0.001	<0.001				
K	mg/L	1	5				
Si	mg/L	0.01	6.65				
Na	mg/L	2	33				
Sr	mg/L	0.003	0.301				
SO4	mg/L	1	69				

MDL = Method Detection Limit INC = Incomplete

Comment:

APPROVAL:

146 Colonnade Road, Unit 8, Nepean, Ontario, K2E 7Y1 Tel:(613)727-5692 Fax:(613)727-5222

ACCUTEST LABORATORIES LTD.

REPORT OF ANALYSIS

Client: Golder Associates Ltd.

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Report Number: 2014107
Date: 2000-12-15
Date Submitted: 2000-11-29
Date Collected: 2000-11-29
Project: 001-2783

P.O. Number:
Matrix: Surfacewater

PARAMETER	UNITS	MDL	103264 SW6				
Tl	mg/L	0.001	<0.001				
Sn	mg/L	0.01	<0.01				
Ti	mg/L	0.01	0.02				
TDS	mg/L	2	428				
Total P	mg/L	0.01	0.15				
V	mg/L	0.001	0.001				
Zn	mg/L	0.01	<0.01				
O-PO4	mg/L	0.03	0.19				

MDL = Method Detection Limit INC = Incomplete
Comment:

APPROVAL:

146 Colonnade Road, Unit 8, Nepean, Ontario, K2E 7Y1 Tel:(613)727-5692 Fax:(613)727-5222

ACCUTEST LABORATORIES LTD.

REPORT OF ANALYSIS

Client: Golder Associates Ltd.

ATT: Mr. Andrew Harwood

Report Number: 2014108
Date: 2000-12-13
Date Submitted: 2000-11-29
Date Collected: 2000-11-29
Project: 001-2783

P.O. Number:
Matrix: Water

PARAMETER	UNITS	MDL	103265 GW1	103266 GW2	103267 GW3	103268 GW4	103269 GW5
Alkalinity as CaCO3	mg/L	5	143	17	457	241	288
COD	mg/L	4	<4	<4	62	<4	8
Ag	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Al	mg/L	0.05	0.30	0.15	0.10	0.33	0.24
B	mg/L	0.01	<0.01	<0.01	0.25	0.29	0.4
Ba	mg/L	0.01	0.04	<0.01	0.21	0.05	0.05
Be	mg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Ca	mg/L	2	40	7	90	122	143
Cd	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001
Cl	mg/L	1	2	5	36	19	13
Co	mg/L	0.0002	0.0005	0.0002	0.0173	0.0008	0.0006
Cr	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cu	mg/L	0.001	0.002	<0.001	0.002	0.003	0.003
DOC	mg/L	0.3	2.1	0.9	23.4	3.8	3.4
Fe	mg/L	0.01	0.35	0.10	39.00	0.40	0.31
Hardness as CaCO3	mg/L	1	145	22	287	404	460
Pb	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Mg	mg/L	1	11	1	15	24	25
Mn	mg/L	0.01	0.02	<0.01	11.60	1.86	1.27
Mo	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Ni	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
N-NH3	mg/L	0.02	0.04	<0.02	19.40	0.03	0.02
N-NO2	mg/L	0.10	<0.10	<0.10	<0.10	<0.10	<0.10
N-NO3	mg/L	0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Phenols	mg/L	0.001	<0.001	<0.001	0.010	0.010	<0.001
K	mg/L	1	2	<1	28	3	2
Si	mg/L	0.01	12.40	6.49	9.85	3.66	3.33
Na	mg/L	2	6	4	37	12	28
Sr	mg/L	0.003	0.100	0.081	0.913	0.807	0.981
SO4	mg/L	1	25	10	7	186	227

MDL = Method Detection Limit INC = Incomplete

Comment:

Samples contain significant amount of solids in the acid preserved bottles. Interferences and elevated analyte concentrations will be encountered.

APPROVAL:

146 Colonnade Road, Unit 8, Nepean, Ontario, K2E 7Y1 Tel:(613)727-5692 Fax:(613)727-5222

ACCUTEST LABORATORIES LTD.

REPORT OF ANALYSIS

Client: Golder Associates Ltd.

ATT: Mr. Andrew Harwood

Report Number: 2014108
Date: 2000-12-13
Date Submitted: 2000-11-29
Date Collected: 2000-11-29
Project: 001-2783

P.O. Number:
Matrix: Water

PARAMETER	UNITS	MDL	103265 GW1	103266 GW2	103267 GW3	103268 GW4	103269 GW5
Tl	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Sn	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Ti	mg/L	0.01	0.01	<0.01	<0.01	0.01	0.01
TDS	mg/L	2	172	44	528	568	656
Total P	mg/L	0.01	1.23	0.74	0.55	2.14	19.6
V	mg/L	0.001	0.003	<0.001	0.006	0.001	0.002
Zn	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
O-PO4	mg/L	0.03	0.23	0.24	0.05	<0.03	<0.03

MDL = Method Detection Limit INC = Incomplete
Comment:

APPROVAL:

146 Colonnade Road, Unit 8, Nepean, Ontario, K2E 7Y1 Tel:(613)727-5692 Fax:(613)727-5222

ACCUTEST LABORATORIES LTD.

REPORT OF ANALYSIS

Client: Golder Associates Ltd.

ATT: Mr. Andrew Harwood

Report Number: 2014108
Date: 2000-12-13
Date Submitted: 2000-11-29
Date Collected: 2000-11-29
Project: 001-2783

P.O. Number:
Matrix: Water

PARAMETER	UNITS	MDL	103270 GW6	103271 GW7	103272 GW8		
Alkalinity as CaCO3	mg/L	5	177	130	<5		
COD	mg/L	4	<4	<4	<4		
Ag	mg/L	0.0001	<0.0001	<0.0001	<0.0001		
Al	mg/L	0.05	0.72	0.12	<0.05		
B	mg/L	0.01	0.11	0.04	<0.01		
Ba	mg/L	0.01	0.04	0.21	<0.01		
Be	mg/L	0.002	<0.002	<0.002	<0.002		
Ca	mg/L	2	45	114	<2		
Cd	mg/L	0.0001	0.0001	<0.0001	<0.0001		
Cl	mg/L	1	1	195	<1		
Co	mg/L	0.0002	0.0005	0.0004	<0.0002		
Cr	mg/L	0.01	<0.01	<0.01	<0.01		
Cu	mg/L	0.001	0.004	0.001	<0.001		
DOC	mg/L	0.3	2.5	1.3	<0.3		
Fe	mg/L	0.01	0.87	0.10	<0.01		
Hardness as CaCO3	mg/L	1	162	433	<1		
Pb	mg/L	0.001	<0.001	<0.001	<0.001		
Mg	mg/L	1	12	36	<1		
Mn	mg/L	0.01	1.51	0.02	<0.01		
Mo	mg/L	0.01	<0.01	<0.01	<0.01		
Ni	mg/L	0.01	<0.01	<0.01	<0.01		
N-NH3	mg/L	0.02	<0.02	<0.02	0.16		
N-NO2	mg/L	0.10	<0.10	<0.10	<0.10		
N-NO3	mg/L	0.10	<0.10	<0.10	<0.10		
Phenols	mg/L	0.001	<0.001	<0.001	<0.001		
K	mg/L	1	1	3	<1		
Si	mg/L	0.01	7.46	8.43	<0.01		
Na	mg/L	2	4	26	<2		
Sr	mg/L	0.003	0.463	0.299	<0.003		
SO4	mg/L	1	16	128	<1		

MDL = Method Detection Limit INC = Incomplete

Comment:

APPROVAL:

146 Colonnade Road, Unit 8, Nepean, Ontario, K2E 7Y1 Tel:(613)727-5692 Fax:(613)727-5222

ACCUTEST LABORATORIES LTD.

REPORT OF ANALYSIS

Client: Golder Associates Ltd.

ATT: Mr. Andrew Harwood

Report Number: 2014108
Date: 2000-12-13
Date Submitted: 2000-11-29
Date Collected: 2000-11-29
Project: 001-2783

P.O. Number:
Matrix: Water

PARAMETER	UNITS	MDL	103270 GW6	103271 GW7	103272 GW8		
Tl	mg/L	0.001	<0.001	<0.001	<0.001		
Sn	mg/L	0.01	<0.01	<0.01	<0.01		
Ti	mg/L	0.01	0.03	<0.01	<0.01		
TDS	mg/L	2	176	716	<2		
Total P	mg/L	0.01	17.20	0.80	<0.01		
V	mg/L	0.001	0.003	0.004	<0.001		
Zn	mg/L	0.01	<0.01	<0.01	<0.01		
O-PO4	mg/L	0.03	0.03	0.06	<0.03		

MDL = Method Detection Limit INC = Incomplete
Comment:

APPROVAL:

146 Colonnade Road, Unit 8, Nepean, Ontario, K2E 7Y1 Tel:(613)727-5692 Fax:(613)727-5222

APPENDIX B

RECORD OF BOREHOLES

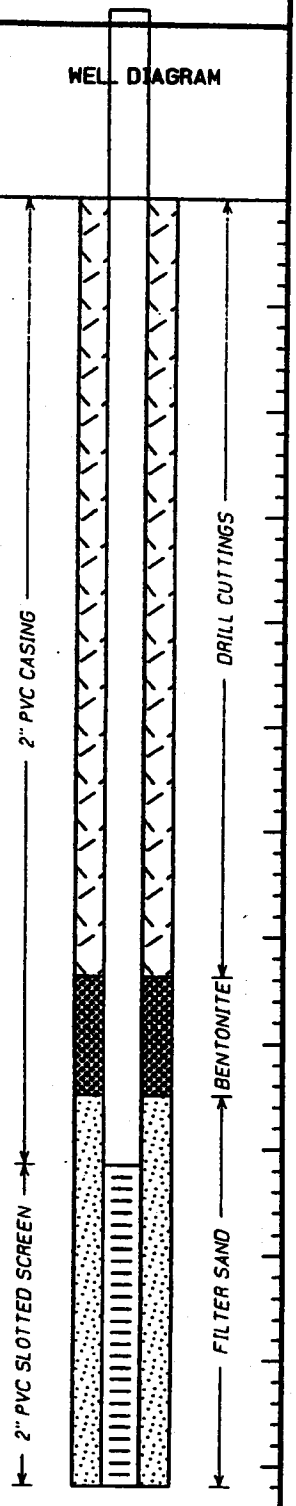
BEATTY FRANZ & ASSOCIATES

Observation Well BH96-1

PROJECT: *CALEDONIA LANDFILL*	LOCATION: *TOWNSHIP OF CALEDONIA ONTARIO*
PROJECT NO.: *141-961*	GROUND SURFACE ELEVATION: *64.70 M.A.S.L.*
DATE STARTED: *NOVEMBER 14, 1996*	TOC ELEVATION: *65.58 M.A.S.L.*
DATE FINISHED: *NOVEMBER 14, 1996*	WATER LEVEL: *61.99 M.A.S.L.*
DRILLING METHOD: *HOLLOW STEM*	TOTAL DEPTH: *6.10 metres*
DRILLING COMPANY: *DOWNING*	LOGGED BY: *D.B.*

DEPTH metres	ELEVATION	SAMPLE NO.	Sample Interval	HNU (ppm) VALUES	HNU (ppm) PROFILE 0 100	GRAPHIC LOG	GEOLOGIC DESCRIPTION
0	64.5	SS-1					SILTY SAND, fine grained, light brown, trace organics, dry.
1	64						
		SS-2					No organics
	63.5						
	63	SS-3					
2							
	62.5						Moist at 2.29m.
		SS-4					
	62						
3							Wet at 3.05m.
	61.5	SS-5					
	61						
4		SS-6					
	60.5						
	60	SS-7					
5							
	59.5						
	59	SS-8					
6							END OF HOLE

WELL DIAGRAM



Note: This borehole log was prepared for hydrogeological and/or environmental assessment purposes and does not necessarily contain information suitable for a geotechnical assessment of the subsurface conditions. Borehole data requires interpretation by Beatty Franz and Associates personnel before use by others.

BEATTY FRANZ & ASSOCIATES

Observation Well BH96-2

PROJECT: *CALEDONIA LANDFILL*	LOCATION: *TOWNSHIP OF CALEDONIA, ONTARIO*
PROJECT NO.: *141-961*	GROUND SURFACE ELEVATION: *63.94 M.A.S.L.*
DATE STARTED: *NOVEMBER 14, 1996*	TOC ELEVATION: *64.89 M.A.S.L.*
DATE FINISHED: *NOVEMBER 14, 1996*	WATER LEVEL: *59.02 M.A.S.L.*
DRILLING METHOD: *HOLLOW STEM*	TOTAL DEPTH: *6.10 metres*
DRILLING COMPANY: *DOWNING*	LOGGED BY: *D.B.*

DEPTH metres	ELEVATION	SAMPLE NO.	Sample Interval	HNU (ppm) VALUES	HNU (ppm) PROFILE 0 100	GRAPHIC LOG	GEOLOGIC DESCRIPTION
1	63.5						SILTY SAND, fine grained, light brown, dry.
	63						
	62.5						
2	62	SS-1					
	61.5	SS-2					
3	61						Some clay.
	60.5	SS-3					
4	60						Moist at 3.81m.
	59.5	SS-4					
5	59						Wet at 4.57m.
	58.5	SS-5					
6	58	SS-6					END OF HOLE

WELL DIAGRAM

2" PVC CASING

2" PVC SLOTTED SCREEN

BENTONITE

CUTTINGS

FILTER SAND

Note: This borehole log was prepared for hydrogeological and/or environmental assessment purposes and does not necessarily contain information suitable for a geotechnical assessment of the subsurface conditions. Borehole data requires interpretation by Beatty Franz and Associates personnel before use by others.

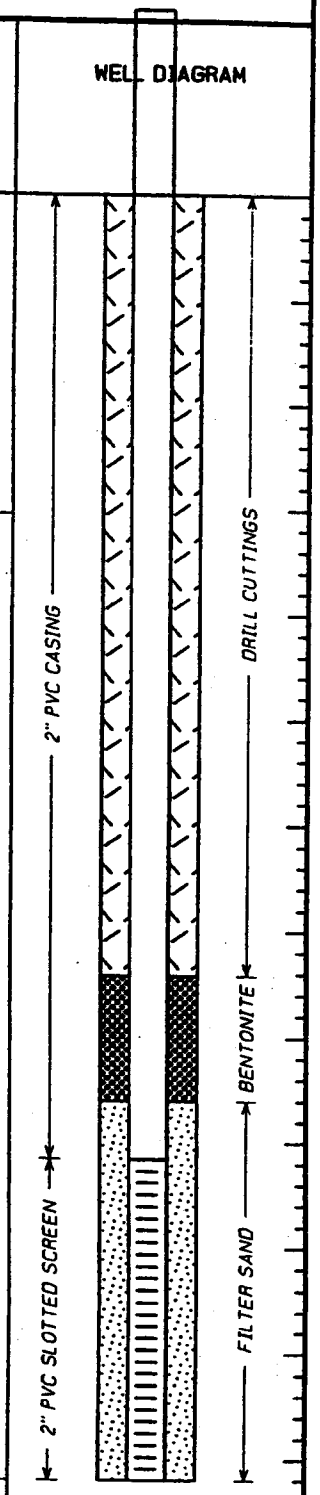
BEATTY FRANZ & ASSOCIATES

Observation Well BH96-3

PROJECT: *CALEDONIA LANDFILL*	LOCATION: *TOWNSHIP OF CALEDONIA, ONTARIO*
PROJECT NO.: *141-961*	GROUND SURFACE ELEVATION: *64.02 M.A.S.L.*
DATE STARTED: *NOVEMBER 15, 1996*	TOC ELEVATION: *64.88 M.A.S.L.*
DATE FINISHED: *NOVEMBER 15, 1996*	WATER LEVEL: *59.99 M.A.S.L.*
DRILLING METHOD: *HOLLOW STEM*	TOTAL DEPTH: *6.10 metres*
DRILLING COMPANY: *DOWNING*	LOGGED BY: *D.B.*

DEPTH metres	ELEVATION	SAMPLE NO.	Sample Interval	HNU (ppm) VALUES	HNU (ppm) PROFILE 0–100	GRAPHIC LOG	GEOLOGIC DESCRIPTION
0	64						
	63.5						SILTY SAND, with cross bedding, fine grained, light brown/grey, dry.
1	63	SS-1					
	62.5						SILTY SAND, fine grained, light brown, moist.
2	62	SS-2					
	61.5	SS-3					
3	61						
		SS-4					
	60.5						
4	60	SS-5					
	59.5						
		SS-6					
5	59						
	58.5	SS-7					
6	58						END OF HOLE

WELL DIAGRAM



Note: This borehole log was prepared for hydrogeological and/or environmental assessment purposes and does not necessarily contain information suitable for a geotechnical assessment of the subsurface conditions. Borehole data requires interpretation by Beatty Franz and Associates personnel before use by others.

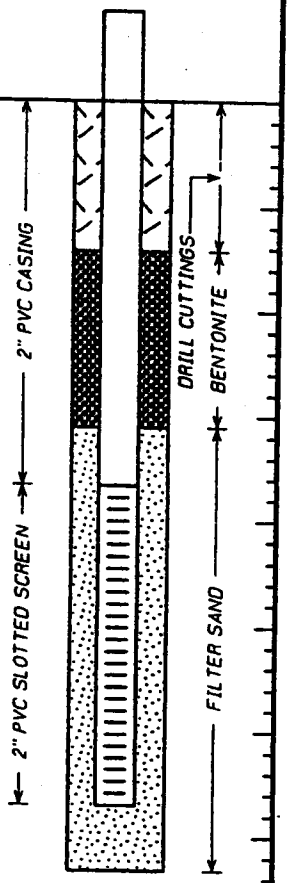
BEATTY FRANZ & ASSOCIATES

Observation Well BH96-4

PROJECT: *CALEDONIA LANDFILL*	LOCATION: *TOWNSHIP OF CALEDONIA, ONTARIO*
PROJECT NO.: *141-961*	GROUND SURFACE ELEVATION: *64.90 M.A.S.L.*
DATE STARTED: *NOVEMBER 15, 1996*	TOC ELEVATION: *65.35 M.A.S.L.*
DATE FINISHED: *NOVEMBER 15, 1996*	WATER LEVEL: *64.34 M.A.S.L.*
DRILLING METHOD: *HOLLOW STEM*	TOTAL DEPTH: *3.66 metres*
DRILLING COMPANY: *DOWNING*	LOGGED BY: *D.B.*

DEPTH metres	ELEVATION	SAMPLE NO.	Sample Interval	HNU (ppm) VALUES	HNU (ppm) PROFILE 0 100	GRAPHIC LOG	GEOLOGIC DESCRIPTION
1	64.5						SILTY SAND, fine grained, light brown, moist.
	64	SS-1					
	63.5						Wet at 1.52m.
2	63	SS-2					
	62.5						
		SS-3					
3	62						Some clay, wet.
	61.5	SS-4					
	61						END OF HOLE
4							
	60.5						
5	60						
	59.5						
6	59						

WELL DIAGRAM



Note: This borehole log was prepared for hydrogeological and/or environmental assessment purposes and does not necessarily contain information suitable for a geotechnical assessment of the subsurface conditions. Borehole data requires interpretation by Beatty Franz and Associates personnel before use by others.

LIST OF ABBREVIATIONS

The abbreviations commonly employed on Records of Boreholes, on figures and in the text of the report are as follows:

I. SAMPLE TYPE

AS	Auger sample
BS	Block sample
CS	Chunk sample
DO	Drive open
DS	Denison type sample
FS	Foil sample
RC	Rock core
SC	Soil core
ST	Slotted tube
TO	Thin-walled, open
TP	Thin-walled, piston
WS	Wash sample

II. PENETRATION RESISTANCE

Standard Penetration Resistance (SPT), N:
The number of blows by a 63.5 kg. (140 lb.) hammer dropped 760 mm (30 in.) required to drive a 50 mm (2 in.) drive open Sampler for a distance of 300 mm (12 in.)

Dynamic Penetration Resistance; N_d:
The number of blows by a 63.5 kg (140 lb.) hammer dropped 760 mm (30 in.) to drive Uncased a 50 mm (2 in.) diameter, 60^0 cone attached to "A" size drill rods for a distance of 300 mm (12 in.).

PH:	Sampler advanced by hydraulic pressure
PM:	Sampler advanced by manual pressure
WH:	Sampler advanced by static weight of hammer
WR:	Sampler advanced by weight of sampler and rod

Peizo-Cone Penetration Test (CPT):
An electronic cone penetrometer with a 60^0 conical tip and a projected end area of 10 cm^2 pushed through ground at a penetration rate of 2 cm/s. Measurements of tip resistance (Q_t), porewater pressure (PWP) and friction along a sleeve are recorded Electronically at 25 mm penetration intervals.

III. SOIL DESCRIPTION

(a) Cohesionless Soils

Density Index (Relative Density)	**N** Blows/300 mm Or Blows/ft.
Very loose	0 to 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very dense	over 50

(b) Cohesive Soils

Consistency	**$C_{u2}S_u$** Kpa	Psf
Very soft	0 to 12	0 to 250
Soft	12 to 25	250 to 500
Firm	25 to 50	500 to 1,000
Stiff	50 to 100	1,000 to 2,000
Very stiff	100 to 200	2,000 to 4,000
Hard	Over 200	Over 4,000

IV. SOIL TESTS

w	water content
w_p	plastic limited
w_l	liquid limit
C	consolidaiton (oedometer) test
CHEM	chemical analysis (refer to text)
CID	consolidated isotropically drained triaxial test[1]
CIU	consolidated isotropically undrained triaxial test with porewater pressure measurement[1]
D_R	relative density (specific gravity, G_s)
DS	direct shear test
M	sieve analysis for particle size
MH	combined sieve and hydrometer (H) analysis
MPC	modified Proctor compaction test
SPC	standard Proctor compaction test
OC	organic content test
SO_4	concentration of water-soluble sulphates
UC	unconfined compression test
UU	unconsolidated undrained triaxial test
V	field vane test (LV-laboratory vane test)
γ	unit weight

Note:
1. Tests which are anisotropically consolidated prior shear are shown as CAD, CAU.

LIST OF SYMBOLS

Unless otherwise stated, the symbols employed in the report are as follows:

I. GENERAL

π	= 3.1416
ln x, natural logarithm of x	
$\log_{10}$ x or log x, logarithm of x to base 10	
g	Acceleration due to gravity
t	time
F	factor of safety
V	volume
W	weight

II. STRESS AND STRAIN

γ	shear strain
Δ	change in, e.g. in stress: $\Delta\sigma'$
ε	linear strain
ε_v	volumetric strain
η	coefficient of viscosity
ν	Poisson's ratio
σ	total stress
σ'	effective stress ($\sigma' = \sigma$"-u)
σ'_{vo}	initial effective overburden stress
$\sigma_1\sigma_2\sigma_3$	principal stresses (major, intermediate, minor)
σ_{oct}	mean stress or octahedral stress $= (\sigma_1+\sigma_2+\sigma_3)/3$
τ	shear stress
u	porewater pressure
E	modulus of deformation
G	shear modulus of deformation
K	bulk modulus of compressibility

III. SOIL PROPERTIES

(a) Index Properties

$\rho(\gamma)$	bulk density (bulk unit weight*)
$\rho_d(\gamma_d)$	dry density (dry unit weight)
$\rho_w(\gamma_w)$	density (unit weight) of water
$\rho_s(\gamma_s)$	density (unit weight) of solid particles
γ'	unit weight of submerged soil ($\gamma'=\gamma-\gamma_w$)
D_R	relative density (specific gravity) of solid particles ($D_R= \rho_s/\rho_w$) formerly (G_s)
e	void ratio
n	porosity
S	degree of saturation

* Density symbol is p. Unit weight symbol is γ where γ=pg(i.e. mass density x acceleration due to gravity)

(a) Index Properties (cont'd.)

w	water content
w_l	liquid limit
w_p	plastic limit
I_p	plasticity Index=(w_l-w_p)
w_s	shrinkage limit
I_L	liquidity index=$(w-w_p)/I_p$
I_c	consistency index=$(w_l-w)/I_p$
e_{max}	void ratio in loosest state
e_{min}	void ratio in densest state
I_D	density index-$(e_{max}-e)/(e_{max}-e_{min})$ (formerly relative density)

(c) Hydraulic Properties

h	hydraulic head or poential
q	rate of flow
v	velocity of flow
i	hydraulic gradient
k	hydraulic conductivity (coefficient of permeability)
j	seepage force per unit volume

(d) Consolidation (one-dimensional)

C_c	compression index (normally consolidated range)
C_r	recompression index (overconsolidated range)
C_s	swelling index
C_a	coefficient of secondary consolidation
m_v	coefficient of volume change
c_v	coefficient of consolidation
T_v	time factor (vertical direction)
U	degree of consolidation
σ'_p	pre-consolidation pressure
OCR	Overconsolidation ratio=σ'_p/σ'_{vo}

(e) Shear Strength

$\tau_p\tau_r$	peak and residual shear strength
ϕ'	effective angle of internal friction
δ	angle of interface friction
μ	coefficient of friction=tan δ
c'	effective cohesion
c_u, s_u	undrained shear strength (ϕ=0 analysis)
p	mean total stress $(\sigma_1+\sigma_3)/2$
p'	mean effective stress $(\sigma'_1+\sigma'_3)/2$
q	$(\sigma_1-\sigma_3)/2$ or $(\sigma'_1-\sigma_3)/2$
q_u	compressive strength $(\sigma_1-\sigma_3)$
S_t	sensitivity

Notes: 1. $\tau=c'\sigma'\tan|'$

2. Shear strength=(Compressive strength)/2

PROJECT: 991-2834

RECORD OF BOREHOLE: BH 99-5

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: May 3, 1999

DATUM: Geodetic

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕; Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Wash Boring / BW Casing	Ground Surface		57.72							
		Dark brown SILTY TOPSOIL.		0.00							100mm x 100mm Protective Casing
				57.54							Bentonite Seal
		Brown to grey SILTY fine SAND, occasional sandy silt seam.		0.18							Sand and Native Backfill
1											
											32mm PVC #10 Slot Screen
2				54.98							
		END OF BOREHOLE		2.74							W.L in Screen at Elev.57.86m, 0.14m Above Ground Surface Oct. 12, 1999
3											
4											
5											

BOREHOLE 991-2834.GPJ HYDROGEO.GDT 3 29 00

DEPTH SCALE

1 : 25

Golder Associates

LOGGED: DJS

CHECKED: AM

PROJECT: 991-2834

RECORD OF BOREHOLE: BH 99-6

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: May 3, 1999

DATUM: Geodetic

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q- ●, U- ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface		65.22							
0	Power Auger 200mm Diam. Hollow Stem	Dark brown SILTY TOPSOIL.		0.00 / 65.07							100mm x 100mm Protective Casing
		Loose brown to grey SILTY fine SAND, occasional thin sandy silt seam. (Stratified)		0.15							Bentonite Seal
1					1	50 DO	9				Native Backfill
					2	50 DO	7				Bentonite Seal
2					3	50 DO	5				Sand and Native Backfill
3					4	50 DO	3				▽
		Loose grey fine SAND, trace silt, occasional silty clay seam.		61.56 / 3.66							50mm PVC #10 Slot Screen
4					5	50 DO	7				
		END OF BOREHOLE		60.65 / 4.57							W.L in Screen at Elev.62.00m Oct. 12, 1999
5											

BOREHOLE 991-2834.GPJ HYDROGEO.GDT 3 29 00

DEPTH SCALE

1 : 25

Golder Associates

LOGGED: DJS

CHECKED: .....

PROJECT: 991-2834

RECORD OF BOREHOLE: BH 99-7

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: May 3, 1999

DATUM: Geodetic

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕; Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger 200mm Diam. Hollow Stem	Ground Surface		65.16							
		Dark brown SILTY TOPSOIL.		0.00							100mm x 100mm Protective Casing
				64.95							Bentonite Seal
		Loose brown stratified SILTY fine SAND, occasional sandy silt seam.		0.21							
1					1	50 DO	7				Native Backfill
											Bentonite Seal
2					2	50 DO	7				
											Sand and Native Backfill
					3	50 DO	7				
3											
					4	50 DO	5				
		Loose brown stratified fine SAND, trace silt.		61.56 3.60							50mm PVC #10 Slot Screen
4					5	50 DO	5				
				60.59							
		END OF BOREHOLE		4.57							W.L in Screen at Elev.62.31m Oct. 12, 1999
5											

BOREHOLE 991-2834.GPJ HYDROGEO.GDT 3 29 00

DEPTH SCALE

1 : 25

Golder Associates

LOGGED: DJS

CHECKED:

APPENDIX C

RESULTS OF FIELD AND LABORATORY CHEMICAL AND PHYSICAL ANALYSES

LIST OF ABBREVIATIONS

The abbreviations commonly employed on the "Chemical and Physical Analyses Data Sheets", on the figures, in the tables and in the text of the report as related to the water quality monitoring programs are as follows:

ODWS	Ontario Drinking Water Standards (Ministry of the Environment, 2000)
PWQO	Provincial Water Quality Objective (Ministry of the Environment, 1994b) (Includes Interim PWQO also)
N	nitrogen
P	phosphorus
$CaCO_3$	calcium carbonate
C	degrees Celsius
microS/cm	microsiemens per centimetre
NTU	Nephelometric Turbidity Unit
TCU	True Colour Unit
mL	millilitre
mg/L	milligrams per litre
ppm	parts per million
COND.	conductivity
DIS. OXYGEN	dissolved oxygen
TKN	total kjeldahl nitrogen
BOD	biochemical oxygen demand
COD	chemical oxygen demand
DOC	dissolved organic carbon
EC	*Escherichia coli*
TOC	total organic carbon
TS	total solids
TSS	total suspended solids
TDS	total dissolved solids
TC	total coliform
FC	faecal coliform
FS	faecal streptococcus
BKGD	background
f (Alk)	PWQO related to alkalinity of surface water
f (Hardness)	PWQO related to hardness of surface water
f (Temp)	PWQO related to temperature of surface water
f (pH,Temp)	PWQO related to pH and temperature of surface water
f (pH)	PWQO related to pH of surface water
*	See Ministry of Environment (2000) for narrative guideline

APPENDIX C-I

GROUNDWATER MONITORS

Golder Associates

CALEDONIA LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **BH96-1** Sheet: 1

Date Sampled:		19-Nov-1996	12-May-1999	14-Oct-1999	09-Aug-2000	29-Nov-2000
Parameter	ODWS/O					
Alkalinity (CaCO3)	30-500	250	226	253	244	241
Aluminum	0.1	0.300	<0.030	0.090	0.130	0.330
Ammonia (as N)		0.04	<0.02	<0.02	0.05	0.03
Barium	1	0.072	0.060	NA	0.070	0.050
Beryllium		<0.001	<0.010	<0.010	<0.002	<0.002
Bicarbonate		250.00				
Boron	5	0.310	0.220	NA	0.250	0.290
Bromide		0.12				
Cadmium	0.005	<0.00200	<0.00500	<0.00500	<0.00010	<0.00010
Calcium		110.0	128.0	145.0	120.0	122.0
Carbonate		<1.00				
Chloride	250	9.9	4.0	5.0	29.0	19.0
Chromium	0.05	<0.004	<0.010	<0.010	<0.010	<0.010
Cobalt		<0.0100	<0.0100	<0.0100	0.0005	0.0008
COD			11	11	15	<4
Colour (TCU)	5	4				
Conductivity (uS/cm)		790	350	490	723	870
Copper	1	<0.0060	<0.0050	<0.0050	<0.0100	0.0030
DOC	5		3.6	4.6	3.4	3.8
Fluoride	1.5	0.08				
Hardness (CaCO3)	80-100	350	414	486	378	404
Iron	0.3	0.32	<0.01	0.11	0.11	0.40
Lead	0.01	<0.0200	<0.0020	<0.0020	<0.0010	<0.0010
Magnesium		22.00	23.00	30.00	19.00	24.00
Manganese	0.05	3.300	0.370	4.560	0.280	1.860
Molybdenum		<0.010	<0.010	<0.010	<0.010	<0.010
Nickel		<0.010	<0.010	<0.010	<0.010	<0.010
Nitrate (as N)	10	<0.05	0.23	<0.10	<0.10	<0.10
Nitrite (as N)	1	<0.05	<0.10	<0.10	<0.10	<0.10
pH (pH units)	6.5-8.5	7.1	7.2	6.8	7.4	6.2
Phenols			<0.001	<0.001	<0.001	0.010
Phosphate (as P)		<0.10	<0.03	0.03	0.02	<0.03
Phosphorus		<0.06				
Phosphorus (total)			0.80	1.48	0.83	2.14
Potassium		4.9	7.0	3.0	8.0	3.0
Silicon		4.20	2.30	3.60	2.96	3.66
Silver		<0.0100	<0.0100	<0.0100	<0.0001	<0.0001
Sodium	200	15.0	11.0	14.0	12.0	12.0
Strontium		0.750	0.610	0.974	0.653	0.807
Sulphate	500	170.0	179.0	258.0	138.0	186.0
Sulphur		50	55	79	51	186
TDS	500	481	444	672	464	568
Temperature (C)	15		8.5	4.5	9.8	8.1
Thallium		<0.06000	<0.20000	<0.50000	<0.00100	<0.00100
Tin		<0.050	<0.050		<0.010	<0.010
Titanium		0.018	<0.010	<0.010	<0.010	0.010
TOC		5				
Turbidity (NTU)	1	2.9				
Vanadium		<0.0050	<0.0100	<0.0100	<0.0100	0.0010
Zinc	5	0.010	<0.010	0.260	<0.010	<0.010
Zirconium		<0.01				

All values reported in mg/L unless otherwise noted.

Golder Associates

CALEDONIA LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **BH96-2**

Sheet: 1

Date Sampled:		19-Nov-1996	12-May-1999	14-Oct-1999	09-Aug-2000	29-Nov-2000
Parameter	ODWS/O					
Alkalinity (CaCO3)	30-500	190	304	244	269	177
Aluminum	0.1	0.045	<0.030	0.290	0.220	0.720
Ammonia (as N)		0.13	0.03	<0.02	0.03	<0.02
Barium	1	0.042	0.040	NA	0.040	0.040
Beryllium		<0.001	<0.010	<0.010	<0.002	<0.002
Bicarbonate		190.00				
Boron	5	0.130	0.120	NA	0.140	0.110
Bromide		<0.10				
Cadmium	0.005	<0.00200	<0.00500	<0.00500	0.00020	0.00010
Calcium		59.0	84.0	69.0	78.0	45.0
Carbonate		<1.00				
Chloride	250	5.1	3.0	4.0	3.0	1.0
Chromium	0.05	<0.004	<0.010	<0.010	<0.010	<0.010
Cobalt		<0.0100	<0.0100	<0.0100	0.0006	0.0005
COD			9	11	15	<4
Colour (TCU)	5	32				
Conductivity (uS/cm)		460	325	310	520	460
Copper	1	<0.0060	<0.0050	<0.0050	0.0200	0.0040
DOC	5		3.5	2.8	2.8	2.5
Fluoride	1.5	0.07				
Hardness (CaCO3)	80-100	200	329	259	286	162
Iron	0.3	0.11	<0.01	0.23	0.17	0.87
Lead	0.01	<0.0200	<0.0020	<0.0020	<0.0010	<0.0010
Magnesium		13.00	29.00	21.00	22.00	12.00
Manganese	0.05	0.220	3.540	1.650	2.720	1.510
Molybdenum		<0.010	<0.010	<0.010	<0.010	<0.010
Nickel		<0.010	<0.010	<0.010	<0.010	<0.010
Nitrate (as N)	10	0.81	0.50	0.66	0.19	<0.10
Nitrite (as N)	1	<0.05	<0.10	<0.10	<0.10	<0.10
pH (pH units)	6.5-8.5	7.1	7.1	6.5	7.7	6.3
Phenols			<0.001	<0.001	<0.001	<0.001
Phosphate (as P)		<0.10	0.06	0.03	0.04	0.03
Phosphorus		<0.06				
Phosphorus (total)			4.62	2.13	2.70	17.20
Potassium		2.1	2.0	1.0	1.0	1.0
Silicon		4.50	5.80	6.30	7.21	7.46
Silver		<0.0100	<0.0100	<0.0100	<0.0001	<0.0001
Sodium	200	13.0	4.0	5.0	4.0	4.0
Strontium		0.480	0.598	0.648	0.656	0.463
Sulphate	500	55.0	34.0	34.0	36.0	16.0
Sulphur		19	12	10	15	16
TDS	500	259	336	312	304	176
Temperature (C)	15		8.0	4.0	11.6	9.0
Thallium		<0.06000	<0.20000	<0.50000	<0.00100	<0.00100
Tin		<0.050	<0.050		<0.010	<0.010
Titanium		<0.010	<0.010	<0.010	<0.010	0.030
TOC		9				
Turbidity (NTU)	1	3.3				
Vanadium		<0.0050	<0.0100	<0.0100	<0.0100	0.0030
Zinc	5	0.019	<0.010	0.360	<0.010	<0.010
Zirconium		<0.01				

All values reported in mg/L unless otherwise noted.

Golder Associates

CALEDONIA LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **BH96-3**

Sheet: 1-1

Date Sampled:		19-Nov-1996	12-May-1999	14-Oct-1999	09-Aug-2000	29-Nov-2000
Parameter	ODWS/O					
Alkalinity (CaCO3)	30-500	160	382	311	397	288
Aluminum	0.1	0.290	<0.030	0.070	0.160	0.240
Ammonia (as N)		0.06	0.03	<0.02	0.03	0.02
Barium	1	0.033	0.030	NA	0.070	0.050
Beryllium		<0.001	0.010	<0.010	<0.002	<0.002
Bicarbonate		160.00				
Boron	5	0.330	0.530	NA	0.460	0.400
Bromide		0.22				
Cadmium	0.005	<0.00200	<0.00500	<0.00500	0.00020	0.00010
Calcium		140.0	137.0	204.0	214.0	143.0
Carbonate		<1.00				
Chloride	250	86.0	14.0	24.0	33.0	13.0
Chromium	0.05	<0.004	<0.010	<0.010	<0.010	<0.010
Cobalt		<0.0100	<0.0100	<0.0100	0.0008	0.0006
COD			9	11	18	8
Colour (TCU)	5	8				
Conductivity (uS/cm)		1100	450	540	1210	980
Copper	1	<0.0060	<0.0050	<0.0050	0.0100	0.0030
DOC	5		4.9	4.4	4.5	3.4
Fluoride	1.5	0.06				
Hardness (CaCO3)	80-100	470	466	666	687	460
Iron	0.3	0.35	<0.01	0.07	0.20	0.31
Lead	0.01	<0.0200	<0.0020	<0.0020	<0.0010	<0.0010
Magnesium		30.00	30.00	38.00	37.00	25.00
Manganese	0.05	1.300	2.020	1.930	1.620	1.270
Molybdenum		<0.010	<0.010	<0.010	<0.010	<0.010
Nickel		0.011	<0.010	<0.010	<0.010	<0.010
Nitrate (as N)	10	0.14	0.36	0.20	0.56	<0.10
Nitrite (as N)	1	<0.05	<0.10	<0.10	<0.10	<0.10
pH (pH units)	6.5-8.5	6.9	7.3	7.1	7.6	6.3
Phenols			0.002	<0.001	<0.001	<0.001
Phosphate (as P)		<0.10	<0.03	0.03	0.03	<0.03
Phosphorus		<0.06				
Phosphorus (total)			4.74	4.13	2.84	19.60
Potassium		2.4	2.0	2.0	2.0	2.0
Silicon		5.50	2.30	2.90	3.59	3.33
Silver		<0.0100	<0.0100	<0.0100	<0.0001	<0.0001
Sodium	200	40.0	26.0	25.0	22.0	28.0
Strontium		1.000	1.070	1.550	1.380	0.981
Sulphate	500	310.0	111.0	359.0	278.0	227.0
Sulphur		99	27	106	101	227
TDS	500	707	608	868	872	656
Temperature (C)	15		8.5	2.5	10.8	9.2
Thallium		<0.06000	<0.20000	<0.50000	<0.00100	<0.00100
Tin		<0.050	<0.050		<0.010	<0.010
Titanium		0.027	<0.010	<0.010	<0.010	0.010
TOC		9				
Turbidity (NTU)	1	3.8				
Vanadium		<0.0050	<0.0100	<0.0100	<0.0100	0.0020
Zinc	5	0.008	<0.010	0.380	<0.010	<0.010
Zirconium		<0.01				
VOC's:						
1,1,1,2-Tetrachloroethane					<0.60	
1,1,1-Trichloroethane					<0.40	
1,1,2,2-Tetrachloroethane					<0.60	
1,1,2-Trichloroethane					<0.40	
1,1-Dichloroethane					<0.40	
1,1-Dichloroethylene	14				<0.5000	
1,2-Dibromoethane					<1.00	
1,2-Dichlorobenzene	200				<1.00	
1,2-Dichloroethane	5				<0.700	
1,2-Dichloropropane					<0.70	
1,3,5-Trimethylbenzene					<0.30	

All VOC's reported in µg/L. All other values reported in mg/L unless otherwise noted.

Golder Associates

CALEDONIA LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **BH96-3**

Date Sampled:		19-Nov-1996	12-May-1999	14-Oct-1999	09-Aug-2000	29-Nov-2000
Parameter	ODWS/O					
1,3-Dichlorobenzene					<1.00	
1,4-Dichlorobenzene	5				<1.000	
Benzene	5				<0.5000	
Bromodichloromethane					<0.300	
Bromoform					<0.400	
Bromomethane					<0.500	
c-1,3-Dichloropropylene					<0.20	
Carbon Tetrachloride	5				<0.900	
Chlorobenzene	80				<0.200	
Chloroethane					<1.0	
Chloroform					<0.50	
Chloromethane					<1.000	
cis-1,2-Dichloroethylene					<0.40	
Dibromochloromethane					<0.30	
Ethylbenzene	2.4				<0.5000	
m/p-Xylene	300				<0.500	
Methylene Chloride	50				<4.00	
o-Xylene	300				<0.500	
Styrene					<0.50	
t-1,2-Dichloroethylene					<0.4000	
t-1,3-Dichloropropylene					<0.20	
Tetrachloroethylene	30				<0.30	
Toluene	24				<0.5000	
Trichloroethylene	50				<0.30	
Trichlorofluoromethane					<0.50	
Vinyl Chloride	2				<0.500	

All VOC's reported in µg/L. All other values reported in mg/L unless otherwise noted.

Golder Associates

CALEDONIA LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **BH96-4** Sheet: 1-1

Date Sampled:		19-Nov-1996	12-May-1999	14-Oct-1999	09-Aug-2000	29-Nov-2000
Parameter	ODWS/O					
Alkalinity (CaCO3)	30-500	160	153	142	158	143
Aluminum	0.1	0.530	<0.030	3.560	0.360	0.300
Ammonia (as N)		0.08	0.03	0.07	0.06	0.04
Barium	1	0.041	0.030	NA	0.040	0.040
Beryllium		<0.001	<0.010	<0.010	<0.002	<0.002
Bicarbonate		150.00				
Boron	5	<0.010	<0.010	NA	<0.010	<0.010
Bromide		<0.10				
Cadmium	0.005	<0.00200	<0.00500	<0.00500	<0.00010	<0.00010
Calcium		42.0	48.0	39.0	44.0	40.0
Carbonate		<1.00				
Chloride	250	1.8	2.0	2.0	1.0	2.0
Chromium	0.05	<0.004	<0.010	<0.010	<0.010	<0.010
Cobalt		<0.0100	<0.0100	<0.0100	0.0007	0.0005
COD			<3	11	10	<4
Colour (TCU)	5	18				
Conductivity (uS/cm)		320	285	210	307	341
Copper	1	<0.0060	<0.0050	<0.0050	<0.0100	0.0020
DOC	5		1.8	2.2	1.7	2.1
Fluoride	1.5	0.10				
Hardness (CaCO3)	80-100	160	177	151	168	145
Iron	0.3	0.51	<0.01	2.31	0.35	0.35
Lead	0.01	<0.0200	<0.0020	<0.0020	<0.0010	<0.0010
Magnesium		13.00	14.00	13.00	14.00	11.00
Manganese	0.05	0.016	0.010	0.070	0.030	0.020
Molybdenum		<0.010	<0.010	<0.010	<0.010	<0.010
Nickel		<0.010	<0.010	<0.010	<0.010	<0.010
Nitrate (as N)	10	<0.05	<0.10	<0.10	<0.10	<0.10
Nitrite (as N)	1	<0.05	<0.10	<0.10	<0.10	<0.10
pH (pH units)	6.5-8.5	7.8	6.9	7.7	7.2	7.1
Phenols			<0.001	<0.001	<0.001	<0.001
Phosphate (as P)		<0.10	0.18	0.15	0.11	0.23
Phosphorus		<0.06				
Phosphorus (total)			0.22	4.51	31.70	1.23
Potassium		2.0	3.0	2.0	2.0	2.0
Silicon		11.00	9.70	13.70	12.60	12.40
Silver		<0.0100	<0.0100	<0.0100	<0.0001	<0.0001
Sodium	200	7.9	7.0	6.0	6.0	6.0
Strontium		0.110	0.093	0.121	0.103	0.100
Sulphate	500	26.0	24.0	25.0	24.0	25.0
Sulphur		9	8	8	10	25
TDS	500	186	184	196	236	172
Temperature (C)	15		7.0	5.0	11.4	8.6
Thallium		<0.06000	<0.20000	<0.50000	<0.00100	<0.00100
Tin		<0.050	<0.050		<0.010	<0.010
Titanium		0.030	<0.010	0.010	0.010	0.010
TOC		5				
Turbidity (NTU)	1	690.0				
Vanadium		<0.0050	<0.0100	<0.0100	<0.0100	0.0030
Zinc	5	<0.005	<0.010	0.020	<0.010	<0.010
Zirconium		<0.01				
VOC's:						
1,1,1,2-Tetrachloroethane					<0.60	
1,1,1-Trichloroethane					<0.40	
1,1,2,2-Tetrachloroethane					<0.60	
1,1,2-Trichloroethane					<0.40	
1,1-Dichloroethane					<0.40	
1,1-Dichloroethylene	14				<0.5000	
1,2-Dibromoethane					<1.00	
1,2-Dichlorobenzene	200				<1.00	
1,2-Dichloroethane	5				<0.700	
1,2-Dichloropropane					<0.70	
1,3,5-Trimethylbenzene					<0.30	

All VOC's reported in µg/L. All other values reported in mg/L unless otherwise noted.

Golder Associates

CALEDONIA LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **BH96-4** Sheet: 1-2

Date Sampled:		19-Nov-1996	12-May-1999	14-Oct-1999	09-Aug-2000	29-Nov-2000
Parameter	ODWS/O					
1,3-Dichlorobenzene					<1.00	
1,4-Dichlorobenzene	5				<1.000	
Benzene	5				<0.5000	
Bromodichloromethane					<0.300	
Bromoform					<0.400	
Bromomethane					<0.500	
c-1,3-Dichloropropylene					<0.20	
Carbon Tetrachloride	5				<0.900	
Chlorobenzene	80				<0.200	
Chloroethane					<1.0	
Chloroform					<0.50	
Chloromethane					<1.000	
cis-1,2-Dichloroethylene					<0.40	
Dibromochloromethane					<0.30	
Ethylbenzene	2.4				<0.5000	
m/p-Xylene	300				<0.500	
Methylene Chloride	50				<4.00	
o-Xylene	300				<0.500	
Styrene					<0.50	
t-1,2-Dichloroethylene					<0.4000	
t-1,3-Dichloropropylene					<0.20	
Tetrachloroethylene	30				<0.30	
Toluene	24				<0.5000	
Trichloroethylene	50				<0.30	
Trichlorofluoromethane					<0.50	
Vinyl Chloride	2				<0.500	

All VOC's reported in µg/L. All other values reported in mg/L unless otherwise noted.

Golder Associates

CALEDONIA LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **BH99-5**

Date Sampled:		12-May-1999	14-Oct-1999	09-Aug-2000	29-Nov-2000
Parameter	ODWS/O				
Alkalinity (CaCO3)	30-500	140	141	155	130
Aluminum	0.1	<0.030	0.830	0.050	0.120
Ammonia (as N)		0.04	<0.02	0.03	<0.02
Barium	1	0.060	NA	0.160	0.210
Beryllium		<0.010	<0.010	<0.002	<0.002
Boron	5	0.020	NA	0.040	0.040
Cadmium	0.005	<0.00500	<0.00500	<0.00010	<0.00010
Calcium		63.0	71.0	117.0	114.0
Chloride	250	43.0	79.0	149.0	195.0
Chromium	0.05	<0.010	<0.010	<0.010	<0.010
Cobalt		<0.0100	<0.0100	0.0006	0.0004
COD		14	8	10	<4
Conductivity (uS/cm)		250	350	970	1100
Copper	1	<0.0050	<0.0050	<0.0100	0.0010
DOC	5	2.1	1.8	0.9	1.3
Hardness (CaCO3)	80-100	240	272	441	433
Iron	0.3	<0.01	0.51	0.11	0.10
Lead	0.01	<0.0020	<0.0020	<0.0010	<0.0010
Magnesium		20.00	23.00	36.00	36.00
Manganese	0.05	<0.010	<0.010	0.020	0.020
Molybdenum		<0.010	<0.010	<0.010	<0.010
Nickel		<0.010	<0.010	<0.010	<0.010
Nitrate (as N)	10	0.24	0.13	<0.10	<0.10
Nitrite (as N)	1	0.11	<0.10	<0.10	<0.10
pH (pH units)	6.5-8.5	7.6	7.5	7.6	6.9
Phenols		<0.001	<0.001	<0.001	<0.001
Phosphate (as P)		0.12	0.09	0.06	0.06
Phosphorus (total)		3.29	2.19	0.54	0.80
Potassium		2.0	2.0	2.0	3.0
Silicon		6.70	8.80	8.45	8.43
Silver		<0.0100	<0.0100	<0.0001	<0.0001
Sodium	200	14.0	20.0	26.0	26.0
Strontium		<0.007	0.184	0.246	0.299
Sulphate	500	72.0	82.0	122.0	128.0
Sulphur		21	26	44	128
TDS	500	312	396	728	716
Temperature (C)	15	6.0	1.0	12.2	7.0
Thallium		<0.20000	<0.50000	<0.00100	<0.00100
Tin		<0.050		<0.010	<0.010
Titanium		<0.010	<0.010	<0.010	<0.010
Vanadium		<0.0100	<0.0100	<0.0100	0.0040
Zinc	5	0.010	0.070	<0.010	<0.010

All values reported in mg/L unless otherwise noted.

Golder Associates

CALEDONIA LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **BH99-6**

Date Sampled:		12-May-1999	14-Oct-1999	09-Aug-2000	29-Nov-2000
Parameter	ODWS/O				
Alkalinity (CaCO3)	30-500	589	507	452	457
Aluminum	0.1	0.100	0.100	0.100	0.100
Ammonia (as N)		22.90	22.00	17.80	19.40
Barium	1	0.240	NA	0.240	0.210
Beryllium		<0.010	<0.010	<0.002	<0.002
Boron	5	0.280	NA	0.220	0.250
Cadmium	0.005	<0.00500	<0.00500	<0.00010	<0.00010
Calcium		139.0	103.0	114.0	90.0
Chloride	250	62.0	49.0	88.0	36.0
Chromium	0.05	<0.010	<0.010	<0.010	<0.010
Cobalt		<0.0100	<0.0100	0.0153	0.0173
COD		98	100	75	62
Conductivity (uS/cm)		560	590	1340	1080
Copper	1	<0.0050	<0.0050	<0.0100	0.0020
DOC	5	37.5	29.3	22.2	23.4
Hardness (CaCO3)	80-100	446	335	384	287
Iron	0.3	65.60	50.20	56.20	39.00
Lead	0.01	<0.0020	<0.0020	<0.0010	<0.0010
Magnesium		24.00	19.00	24.00	15.00
Manganese	0.05	15.100	13.600	14.800	11.600
Molybdenum		<0.010	<0.010	<0.010	<0.010
Nickel		<0.010	<0.010	<0.010	<0.010
Nitrate (as N)	10	<0.10	<0.10	<0.10	<0.10
Nitrite (as N)	1	<0.10	<0.10	<0.10	<0.10
pH (pH units)	6.5-8.5	7.6	6.4	7.3	5.9
Phenols		0.015	0.012	0.007	0.010
Phosphate (as P)		0.21	<0.01	<0.03	0.05
Phosphorus (total)		2.55	0.49	0.45	0.55
Potassium		26.0	16.0	27.0	28.0
Silicon		7.90	9.10	10.50	9.85
Silver		0.0200	<0.0100	<0.0001	<0.0001
Sodium	200	55.0	45.0	57.0	37.0
Strontium		1.160	1.320	1.090	0.913
Sulphate	500	12.0	4.0	39.0	7.0
Sulphur		6	<1	18	7
TDS	500	728	628	688	528
Temperature (C)	15	9.0	5.0	10.7	9.9
Thallium		<0.20000	<0.50000	<0.00100	<0.00100
Tin		<0.050		<0.010	<0.010
Titanium		<0.010	<0.010	<0.010	<0.010
Vanadium		<0.0100	<0.0100	0.0100	0.0060
Zinc	5	0.010	0.330	<0.010	<0.010
VOC's:					
1,1,1,2-Tetrachloroethane				<0.60	
1,1,1-Trichloroethane				<0.40	
1,1,2,2-Tetrachloroethane				<0.60	
1,1,2-Trichloroethane				<0.40	
1,1-Dichloroethane				0.50	
1,1-Dichloroethylene	14			<0.5000	
1,2-Dibromoethane				<1.00	
1,2-Dichlorobenzene	200			<1.00	
1,2-Dichloroethane	5			<0.700	
1,2-Dichloropropane				<0.70	
1,3,5-Trimethylbenzene				0.60	
1,3-Dichlorobenzene				2.00	
1,4-Dichlorobenzene	5			2.000	
Benzene	5			2.1000	
Bromodichloromethane				<0.300	
Bromoform				<0.400	
Bromomethane				<0.500	
c-1,3-Dichloropropylene				<0.20	
Carbon Tetrachloride	5			<0.900	
Chlorobenzene	80			<0.200	

All VOC's reported in µg/L. All other values reported in mg/L unless otherwise noted.

Golder Associates

CALEDONIA LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **BH99-6**

Date Sampled:		12-May-1999	14-Oct-1999	09-Aug-2000	29-Nov-2000
Parameter	ODWS/O				
Chloroethane				<1.0	
Chloroform				<0.50	
Chloromethane				<1.000	
cis-1,2-Dichloroethylene				1.90	
Dibromochloromethane				<0.30	
Ethylbenzene	2.4			28.9000	
m/p-Xylene	300			44.400	
Methylene Chloride	50			<4.00	
o-Xylene	300			2.300	
Styrene				<0.50	
t-1,2-Dichloroethylene				<0.4000	
t-1,3-Dichloropropylene				<0.20	
Tetrachloroethylene	30			<0.30	
Toluene	24			<0.5000	
Trichloroethylene	50			<0.30	
Trichlorofluoromethane				<0.50	
Vinyl Chloride	2			<0.500	

All VOC's reported in µg/L. All other values reported in mg/L unless otherwise noted.

Golder Associates

CALEDONIA LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **BH99-7**

Date Sampled:		12-May-1999	14-Oct-1999	09-Aug-2000	29-Nov-2000
Parameter	ODWS/O				
Alkalinity (CaCO3)	30-500	26	15	28	17
Aluminum	0.1	<0.030	0.070	0.060	0.150
Ammonia (as N)		0.05	<0.02	0.03	<0.02
Barium	1	0.010	NA	<0.010	<0.010
Beryllium		<0.010	<0.010	<0.002	<0.002
Boron	5	<0.010	NA	<0.010	<0.010
Cadmium	0.005	<0.00500	<0.00500	<0.00010	<0.00010
Calcium		8.0	8.0	8.0	7.0
Chloride	250	4.0	4.0	6.0	5.0
Chromium	0.05	<0.010	<0.010	<0.010	<0.010
Cobalt		<0.0100	<0.0100	<0.0001	0.0002
COD		5	<3	8	<4
Conductivity (uS/cm)		240	76	74	92
Copper	1	<0.0050	<0.0050	<0.0100	<0.0010
DOC	5	1.8	0.8	0.4	0.9
Hardness (CaCO3)	80-100	28	28	28	22
Iron	0.3	0.07	0.04	0.11	0.10
Lead	0.01	<0.0020	<0.0020	<0.0010	<0.0010
Magnesium		2.00	2.00	2.00	1.00
Manganese	0.05	<0.010	<0.010	<0.010	<0.010
Molybdenum		<0.010	<0.010	<0.010	<0.010
Nickel		<0.010	<0.010	<0.010	<0.010
Nitrate (as N)	10	<0.10	<0.10	<0.10	<0.10
Nitrite (as N)	1	<0.10	<0.10	<0.10	<0.10
pH (pH units)	6.5-8.5	6.7	6.0	5.9	6.5
Phenols		<0.001	<0.001	<0.001	<0.001
Phosphate (as P)		0.06	0.06	0.04	0.24
Phosphorus (total)		3.36	0.11	0.40	0.74
Potassium		2.0	<1.0	<1.0	<1.0
Silicon		6.00	6.90	6.85	6.49
Silver		<0.0100	<0.0100	<0.0001	<0.0001
Sodium	200	3.0	4.0	3.0	4.0
Strontium		0.079	0.067	0.086	0.081
Sulphate	500	11.0	17.0	10.0	10.0
Sulphur		4	5	4	10
TDS	500	44	52	68	44
Temperature (C)	15	8.0	5.0	10.1	8.6
Thallium		<0.20000	<0.50000	<0.00100	<0.00100
Tin		<0.050		<0.010	<0.010
Titanium		<0.010	<0.010	<0.010	<0.010
Vanadium		<0.0100	<0.0100	<0.0100	<0.0010
Zinc	5	<0.010	<0.010	<0.010	<0.010

All values reported in mg/L unless otherwise noted.

APPENDIX C-II

SURFACE WATER SAMPLING STATIONS

Golder Associates

CALEDONIA LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **SW-2**

Date Sampled:		19-Nov-1996	12-May-1999	28-Aug-1999	14-Oct-1999	08-Aug-2000
Parameter	PWQO					
Alkalinity (CaCO3)	75% Bkgd	51	91	NS	NS	52
Aluminum	f (pH)	8.100	<0.030			0.050
Ammonia (as N)		0.10	0.04			0.06
Barium		0.064	0.030			0.010
Beryllium	f (Hardness)	<0.001	<0.010			<0.002
Bicarbonate		51.00				
Boron	0.2	0.015	0.020			0.010
Bromide		<0.10				
Cadmium	0.0002	<0.00200	<0.00015			<0.00010
Calcium		23.0	32.0			18.0
Carbonate		<1.00				
Chloride		10.0	12.0			5.0
Chromium		0.017	<0.010			<0.010
Cobalt	0.0009	<0.0100	<0.0004			0.0006
COD			14			10
Colour (TCU)		2				
Conductivity (uS/cm)		170	130			136
Copper	0.005	0.0067	<0.0050			<0.0010
Dissolved Oxygen	f (Temp)		9.8			8.4
DOC			4.9			4.8
Fluoride		0.06				
Hardness (CaCO3)		84	121			57
Iron	0.3	12.00	0.24			0.39
Lead	f (Alk)	0.0046	<0.0020			0.0010
Magnesium		6.50	10.00			3.00
Manganese		0.660	0.060			0.130
Molybdenum	0.04	<0.010	<0.010			<0.010
Nickel	0.025	0.010	<0.010			<0.010
Nitrate (as N)		0.11	1.14			0.11
Nitrite (as N)		<0.05	<0.10			<0.10
pH (pH units)	6.5-8.5	6.6	7.2			7.0
Phenols	0.001		<0.001			0.001
Phosphate (as P)		<0.10	0.03			0.03
Phosphorus		0.22				
Phosphorus (total)	0.03	0.12	0.03			0.08
Potassium		1.8	1.0			<1.0
Silicon		17.00	6.80			6.47
Silver	0.0001	<0.0100	<0.0001			<0.0001
Sodium		4.7	10.0			4.0
Strontium		0.190	0.154			0.139
Sulphate		12.0	35.0			14.0
Sulphur		4	11			6
TDS		88	160			104
Temperature (C)			6.0			17.0
Thallium	0.0003	<0.06000	<0.00500			<0.00100
Tin		<0.050	<0.050			<0.010
Titanium		0.510	<0.010			0.020
TOC		7				
Turbidity (NTU)		17.0				
Unionized Ammonia	0.02		<0.020			<0.020
Vanadium	0.006	0.0160	<0.0070			<0.0100
Zinc	0.03	0.023	<0.010			<0.010
Zirconium		<0.01				

All values reported in mg/L unless otherwise noted.

Golder Associates

CALEDONIA LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **SW-2**

Parameter	PWQO	Date Sampled: 29-Nov-2000	23-Dec-2000
Alkalinity (CaCO3)	75% Bkgd	DRY	NS
Aluminum	f (pH)		
Ammonia (as N)			
Barium			
Beryllium	f (Hardness)		
Bicarbonate			
Boron	0.2		
Bromide			
Cadmium	0.0002		
Calcium			
Carbonate			
Chloride			
Chromium			
Cobalt	0.0009		
COD			
Colour (TCU)			
Conductivity (uS/cm)			
Copper	0.005		
Dissolved Oxygen	f (Temp)		
DOC			
Fluoride			
Hardness (CaCO3)			
Iron	0.3		
Lead	f (Alk)		
Magnesium			
Manganese			
Molybdenum	0.04		
Nickel	0.025		
Nitrate (as N)			
Nitrite (as N)			
pH (pH units)	6.5-8.5		
Phenols	0.001		
Phosphate (as P)			
Phosphorus			
Phosphorus (total)	0.03		
Potassium			
Silicon			
Silver	0.0001		
Sodium			
Strontium			
Sulphate			
Sulphur			
TDS			
Temperature (C)			
Thallium	0.0003		
Tin			
Titanium			
TOC			
Turbidity (NTU)			
Unionized Ammonia	0.02		
Vanadium	0.006		
Zinc	0.03		
Zirconium			

All values reported in mg/L unless otherwise noted.

Golder Associates

CALEDONIA LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **SW-3** Sheet: 1

Date Sampled:		12-May-1999	28-Aug-1999	14-Oct-1999	08-Aug-2000	29-Nov-2000
Parameter	PWQO					
Alkalinity (CaCO3)	75% Bkgd	86	133	77	87	77
Aluminum	f (pH)	<0.030	<0.030	<0.030	<0.050	0.140
Ammonia (as N)		0.10	0.04	<0.02	0.08	<0.02
Barium		0.020	<0.010	0.050	0.030	0.040
Beryllium	f (Hardness)	<0.010	<0.010	<0.010	<0.002	<0.002
Boron	0.2	0.020	0.040	<0.010	0.030	<0.010
Cadmium	0.0002	<0.00015	<0.00015	<0.00500	<0.00010	<0.00010
Calcium		32.0	52.0	35.0	29.0	36.0
Chloride		10.0	27.0	25.0	12.0	23.0
Chromium		<0.010	<0.010	<0.010	<0.010	<0.010
Cobalt	0.0009	<0.0004	<0.0004	<0.0100	0.0003	0.0003
COD		9	18	33	21	5
Conductivity (uS/cm)		150	320	230	240	450
Copper	0.005	<0.0050	<0.0050	<0.0050	<0.0010	0.0010
Dissolved Oxygen	f (Temp)	12.3	7.5	9.6	9.7	11.7
DOC		4.4	5.3	9.0	7.1	4.0
Hardness (CaCO3)		121	196	137	110	135
Iron	0.3	0.20	0.55	0.39	0.46	0.23
Lead	f (Alk)	<0.0020	<0.0020	<0.0020	<0.0010	<0.0010
Magnesium		10.00	16.00	12.00	9.00	11.00
Manganese		0.060	0.150	0.040	0.120	0.030
Molybdenum	0.04	<0.010	<0.010	<0.010	<0.010	<0.010
Nickel	0.025	<0.010	<0.010	<0.010	<0.010	<0.010
Nitrate (as N)		1.27	0.44	4.07	0.45	9.69
Nitrite (as N)		<0.10	<0.10	<0.10	<0.10	<0.10
pH (pH units)	6.5-8.5	7.4	7.2	7.1	7.1	6.8
Phenols	0.001	<0.001	<0.001	<0.001	0.003	<0.001
Phosphate (as P)		0.03	0.03	0.06	0.09	0.04
Phosphorus (total)	0.03	0.02	0.08	0.09	0.05	0.05
Potassium		1.0	1.0	2.0	1.0	1.0
Silicon		6.90	9.20	8.40	7.98	9.23
Silver	0.0001	<0.0001	<0.0001	<0.0100	<0.0001	<0.0001
Sodium		9.0	16.0	8.0	8.0	8.0
Strontium		0.127	0.209	0.167	0.153	0.173
Sulphate		27.0	53.0	28.0	30.0	21.0
Sulphur		9	16	9	12	7
TDS		144	256	204	204	248
Temperature (C)		5.0	27.0	4.5	15.2	6.0
Thallium	0.0003	<0.00500	<0.00500	<0.50000	<0.00100	<0.00100
Tin		<0.050	<0.050		<0.010	<0.010
Titanium		<0.010	<0.010	<0.010	<0.010	<0.010
Unionized Ammonia	0.02	<0.020	<0.020	<0.020	<0.020	<0.020
Vanadium	0.006	<0.0070	<0.0070	<0.0100	<0.0100	0.0010
Zinc	0.03	<0.010	<0.010	<0.010	<0.010	<0.010

All values reported in mg/L unless otherwise noted.

Golder Associates

CALEDONIA LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **SW-3**

Date Sampled: 23-Dec-2000

Parameter	PWQO	
Alkalinity (CaCO3)	75% Bkgd	NS
Aluminum	f (pH)	
Ammonia (as N)		
Barium		
Beryllium	f (Hardness)	
Boron	0.2	
Cadmium	0.0002	
Calcium		
Chloride		
Chromium		
Cobalt	0.0009	
COD		
Conductivity (uS/cm)		
Copper	0.005	
Dissolved Oxygen	f (Temp)	
DOC		
Hardness (CaCO3)		
Iron	0.3	
Lead	f (Alk)	
Magnesium		
Manganese		
Molybdenum	0.04	
Nickel	0.025	
Nitrate (as N)		
Nitrite (as N)		
pH (pH units)	6.5-8.5	
Phenols	0.001	
Phosphate (as P)		
Phosphorus (total)	0.03	
Potassium		
Silicon		
Silver	0.0001	
Sodium		
Strontium		
Sulphate		
Sulphur		
TDS		
Temperature (C)		
Thallium	0.0003	
Tin		
Titanium		
Unionized Ammonia	0.02	
Vanadium	0.006	
Zinc	0.03	

All values reported in mg/L unless otherwise noted.

Golder Associates

CALEDONIA LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **SW-4** Sheet: 1

Date Sampled:		12-May-1999	08-Aug-2000	29-Nov-2000	23-Dec-2000
Parameter	PWQO				
Alkalinity (CaCO3)	75% Bkgd	156	164	96	NS
Aluminum	f (pH)	0.340	<0.050	<0.050	
Ammonia (as N)		0.05	0.20	0.05	
Barium		0.030	0.030	0.010	
Beryllium	f (Hardness)	<0.010	<0.002	<0.002	
Boron	0.2	0.180	0.210	0.100	
Cadmium	0.0002	<0.00015	<0.00010	<0.00010	
Calcium		75.0	70.0	44.0	
Chloride		22.0	31.0	26.0	
Chromium		<0.010	<0.010	<0.010	
Cobalt	0.0009	<0.0004	0.0003	0.0003	
COD		20	33	8	
Conductivity (uS/cm)		320	580	530	
Copper	0.005	<0.0050	0.0010	<0.0010	
Dissolved Oxygen	f (Temp)	10.0	8.1	15.5	
DOC		9.3	10.8	7.1	
Hardness (CaCO3)		270	253	164	
Iron	0.3	2.47	4.36	0.85	
Lead	f (Alk)	<0.0020	<0.0010	<0.0010	
Magnesium		20.00	19.00	13.00	
Manganese		0.260	0.180	0.200	
Molybdenum	0.04	<0.010	<0.010	<0.010	
Nickel	0.025	<0.010	<0.010	<0.010	
Nitrate (as N)		0.19	<0.10	<0.10	
Nitrite (as N)		<0.10	<0.10	<0.10	
pH (pH units)	6.5-8.5	7.2	7.2	6.8	
Phenols	0.001	<0.001	0.002	<0.001	
Phosphate (as P)		0.15	0.36	0.04	
Phosphorus (total)	0.03	0.28	0.27	0.07	
Potassium		2.0	1.0	1.0	
Silicon		4.80	7.13	4.70	
Silver	0.0001	<0.0001	<0.0001	<0.0001	
Sodium		26.0	22.0	14.0	
Strontium		0.450	0.500	0.328	
Sulphate		103.0	99.0	82.0	
Sulphur		32	41	27	
TDS		320	400	244	
Temperature (C)		7.0	17.4	1.0	
Thallium	0.0003	<0.00500	<0.00100	<0.00100	
Tin		<0.050	<0.010	<0.010	
Titanium		<0.010	0.020	<0.010	
Unionized Ammonia	0.02		<0.020	<0.020	
Vanadium	0.006	<0.0070	<0.0100	<0.0010	
Zinc	0.03	<0.010	<0.010	<0.010	

All values reported in mg/L unless otherwise noted.

Golder Associates

CALEDONIA LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **SW-5** Sheet: 1

Date Sampled:		12-May-1999	28-Aug-1999	14-Oct-1999	08-Aug-2000	29-Nov-2000
Parameter	PWQO					
Alkalinity (CaCO3)	75% Bkgd	92	132	79	96	79
Aluminum	f (pH)	<0.030	<0.030	0.490	<0.050	0.160
Ammonia (as N)		0.18	0.04	<0.02	0.07	<0.02
Barium		0.020	0.040	0.050	0.030	0.040
Beryllium	f (Hardness)	<0.010	<0.010	<0.010	<0.002	<0.002
Boron	0.2	<0.010	0.040	<0.010	0.040	<0.010
Cadmium	0.0002	<0.00015	<0.00015	<0.00500	<0.00010	<0.00010
Calcium		38.0	54.0	36.0	32.0	37.0
Chloride		10.0	26.0	27.0	14.0	24.0
Chromium		<0.010	<0.010	<0.010	<0.010	<0.010
Cobalt	0.0009	0.0010	<0.0004	<0.0100	0.0003	0.0003
COD		9	15	32	23	5
Conductivity (uS/cm)		160	320	230	270	460
Copper	0.005	<0.0050	<0.0050	<0.0050	<0.0010	0.0020
Dissolved Oxygen	f (Temp)	10.6	11.2	9.8	9.3	11.3
DOC		6.4	5.8	9.5	7.6	3.5
Hardness (CaCO3)		120	205	139	117	138
Iron	0.3	1.25	0.55	0.67	0.52	0.33
Lead	f (Alk)	<0.0020	<0.0020	<0.0020	<0.0010	<0.0010
Magnesium		6.00	17.00	12.00	9.00	11.00
Manganese		0.120	0.080	0.080	0.090	0.040
Molybdenum	0.04	<0.010	<0.010	<0.010	<0.010	0.020
Nickel	0.025	<0.010	<0.010	<0.010	<0.010	<0.010
Nitrate (as N)		1.42	0.45	3.78	0.40	9.77
Nitrite (as N)		<0.10	<0.10	<0.10	<0.10	<0.10
pH (pH units)	6.5-8.5	7.4	7.0	7.1	7.1	7.1
Phenols	0.001	<0.001	<0.001	<0.001	0.003	<0.001
Phosphate (as P)		<0.03	0.03	0.06	0.09	0.04
Phosphorus (total)	0.03	0.16	0.10	0.12	0.27	0.04
Potassium		3.0	2.0	2.0	1.0	1.0
Silicon		4.40	9.30	8.30	8.06	9.19
Silver	0.0001	<0.0001	<0.0001	<0.0100	<0.0001	<0.0001
Sodium		4.0	17.0	9.0	9.0	9.0
Strontium		0.227	0.215	0.170	0.177	0.177
Sulphate		19.0	53.0	32.0	35.0	24.0
Sulphur		6	17	10	14	8
TDS		144	256	212	192	172
Temperature (C)		8.0	18.0	4.5	15.3	5.0
Thallium	0.0003	<0.00500	<0.00500	<0.50000	<0.00100	<0.00100
Tin		<0.050	<0.050		<0.010	<0.010
Titanium		<0.010	<0.010	<0.010	<0.010	0.020
Unionized Ammonia	0.02	<0.020	<0.020	<0.020	<0.020	<0.020
Vanadium	0.006	<0.0070	<0.0070	<0.0100	<0.0100	0.0020
Zinc	0.03	<0.010	<0.010	<0.010	<0.010	<0.010

All values reported in mg/L unless otherwise noted.

Golder Associates

CALEDONIA LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **SW-5**

Date Sampled: 23-Dec-2000

Parameter	PWQO	
Alkalinity (CaCO3)	75% Bkgd	NS
Aluminum	f (pH)	
Ammonia (as N)		
Barium		
Beryllium	f (Hardness)	
Boron	0.2	
Cadmium	0.0002	
Calcium		
Chloride		
Chromium		
Cobalt	0.0009	
COD		
Conductivity (uS/cm)		
Copper	0.005	
Dissolved Oxygen	f (Temp)	
DOC		
Hardness (CaCO3)		
Iron	0.3	
Lead	f (Alk)	
Magnesium		
Manganese		
Molybdenum	0.04	
Nickel	0.025	
Nitrate (as N)		
Nitrite (as N)		
pH (pH units)	6.5-8.5	
Phenols	0.001	
Phosphate (as P)		
Phosphorus (total)	0.03	
Potassium		
Silicon		
Silver	0.0001	
Sodium		
Strontium		
Sulphate		
Sulphur		
TDS		
Temperature (C)		
Thallium	0.0003	
Tin		
Titanium		
Unionized Ammonia	0.02	
Vanadium	0.006	
Zinc	0.03	

All values reported in mg/L unless otherwise noted.

Golder Associates

CALEDONIA LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **SW-6** Sheet: 1-1

Date Sampled:		12-May-1999	28-Aug-1999	14-Oct-1999	08-Aug-2000	29-Nov-2000
Parameter	PWQO					
Alkalinity (CaCO3)	75% Bkgd	252	135	174	173	225
Aluminum	f (pH)	<0.030	<0.030	<0.030	0.090	0.100
Ammonia (as N)		0.08	0.06	0.19	0.19	0.13
Barium		0.020	0.030	0.060	0.040	0.040
Beryllium	f (Hardness)	<0.010	<0.010	<0.010	<0.002	<0.002
Boron	0.2	0.020	0.020	0.030	0.030	0.040
Cadmium	0.0002	<0.00015	<0.00015	<0.00500	<0.00010	0.00010
Calcium		91.0	43.0	63.0	55.0	73.0
Chloride		28.0	28.0	44.0	23.0	32.0
Chromium		<0.010	<0.010	<0.010	<0.010	<0.010
Cobalt	0.0009	<0.0004	<0.0004	<0.0100	0.0006	0.0003
COD		<3	15	29	26	11
Conductivity (uS/cm)		330	300	330	420	890
Copper	0.005	<0.0050	<0.0050	<0.0050	0.0030	0.0030
Dissolved Oxygen	f (Temp)	9.8	8.4	9.1	5.7	13.5
DOC		5.9	5.5	9.9	7.7	5.2
Hardness (CaCO3)		293	153	219	183	257
Iron	0.3	0.03	0.60	1.01	0.92	0.68
Lead	f (Alk)	<0.0020	<0.0020	<0.0020	0.0010	<0.0010
Magnesium		16.00	11.00	15.00	11.00	18.00
Manganese		0.030	0.090	0.060	0.090	0.040
Molybdenum	0.04	<0.010	<0.010	<0.010	<0.010	<0.010
Nickel	0.025	<0.010	<0.010	<0.010	<0.010	<0.010
Nitrate (as N)		0.74	0.26	2.00	0.43	6.62
Nitrite (as N)		0.11	<0.10	<0.10	<0.10	<0.10
pH (pH units)	6.5-8.5	7.5	7.4	7.6	7.2	7.2
Phenols	0.001	<0.001	<0.001	<0.001	0.002	<0.001
Phosphate (as P)		0.06	0.12	0.52	0.48	0.19
Phosphorus (total)	0.03	0.09	0.27	0.35	0.14	0.15
Potassium		4.0	4.0	11.0	6.0	5.0
Silicon		1.30	5.50	5.60	4.09	6.65
Silver	0.0001	<0.0001	<0.0001	<0.0100	<0.0001	<0.0001
Sodium		30.0	22.0	26.0	16.0	33.0
Strontium		0.292	0.179	0.296	0.258	0.301
Sulphate		30.0	16.0	53.0	21.0	69.0
Sulphur		10	5	17	9	23
TDS		332	252	360	288	428
Temperature (C)		10.5	20.0	4.5	18.5	4.0
Thallium	0.0003	<0.00500	<0.00500	<0.50000	<0.00100	<0.00100
Tin		<0.050	<0.050		<0.010	<0.010
Titanium		<0.010	<0.010	0.020	0.020	0.020
Unionized Ammonia	0.02	<0.020	<0.020	<0.020	<0.020	<0.020
Vanadium	0.006	<0.0070	<0.0070	<0.0100	<0.0100	0.0010
Zinc	0.03	<0.010	<0.010	<0.010	<0.010	<0.010
VOC's:						
1,1,1,2-Tetrachloroethane	20				<0.60	
1,1,1-Trichloroethane	10				<0.40	
1,1,2,2-Tetrachloroethane					<0.60	
1,1,2-Trichloroethane	800				<0.40	
1,1-Dichloroethane	200				<0.40	
1,1-Dichloroethylene	40				<0.5000	
1,2-Dibromoethane					<1.00	
1,2-Dichlorobenzene	2.5				<1.00	
1,2-Dichloroethane	100				<0.700	
1,2-Dichloropropane	0.7				<0.70	
1,3,5-Trimethylbenzene					<0.30	
1,3-Dichlorobenzene	2.5				<1.00	
1,4-Dichlorobenzene	4				<1.000	
Benzene	100				<0.5000	
Bromodichloromethane	200				<0.300	
Bromoform	60				<0.400	
Bromomethane	0.9				<0.500	
c-1,3-Dichloropropylene					<0.20	

All VOC's reported in µg/L. All other values reported in mg/L unless otherwise noted.

Golder Associates

CALEDONIA LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **SW-6**

Date Sampled:		12-May-1999	28-Aug-1999	14-Oct-1999	08-Aug-2000	29-Nov-2000
Parameter	PWQO					
Carbon Tetrachloride					<0.900	
Chlorobenzene	15				<0.200	
Chloroethane					<1.0	
Chloroform					<0.50	
Chloromethane	700				<1.000	
cis-1,2-Dichloroethylene					<0.40	
Dibromochloromethane					<0.30	
Ethylbenzene	8				<0.5000	
m/p-Xylene	32				<0.500	
Methylene Chloride	100				<4.00	
o-Xylene	40				<0.500	
Styrene	4				<0.50	
t-1,2-Dichloroethylene					<0.4000	
t-1,3-Dichloropropylene	7				<0.20	
Tetrachloroethylene	50				<0.30	
Toluene	0.8				<0.5000	
Trichloroethylene	20				<0.30	
Trichlorofluoromethane					<0.50	
Vinyl Chloride	600				<0.500	

All VOC's reported in µg/L. All other values reported in mg/L unless otherwise noted.

Golder Associates

CALEDONIA LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **SW-6**

Sheet: 2-1

Date Sampled:		23-Dec-2000
Parameter	PWQO	
Alkalinity (CaCO3)	75% Bkgd	NS
Aluminum	f (pH)	
Ammonia (as N)		
Barium		
Beryllium	f (Hardness)	
Boron	0.2	
Cadmium	0.0002	
Calcium		
Chloride		
Chromium		
Cobalt	0.0009	
COD		
Conductivity (uS/cm)		
Copper	0.005	
Dissolved Oxygen	f (Temp)	
DOC		
Hardness (CaCO3)		
Iron	0.3	
Lead	f (Alk)	
Magnesium		
Manganese		
Molybdenum	0.04	
Nickel	0.025	
Nitrate (as N)		
Nitrite (as N)		
pH (pH units)	6.5-8.5	
Phenols	0.001	
Phosphate (as P)		
Phosphorus (total)	0.03	
Potassium		
Silicon		
Silver	0.0001	
Sodium		
Strontium		
Sulphate		
Sulphur		
TDS		
Temperature (C)		
Thallium	0.0003	
Tin		
Titanium		
Unionized Ammonia	0.02	
Vanadium	0.006	
Zinc	0.03	
VOC's:		
1,1,1,2-Tetrachloroethane	20	
1,1,1-Trichloroethane	10	
1,1,2,2-Tetrachloroethane		
1,1,2-Trichloroethane	800	
1,1-Dichloroethane	200	
1,1-Dichloroethylene	40	
1,2-Dibromoethane		
1,2-Dichlorobenzene	2.5	
1,2-Dichloroethane	100	
1,2-Dichloropropane	0.7	
1,3,5-Trimethylbenzene		
1,3-Dichlorobenzene	2.5	
1,4-Dichlorobenzene	4	
Benzene	100	
Bromodichloromethane	200	
Bromoform	60	
Bromomethane	0.9	
c-1,3-Dichloropropylene		

All VOC's reported in µg/L. All other values reported in mg/L unless otherwise noted.

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CALEDONIA LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **SW-6**

Date Sampled: 23-Dec-2000

Parameter	PWQO
Carbon Tetrachloride	
Chlorobenzene	15
Chloroethane	
Chloroform	
Chloromethane	700
cis-1,2-Dichloroethylene	
Dibromochloromethane	
Ethylbenzene	8
m/p-Xylene	32
Methylene Chloride	100
o-Xylene	40
Styrene	4
t-1,2-Dichloroethylene	
t-1,3-Dichloropropylene	7
Tetrachloroethylene	50
Toluene	0.8
Trichloroethylene	20
Trichlorofluoromethane	
Vinyl Chloride	600

All VOC's reported in µg/L. All other values reported in mg/L unless otherwise noted.

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CALEDONIA LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **SW-7** Sheet: 1

Date Sampled:		12-May-1999	28-Aug-1999	14-Oct-1999	08-Aug-2000	29-Nov-2000
Parameter	PWQO					
Alkalinity (CaCO3)	75% Bkgd	66	51	83	62	79
Aluminum	f (pH)	0.190	<0.030	0.030	0.070	0.160
Ammonia (as N)		0.05	0.09	<0.02	0.14	0.02
Barium		0.020	0.020	0.060	0.020	0.050
Beryllium	f (Hardness)	<0.010	<0.010	<0.010	<0.002	<0.002
Boron	0.2	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium	0.0002	<0.00015	<0.00015	<0.00500	0.00010	<0.00010
Calcium		20.0	16.0	35.0	16.0	37.0
Chloride		6.0	6.0	48.0	7.0	24.0
Chromium		<0.010	<0.010	<0.010	<0.010	<0.010
Cobalt	0.0009	<0.0004	<0.0004	<0.0100	0.0005	0.0003
COD		14	20	29	28	<4
Conductivity (uS/cm)		105	140	225	130	470
Copper	0.005	<0.0050	<0.0050	<0.0050	0.0060	0.0010
Dissolved Oxygen	f (Temp)	9.3	7.6	9.4	8.6	10.7
DOC		5.1	6.0	7.6	8.1	3.6
Hardness (CaCO3)		79	61	137	61	142
Iron	0.3	0.11	1.57	0.33	0.37	0.21
Lead	f (Alk)	<0.0020	<0.0020	<0.0020	<0.0010	<0.0010
Magnesium		7.00	5.00	12.00	5.00	12.00
Manganese		0.050	0.170	0.020	0.130	0.030
Molybdenum	0.04	<0.010	<0.010	<0.010	<0.010	<0.010
Nickel	0.025	<0.010	<0.010	<0.010	<0.010	<0.010
Nitrate (as N)		1.40	0.52	4.65	0.51	11.40
Nitrite (as N)		<0.10	<0.10	<0.10	<0.10	<0.10
pH (pH units)	6.5-8.5	7.6	7.1	7.1	6.8	7.0
Phenols	0.001	<0.001	<0.001	<0.001	0.002	<0.001
Phosphate (as P)		0.03	<0.03	0.06	0.09	0.04
Phosphorus (total)	0.03	0.07	0.15	0.06	0.08	0.06
Potassium		1.0	1.0	1.0	1.0	2.0
Silicon		7.40	8.50	8.80	8.22	9.56
Silver	0.0001	<0.0001	<0.0001	<0.0100	<0.0001	<0.0001
Sodium		5.0	6.0	8.0	5.0	8.0
Strontium		0.087	0.087	0.163	0.091	0.175
Sulphate		13.0	8.0	24.0	9.0	18.0
Sulphur		5	3	8	3	6
TDS		96	92	212	108	208
Temperature (C)		13.0	19.0	3.0	16.2	6.0
Thallium	0.0003	<0.00500	<0.00500	<0.50000	<0.00100	<0.00100
Tin		<0.050	<0.050		<0.010	<0.010
Titanium		<0.010	<0.010	<0.010	<0.010	<0.010
Unionized Ammonia	0.02	<0.020	<0.020	<0.020	<0.020	<0.020
Vanadium	0.006	<0.0070	<0.0070	<0.0100	<0.0100	<0.0010
Zinc	0.03	<0.010	<0.010	<0.010	<0.010	<0.010

All values reported in mg/L unless otherwise noted.

Golder Associates

CALEDONIA LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **SW-7**

Date Sampled: 23-Dec-2000

Parameter	PWQO	
Alkalinity (CaCO3)	75% Bkgd	NS
Aluminum	f (pH)	
Ammonia (as N)		
Barium		
Beryllium	f (Hardness)	
Boron	0.2	
Cadmium	0.0002	
Calcium		
Chloride		
Chromium		
Cobalt	0.0009	
COD		
Conductivity (uS/cm)		
Copper	0.005	
Dissolved Oxygen	f (Temp)	
DOC		
Hardness (CaCO3)		
Iron	0.3	
Lead	f (Alk)	
Magnesium		
Manganese		
Molybdenum	0.04	
Nickel	0.025	
Nitrate (as N)		
Nitrite (as N)		
pH (pH units)	6.5-8.5	
Phenols	0.001	
Phosphate (as P)		
Phosphorus (total)	0.03	
Potassium		
Silicon		
Silver	0.0001	
Sodium		
Strontium		
Sulphate		
Sulphur		
TDS		
Temperature (C)		
Thallium	0.0003	
Tin		
Titanium		
Unionized Ammonia	0.02	
Vanadium	0.006	
Zinc	0.03	

All values reported in mg/L unless otherwise noted.

Golder Associates

CALEDONIA LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **SW-8** Sheet: 1-1

Date Sampled:		08-Aug-2000	29-Nov-2000	23-Dec-2000
Parameter	PWQO			
Alkalinity (CaCO3)	75% Bkgd	173	281	NS
Aluminum	f (pH)	0.120	<0.050	
Ammonia (as N)		0.19	0.17	
Barium		0.040	0.040	
Beryllium	f (Hardness)	<0.002	<0.002	
Boron	0.2	0.030	0.050	
Cadmium	0.0002	<0.00010	<0.00010	
Calcium		54.0	85.0	
Chloride		23.0	35.0	
Chromium		<0.010	<0.010	
Cobalt	0.0009	0.0006	0.0008	
COD		23	10	
Conductivity (uS/cm)		420	860	
Copper	0.005	0.0030	0.0060	
Dissolved Oxygen	f (Temp)	5.2	11.6	
DOC		7.7	5.7	
Hardness (CaCO3)		176	311	
Iron	0.3	0.97	0.95	
Lead	f (Alk)	<0.0010	<0.0010	
Magnesium		10.00	24.00	
Manganese		0.080	0.050	
Molybdenum	0.04	<0.010	<0.010	
Nickel	0.025	<0.010	<0.010	
Nitrate (as N)		0.43	5.48	
Nitrite (as N)		<0.10	<0.10	
pH (pH units)	6.5-8.5	7.1	7.2	
Phenols	0.001	0.002	<0.001	
Phosphate (as P)		0.39	0.23	
Phosphorus (total)	0.03	0.26	0.18	
Potassium		6.0	6.0	
Silicon		4.43	5.24	
Silver	0.0001	<0.0001	<0.0001	
Sodium		16.0	43.0	
Strontium		0.256	0.347	
Sulphate		21.0	81.0	
Sulphur		9	27	
TDS		264	512	
Temperature (C)		18.6	5.0	
Thallium	0.0003	<0.00100	<0.00100	
Tin		<0.010	<0.010	
Titanium		0.030	0.020	
Unionized Ammonia	0.02	<0.020	<0.020	
Vanadium	0.006	0.0100	0.0030	
Zinc	0.03	<0.010	<0.010	
VOC's:				
1,1,1,2-Tetrachloroethane	20	<0.60		
1,1,1-Trichloroethane	10	<0.40		
1,1,2,2-Tetrachloroethane		<0.60		
1,1,2-Trichloroethane	800	<0.40		
1,1-Dichloroethane	200	<0.40		
1,1-Dichloroethylene	40	<0.5000		
1,2-Dibromoethane		<1.00		
1,2-Dichlorobenzene	2.5	<1.00		
1,2-Dichloroethane	100	<0.700		
1,2-Dichloropropane	0.7	<0.70		
1,3,5-Trimethylbenzene		<0.30		
1,3-Dichlorobenzene	2.5	<1.00		
1,4-Dichlorobenzene	4	<1.000		
Benzene	100	<0.5000		
Bromodichloromethane	200	<0.300		
Bromoform	60	<0.400		
Bromomethane	0.9	<0.500		
c-1,3-Dichloropropylene		<0.20		

All VOC's reported in µg/L. All other values reported in mg/L unless otherwise noted.

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CALEDONIA LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **SW-8**

Date Sampled:		08-Aug-2000	29-Nov-2000	23-Dec-2000
Parameter	PWQO			
Carbon Tetrachloride		<0.900		
Chlorobenzene	15	<0.200		
Chloroethane		<1.0		
Chloroform		<0.50		
Chloromethane	700	<1.000		
cis-1,2-Dichloroethylene		<0.40		
Dibromochloromethane		<0.30		
Ethylbenzene	8	<0.5000		
m/p-Xylene	32	<0.500		
Methylene Chloride	100	<4.00		
o-Xylene	40	<0.500		
Styrene	4	<0.50		
t-1,2-Dichloroethylene		<0.4000		
t-1,3-Dichloropropylene	7	<0.20		
Tetrachloroethylene	50	<0.30		
Toluene	0.8	<0.5000		
Trichloroethylene	20	<0.30		
Trichlorofluoromethane		<0.50		
Vinyl Chloride	600	<0.500		

All VOC's reported in µg/L. All other values reported in mg/L unless otherwise noted.