

Sid Chumley
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**HALTON REGIONAL LANDFILL-BURLINGTON
1986 MONITORING REPORT**

**FOR
THE REGIONAL MUNICIPALITY OF HALTON**

PROJECT 86-53

MARCH, 1987

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March 30, 1987

GLL 86053

The Regional Municipality of Halton
1151 Bronte Road
Oakville, Ontario
L6S 4Z3

Attention: Mr. J. McKay, P.Eng.,

Dear Sirs:

Re: Halton Regional Landfill Burlington
1986 Monitoring Report

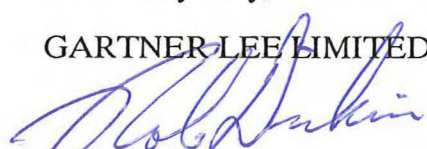
We respectfully submit the final 1986 Monitoring Report for the Halton Regional Landfill in Burlington.

The report contains ground water and surface water quality data collected during 1986 and our interpretation of these data. As in 1984 and 1985 the landfill appears to have degraded water quality in drainage ditches to the south of the landfill, particularly the sedimentation pond outlet. Several small leachate seeps are present in the Falcon Creek ravine as noted in previous monitoring reports. The overall impact of these small leachate discharges on Falcon Creek water quality was minimal.

If you have any questions concerning this report please contact our office. Thank you for this opportunity to be of service.

Yours very truly,

GARTNER LEE LIMITED


R.C. Dickin, M.Sc.,
Senior Hydrogeologist


for R.E.J. Leech, B.Sc., M.Eng.Sc.,
Senior Hydrogeologist
Principal

RCD:emh



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1.0 CONCLUSIONS

Based on the findings of the 1986 monitoring program and review of previously prepared hydrogeological and monitoring reports we draw the following conclusions:

- i) Water quality at the sedimentation pond outlet SW12 was affected by landfill leachate in 1986 as it was in 1984 and 1985. The source of the water quality degradation was probably leachate seepages at the southwest corner of the landfill. Engineering measures were carried out by Regional staff in July 1986 to contain and collect this leachate. Initial monitoring results since July suggest some improvement in water quality but additional monitoring is required to further assess the effectiveness of these remedial measures.
- ii) Intermittent discharges of leachate-affected runoff from the sedimentation pond (SW12) and drainage ditches to the southeast of the landfill appear to have caused a slight impairment of water quality in Falcon Creek at the downstream station SW14. In addition, evidence of leachate was noted at two locations in the Falcon Creek ravine. However, due to dilution and natural renovation these small discharges have minimal impact on the downstream station SW3. The degree of water quality impairment in Falcon Creek downstream from the landfill is generally no worse than that found at sampling stations on a control stream located in an urban setting but far removed from any potential landfill impact.
- iii) There is no apparent leachate impact on ground water at the north end of the landfill. The north end of the landfill is underlain by low permeability till soils and is equipped with an underdrain leachate collection system.
- iv) At the south end of the landfill there is some evidence that leachate may have moved 25 m southward with the ground water flow system. However, the leachate appears to be significantly diluted and attenuated.



- v) The average volume of leachate collected by the toedrain/underdrain collection system was 1.75 L/s for the period October 1986 to February 1987. Flow rates increased rapidly in response to significant precipitation events. The total volume of leachate collected was equivalent to about 15% of total precipitation.



2.0 RECOMMENDATIONS

The following recommendations are respectfully submitted for consideration. These recommendations are based on the results of 1986 monitoring program and discussions of the "Plume Delineation Program Report" with Halton Regional Staff and the Burlington Landfill Advisory Committee.

- i) The Region should continue to map leachate seeps monthly and to promptly repair any seeps which they find.
- ii) Monitoring data from the first half of 1987 should be reviewed to determine if leachate continues to affect water quality in the sedimentation pond. Based on this information the need for additional remedial measures to prevent leachate discharges in this area should be reassessed.
- iii) Evidence of leachate discharges in the Falcon Creek ravine should be further investigated by installing several shallow monitoring wells suitable for trace organic testing. As previously recommended in the "Plume Delineation Report" these new monitors should be sampled twice in 1987 for volatile organics, phenols, inorganics and routine water quality parameters in order to assess the significance of westward leachate migration towards Falcon Creek.
- iv) Age dating of ground waters at this site would increase understanding of the ground water flow system and would assist in determining the extent of the leachate plume. Waters which infiltrated into the ground before the landfill was established in 1972 are unlikely to be affected by leachate. As previously recommended in the "Plume Delineation Report", ground water samples from the deeper (12 and 18 m depths) plume delineation monitors, (23-I, 23-II, 24-I, 24-II, 25-I, 26-II, 27-I, 27-II) should be age dated using tritium analyses.



- v) Leachate flow in the toedrain from the northern portion of the landfill should be measured. This will provide information on the collection efficiency of the underdrained northern area versus the southern area which does not have an underdrain system.

- vi) The monitoring program should be continued as outlined on Figure 1. This proposed program incorporates the recommendations of the plume delineation report and additional recommendations requested by Regional Staff and the Burlington Landfill Advisory Committee. The proposed 1987 monitoring program is similar to the 1986 program but includes the following additional items:
 - a) Sampling and testing of the HC-15 monitoring well nest, located south of the landfill on the south side of Highway 403 should be included in the ground water monitoring program. These monitors were installed by Hydrology Consultants during a separate hydrogeological study. Monitoring of these wells will provide additional information on the deep ground water flow system.
 - b) The proposed ground water sampling frequency has been increased to twice per year from once a year. This was requested by Regional staff during recent discussions in order that any potential leachate breakthroughs could be detected earlier, thus allowing more time to design and install any required remedial measures.
 - c) A program is recommended to assess the short-term variability of volatile organic and phenol concentrations in ground water. Three replicate samples should be taken twice in 1987 from the twelve plume delineation monitors for volatile organic and phenol analysis. Two of the replicates should be tested leaving the third to be used only if verification of the first two is required.



FIGURE 1 : BURLINGTON LANDFILL 1987 MONITORING PROGRAM

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	SAMPLING LOCATIONS	TASK	FREQUENCY PER ANNUM	ANALYTICAL PARAMETERS
Groundwater	PVC Plastic Monitors 12-II, 13-II, 14-I, 14-II, 15-I, 15-II, 16-IV, 18-II, 18-III, 21-I, 21-II, 21-III, 22-I, 22-II, 22-III	Develop, sample and deliver samples to laboratories	2	Conductivity, chloride, hardness, alkalinity, nitrogen (TKN, NH ₄), BOD, COD, phenols
	Stainless Steel Monitors 23-I, 23-II, 23-III, 24-I, 24-II, 24-III, 26-I, 26-II, 26-III, 27-I, 27-II, 27-III, 28-I, 29-I, 30-I, 31-I, HC-15-86-1, 2, 3, 4 plus proposed new monitors	Same as above	2	Same as above plus volatile organic scan
	All existing ground water monitors.	Measure water levels.	2	
Surface Water	SW1, SW2, SW3, SW4, SW5, SW6, SW7, SW10, SW11, SW12, SW13, SW14, SW15, SW16, SW17, SW18, SW19, SW20, SW21	- Sample - Measure flows at time of sampling - deliver samples to laboratory.	4	Conductivity, pH, Chloride, hardness, alkalinity, nitrogen (TKN, NH ₄ , NO ₃ , NO ₂) BOD, COD, phosphorous, phenol, iron, suspended solids
	Falcon Creek Indian Creek	Inspect stream bank and valley walls for springs and sample if sufficient flow.	4	Same as for surface water samples above.
	SW3	Read staff gauge (Regional staff)	2 per week	
Leachate	Toe-drain, manhole 23	Sample and deliver samples to laboratory.	4	Conductivity, pH, chloride, hardness, alkalinity, nitrogen, (TKN, NH ₄ , NO ₃ , NO ₂) BOD, COD, phosphorous, phenol, iron, suspended solids, heavy metal scan, priority pollutant trace organics, including volatiles, extractibles, PCB and pesticides.
		Monitor leachate flow rate. (Regional Staff)	Continuously	
	Entire Site	Map leachate springs and document repair work (Regional Staff)	As required, minimum frequency 12.	
		Review Regional leachate spring maps and confirm mapping in the field (Monitoring Consultant).	4	



- d) An additional stainless steel plume delineation monitoring well should be installed in the south-east corner of the site in 1987. The need for a further additional stainless steel monitoring well directly south of monitor 24, halfway between there and the North Service Road, should be reviewed in 1988.
- e) Selected PVC plastic ground water monitors (14-I, 14-II, 15-I, 15-II, 16-I, 16-II, 16-III, 16-IV) at the south end of the landfill should be tested for volatile organics twice during 1987 on an experimental basis. These monitors were constructed with PVC glue which contains volatile organic compounds, and could cause anomalous results. However, these monitors were installed in 1979 and the volatile organic compounds in the glue may have dissipated. If so, then these monitors would be suitable for collecting ground water samples for trace organic analysis.
- f) The MOE laboratory will no longer be carrying out the laboratory analyses for this monitoring program. Analyses will be carried out at the Halton Regional Laboratory and a commercial laboratory. Appropriate quality assurance programs should be set up to ensure consistent and reliable laboratory analysis results.



3.0 INTRODUCTION

Gartner Lee Limited (GLL) were retained on August 13, 1980 by the Regional Municipality of Halton to carry out a monitoring program at the Burlington Regional Landfill. The Region authorized the 1986 sampling program under Purchase Order No. 73769. This monitoring program was required by the Ministry of Environment (MOE) as part of the provisional Certificate of Approval No. A210102. This is the seventh annual monitoring report on data collected at this site. The monitoring program is ongoing as per the recommendations in this report.

The purpose of the ground water monitoring program is to assess the impact of the existing landfill on ground water quality. The purpose of the surface water monitoring program is to assess the impact, if any, of landfill site operations on the water quality of Falcon Creek and Indian Creek and to determine the effectiveness of the toe-drain collection system in preventing overland leachate flow.

A considerable amount of hydrogeological work has already been done at this site. Previous reports were reviewed and pertinent data and interpretations are included in this report. Previous GLL reports on this site are referenced in Section 8.0.



4.0 BACKGROUND PHYSIOGRAPHY AND GEOLOGY

Regionally the Burlington Landfill site is situated on the lower slopes of the Niagara Escarpment in an area heavily dissected by gullies and ravines. The lands comprising the site slope moderately towards the south and east, except as altered by the existing fills. A deep ravine, eroded into the shale bedrock, borders the western periphery of the site. Falcon Creek flows intermittently to the south along the ravine bottom.

A less pronounced ravine borders the northeast side of the site. Intermittent drainage channels to the northeast of the property are part of the Indian Creek drainage basin.

The northern portion of the site is mantled by a relatively dense to very dense clayey silt till. This till is absent in the southern part of the site. A layer of weathered Queenston shale, varying in thickness, occurs beneath the till in the northern part of the subject area and at surface in the south. Unweathered Queenston shale forms the bedrock below the whole site.



5.0 LEACHATE

5.1 LEACHATE COLLECTION

Rainfall and snowmelt which infiltrates through the refuse will produce leachate. At the Burlington landfill site a toe-drain leachate collection system has been retrofitted along the west, south and southeast sides. The toe-drain was extended around most of the site as part of the "continued use" landfill expansion. The purpose of the toe-drain is to reduce leachate discharges from springs at the toe of the landfill into the surrounding environment.

The northern part of the landfill is underlain by a layer of clayey silt till and is equipped with an underdrain system for leachate collection (see Figure 2). The purpose of the underdrain system is to collect leachate and thus reduce downward movement into the shale bedrock.

The southern part of the landfill is older and is not equipped with an underdrain system. The layer of clayey silt till thins to the south and in places the refuse lies directly on shale bedrock. Leachate enters the ground water flow system in the shale bedrock in these areas.

All collected leachate from the toe-drain and underdrain is discharged to the Burlington sanitary sewer system. A flow meter to record leachate flow volumes was installed on the toe-drain in the fall of 1986.

Leachate flow data for the period October 1986 to February 1987 is tabulated and presented in Appendix II. The average leachate flow rate during this period was about 1.75 L/s.

Daily leachate flow rates and daily precipitation from the Royal Botanical Gardens Meteorological Station are plotted versus time on Figure 3. It should be noted that there are some gaps in the flow data. Review of Figure 3 suggests that during relatively dry weather such as in October 1986, base leachate flows are generally within the range



of 0.4 to 0.6 L/s. Base leachate flows increased in the latter part of November and generally ranged between 1 and 2 L/s for December, January and February.

Leachate flow rates in the toe-drain generally increase after precipitation events of 5 mm or more. The response to precipitation occurs relatively rapidly, usually within one day. Since the northern part of the site is underdrained but has not been completely filled and final covered this rapid response was expected.

The total volume of leachate collected between October 9 and December 31, 1986 was compared to the total volume of precipitation which fell on the landfill area (34.5 hectares) during this period. About 15% of the total precipitation volume was collected in the leachate collection system. Based on research studies at other landfills in southern Ontario it is estimated that about 75% of rainfall is lost via evapotranspiration or runoff and about 25% infiltrates into the refuse through a clay landfill cap on an annual basis. If these percentages are applicable to the Burlington site it would suggest that some infiltration is being retained in storage as soil and refuse moisture, or is being lost to the ground water flow system.

10%
where
go?

possibly to gw

5.2 LEACHATE CHEMISTRY

Leachate samples were collected by GLL from toe-drain manhole 23 (see Figure 2) in May, July, September and December 1986. The samples were submitted to the MOE laboratory for analysis of routine water quality parameters, heavy metals, volatile organics, extractable organics and a PCB and pesticide scan. Complete laboratory results for the May samples were available at the time of writing, but only partial results were available for the July, September and December samples. Results received to date are presented in Appendix III.

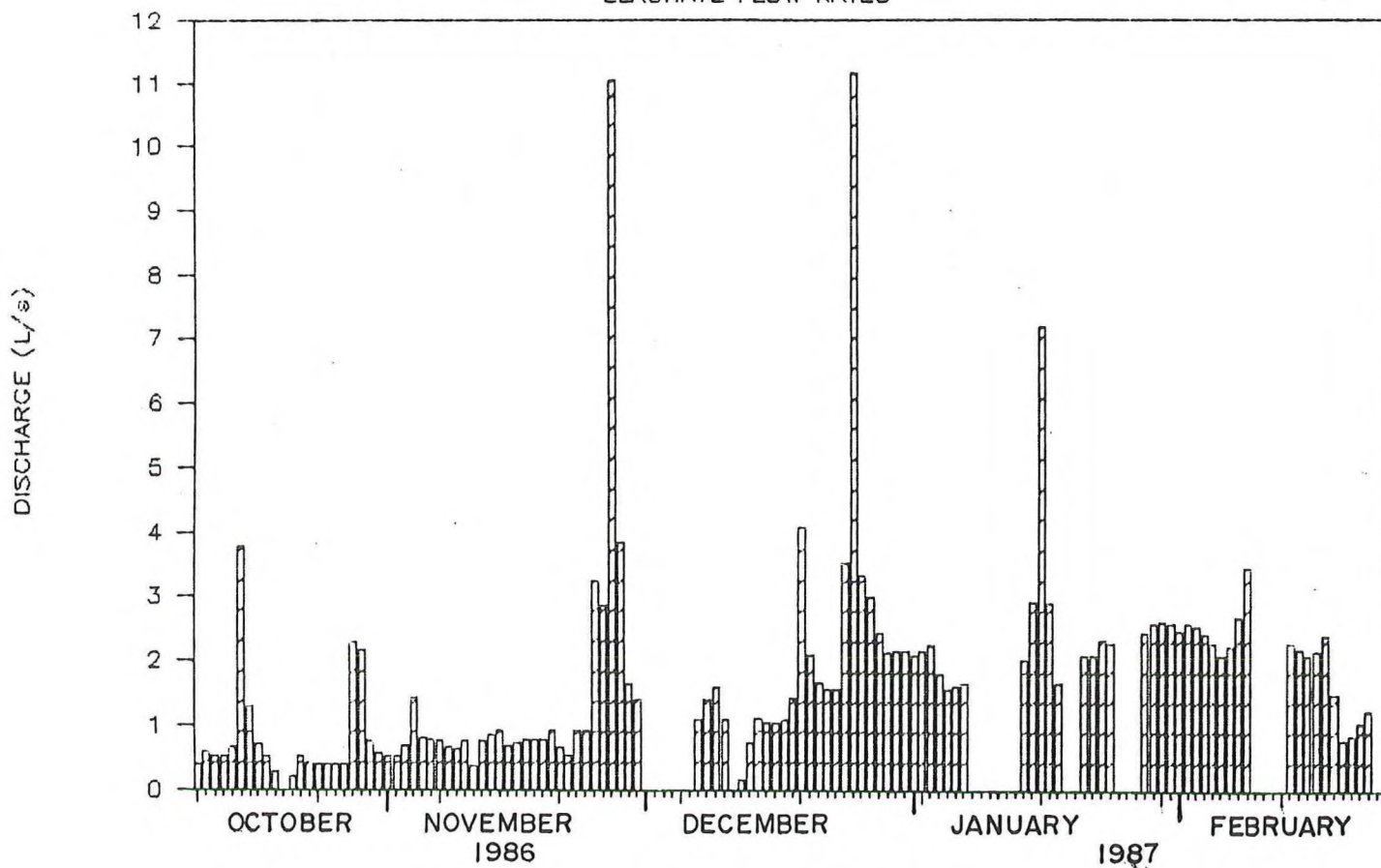
Figure 4 presents the average concentrations of selected parameters in Burlington Landfill leachate for 1984, 1985 and 1986. No consistent overall trends of increasing or decreasing leachate concentration are apparent. Figure 4 also presents the Region of Halton sanitary sewer bylaw 97-79 concentration limits. Average concentrations of BOD, iron and zinc exceeded the bylaw limits in 1986.

Figure 3

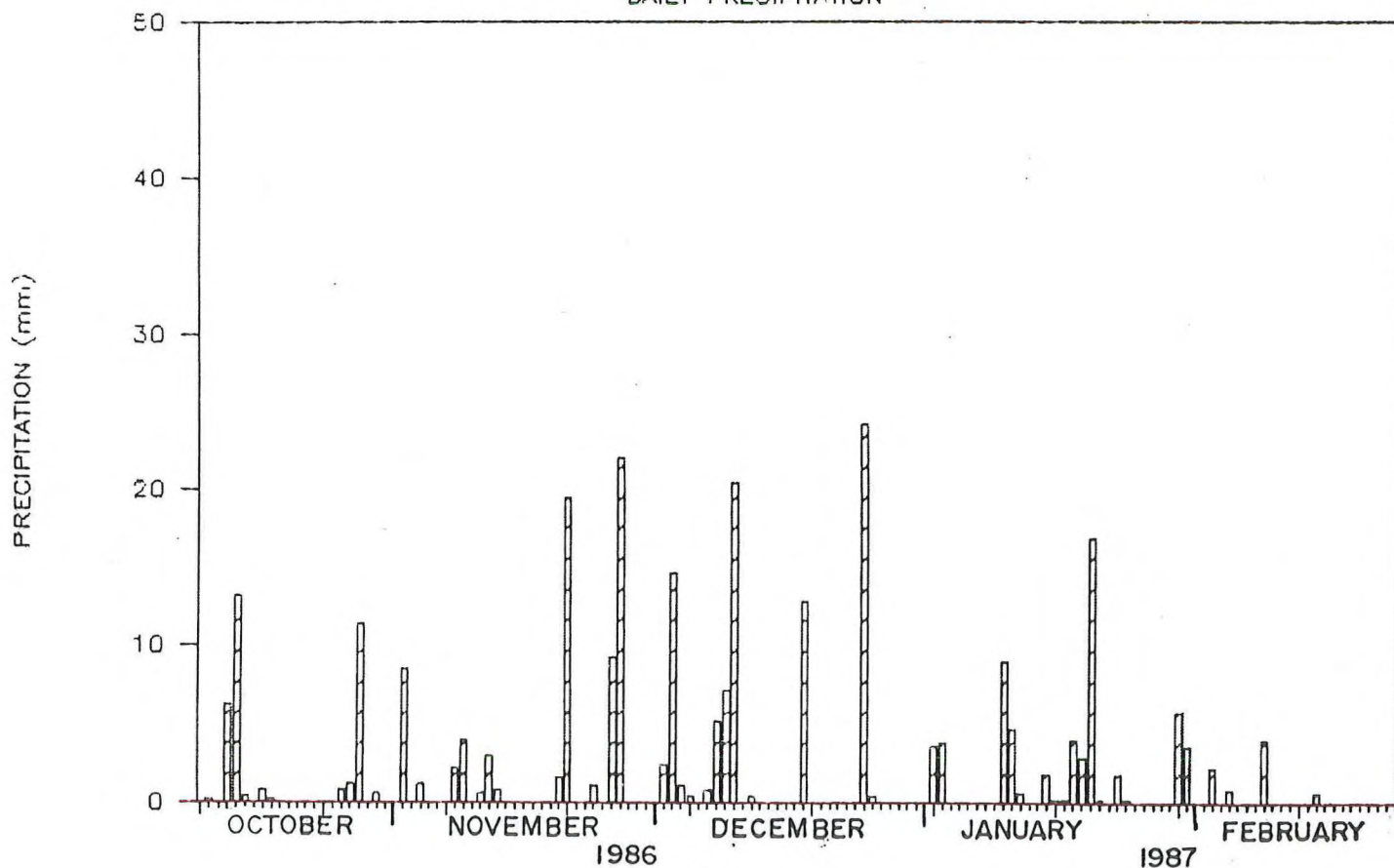
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BURLINGTON LANDFILL - Leachate Flows and Precipitation

LEACHATE FLOW RATES



DAILY PRECIPITATION





PROJECT 66-53

FIGURE 4 : CHEMISTRY AVERAGE LEACHATE

PARAMETER	1984 AVERAGE	1985 AVERAGE	1986 AVERAGE	SEWER BY-LAW 97-79
Conductance (umhos/cm)	8348	8923	8303	
pH	6.8	6.9	7.3	6 - 10.5
Hardness (mg/L)	2817	2440	2097	
Alkalinity (mg/L)	3254	3436	3028	
Chloride (mg/L)	1061	1158	869	
Phosphorous Total (mg/L)	1.8	1.6	1.2	
TKN (mg/L)	227	288	227	
Ammonia (mg/L)	179	249	140	
Phenols (ug/L)	1544	1726	1408	
BOD (mg/L)	4298	5565	3423	300
COD (mg/L)	5273	5737	8222	
Iron Total (mg/L)	497	64	92	50
Cadium Total (mg/L)	<.005	<.005	<.015	2.0
Chromium Total (mg/L)	0.027	0.12	0.29	3.0
Copper Total (mg/L)	<.006	0.06	0.16	3.0
Nickel Total (mg/L)	<.03	0.07	0.08	3.0
Lead Total (mg/L)	0.01	<.06	<.15	3.0
Zinc Total (mg/L)	0.4	2.0	4.4	3.0
Dichloromethane (ug/L)	<10	1990	753	
1,1-Dichloroethane (ug/L)	<10	260	58	
1,1,1-Trichloroethane (ug/L)	<10	74	<10	
Benzene (ug/L)	10	16	<10	
Trichloroethylene (ug/L)	<10	17	36	
Toluene (ug/L)	500	520	510	
Tetrachloroethylene (ug/L)	<10	10	<10	
Ethylbenzene (ug/L)	40	61	38	
M- and P-xylene (ug/L)	125	324	189	
O-xylene (ug/L)	40	156	51	



Volatile organic concentrations in 1986 were in the same range as previous monitoring results. Extractable organic analyses of the May samples were carried out using GC-MS techniques. Carboxylic acids, phenols and sulphur were the principal compounds found. The September samples were analyzed for extractable organic priority pollutants using dual column GC techniques. The only compounds detected were nitrobenzene (10 ppb) and bis-2-ethylhexylphthalate (30 ppb). For a detailed discussion on trace organic concentrations in leachate the reader is referred to the "Plume Delineation Report" of December 1986.

PCBs and pesticides were analyzed on samples collected in July and September. Leachate chemistry results are presented in Appendix III. No PCBs were detected. The pesticides chlorodane, dieldrin and endosulfan sulphate were detected on at least one occasion in concentrations ranging from 2 to 8 ng/L. The dieldrin and endosulfan sulphate concentrations slightly exceeded the Ontario objectives for surface water quality.

5.3 LEACHATE SEEPAGES

The site was inspected for leachate seepages by GLL staff during surface water sampling visits. Regional staff inspected the site more frequently. Leachate seepage locations noted by both Regional and GLL staff are shown on the site plan Figure 2.

A leachate seep was noted on the southeast slope of the landfill in the spring of 1986. This seep was caused by perched water within the refuse. The Region repaired this area in May 1986 by excavating down through the clayey silt daily cover material to permit hydraulic connection and then backfilling with refuse and replacing the final cover.

Another leachate seep developed at the southwest end of the landfill in the vicinity of the refuse loading facility. The seep was located at the surface drainage outlet from the loading facility. Drainage from this area flows southward down a ditch to the sedimentation pond near the North Service Road. This seep was repaired in May 1986 by excavating to permit hydraulic connection and then backfilling. This was unsuccessful in stopping leachate flows at this location. In July 1986 the seep was



repaired again by installing a French drain which discharged to the leachate collection toe-drain system. This work was successful in diminishing overland leachate flows.

A leachate seepage was observed about 20 m outside the toe-drain on the west side of the landfill (Falcon Creek ravine). It is located about 400 m north of the loading facility as shown on Figure 2. This seepage was previously reported in the 1983, 1984 and 1985 monitoring reports. There is no measurable flow and the leachate reinfilters into the ground about 5 m down-slope. The seepage is over 150 m from Falcon Creek and the property boundary. There is no evidence of direct overland flow of leachate into Falcon Creek.



6.0 GROUND WATER

6.1 GROUND WATER FLOW

Ground water levels were measured in July 1986 before well purging and sampling. Figure 5 (map pocket at back) illustrates the water table configuration and shallow ground water flow direction as of July 19, 1986. Overall ground water flow patterns have not changed significantly from that presented in previous monitoring reports. Flow is generally to the southeast with locally radial components of flow towards adjacent streams and low wetland areas. Vertical gradients are primarily downward throughout the landfill area.

Water levels in October 1985 were generally 0.5 to 2 m less than in February 1986 reflecting seasonal variations caused by recharge events. July 1986 water levels were also generally higher than in October 1985.

Monitor 25-I is a standpipe installed through the new under-drained northern portion of the landfill. It is over 18 m deep and penetrates the entire thickness of refuse plus about 2 m of the native materials below. This monitor has been dry since installation in September 1985. This suggests that the refuse in the new northern area has not yet attained a moisture content equal to field capacity and therefore at present leachate outflow from this area may be minimal.

Monitors at locations 11A, 21 and 22 (see Figure 2) were previously damaged and were repaired in April 1986. Resurveying the geodetic elevations of these monitors is required.

6.2 GROUND WATER QUALITY

Ground water samples were collected from designated monitoring wells in July 1986. The monitors were pumped out or purged before sampling. The volume of water purged from each monitor is presented in Appendix I. The samples were submitted to the MOE laboratory for analysis of routine water quality parameters. Samples from the



sixteen existing monitors which are constructed of stainless steel (including the plume delineation monitors) were tested for a scan of twenty-five volatile organic compounds as well as the routine parameters. All ground water chemical analyses are presented in Appendix IV.

6.2.1 NORTH END OF THE LANDFILL

The geologic setting at the north end of the landfill includes a sequence of silt till soils above shale bedrock. Ground water quality in the northern till differs from that in the shales at the south end of the site, therefore different indicator parameters can be used for assessing landfill impacts. Background chloride concentrations in the till are generally less than 20 mg/L. Chloride is an appropriate leachate indicator at the north end of this site where till occurs.

Monitors 21-II, 21-III, 22-II, 22-III, 23-II, 23-III are screened in the glacial till. Ground waters from all these monitors had less than 20 mg/L chloride in 1986 and appear to be unaffected by leachate.

Other monitors located at the north end of the site are screened in the upper part of the shale bedrock but have less than 20 mg/L chloride. Monitors 21-I, 22-I, 23-I, 29-I and 30-I fall into this category. Based on the chloride data these monitors do not appear to be affected by leachate.

Monitors at locations 21 and 22 were damaged by heavy equipment and were repaired in 1986. Topsoil and surface water drainage probably entered the monitors during the period when they were damaged. After the repairs were completed the initial water purged from the monitors was discoloured and odourous. Water quality improved with additional purging and samples were collected. However, the test results indicate anomalous levels of TKN ammonia, BOD and phenols. This suggests that additional purging is required before representative ground water samples can be collected from these wells.



The two deep monitors 23-I and 23-II also had slightly anomalous water quality in 1986. Elevated TKN and ammonia concentrations occurred in the deepest monitor and phenol concentrations increased to 2.4 ug/L. Similarly TKN, BOD and DOC concentrations were slightly elevated in the ground water from intermediate depth monitor 23-II. Additional monitoring is required to determine the source and nature of these anomalies.

The shallow monitor 23-III had good water quality in 1986. Elevated phenol concentrations of 41 ug/L were present in waters from this monitor in November, 1985 but levels have decreased to background levels of 0.2 ug/L in 1986. This suggests that the original phenol concentrations were somehow introduced into the well during drilling and monitor installation.

Monitor 18-II is located in a ravine southeast of the northern part of the landfill (see Figure 2). Naturally high chloride concentrations of over 600 mg/L were found in ground water in this monitor in 1983 before landfilling at the north end of the site had commenced. Chloride concentrations in 1986 were 113 mg/L. This monitor does not appear to be affected by leachate, but due to the naturally poor water quality it would be difficult to detect any small diluted quantities of leachate.

No volatile organic compounds were detected in 1986 ground water samples from stainless steel monitoring wells located at the north end of the site (23-I, 23-II, 23-III, 29-I and 30-I). This tends to confirm the lack of any leachate impact in this area in 1986.

6.2.2 SOUTH END OF THE LANDFILL

The layer of glacial till is generally absent at the south end of the landfill. The refuse in this part of the landfill was placed immediately on top of the shale bedrock. There are no underdrains in this older part of the landfill, therefore, there is potential for leachate movement through the subsurface at the south end of the landfill.



Previous ground water monitoring involving routine water quality parameters was unsuccessful in mapping the leachate plume in the shale bedrock at the southern end of the landfill. This is due to naturally poor water quality in the shale particularly at depth which masks the presence of attenuated leachate. In addition, there used to be a municipal snow dump immediately south of the landfill. The presence of road salt from dumped snow in the ground water system further complicates data interpretation.

As in previous years, we are unable to conclusively map the leachate plume in 1986 using routine water quality analyses of the ground water samples. Most of the monitors located downgradient of the southern end of the landfill (12, 13, 14, 15, 16, 24, 27 and 28) exhibit elevated concentrations of chloride and in some cases other parameters, such as TKN. Saline ground waters with chloride concentrations in excess of those in leachate, were found in some of the deep monitors (24-I, 24-II and 27-I) completed in the shale. These saline waters cause analytical interferences which result in elevated levels of some parameters such as COD, TKN and ammonia. The reliability of such results is open to question.

Ground water samples from the stainless steel monitors (24-I, 24-II, 24-III, 26-I, 26-II, 26-III, 27-I, 27-II, 27-III, 28-I) at the south end of the landfill were tested for volatile organic compounds and phenols in 1986, in an attempt to map the leachate plume. This work was carried out as a follow-up to the "Plume Delineation Program". Two volatile organic compounds (9 ug/L trichloroethylene and 1 ug/L 1,1-dichloroethylene) were detected in ground water from monitor 24-III. This monitor is 6 m deep and located 25 m to the south of the landfill. Trichloroethylene was previously detected in this monitor in November 1985. It was concluded in the "Plume Delineation Report" December 1986 that a small amount of leachate had reached this well. No other monitors had detectable concentrations of volatile organic compounds in 1986.

Slightly elevated phenol concentrations of 2 to 4 ug/L were detected in monitors 14-I, 15-I, 24-I, 24-II and 26-I in 1986. Phenol concentrations in these wells will be closely monitored to see if they continue to increase and are indicative of diluted leachate.



7.0 SURFACE WATER

7.1 SURFACE WATER FLOW

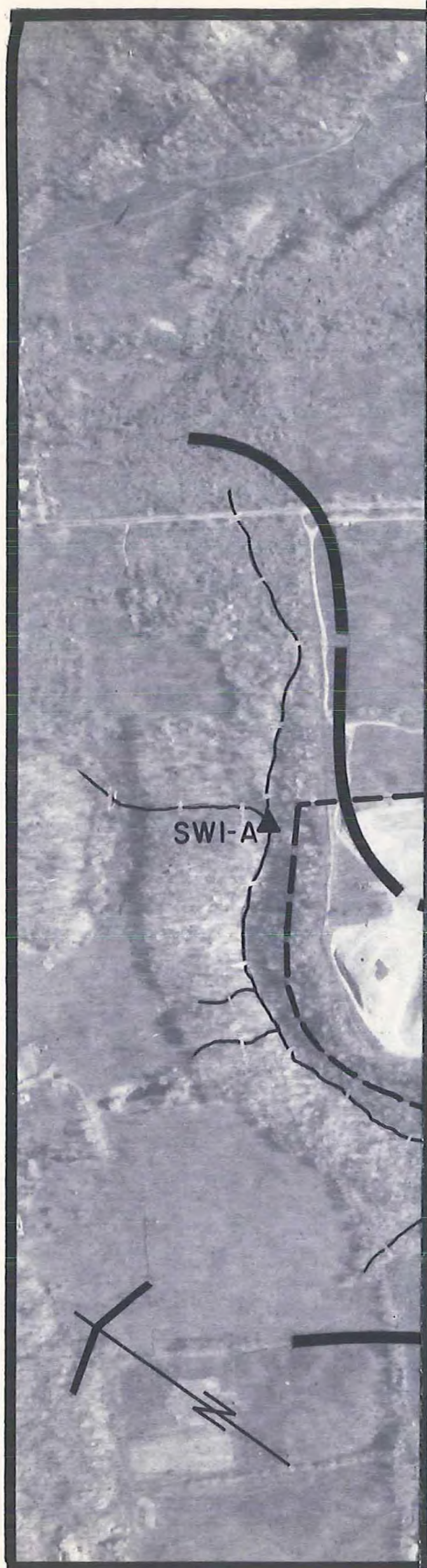
The Burlington Landfill is located within two watersheds; Falcon Creek and Indian Creek. Surface water monitoring stations are located within both watersheds and are shown in Figure 6.

Two additional temporary sampling stations (SW16 and SW17) were established for control purposes on another stream far removed from any potential landfill impact. The location of these stations is shown on Figure 7. The purpose of sampling these stations is to assess the impact of Highway 403 on surface water quality so that highway impacts can be distinguished from landfill impacts.

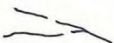
Visual estimates of flow are made at monitoring stations during sampling visits, if possible. These results are presented in Appendix V. They indicate that there was generally no flow at any of the landfill monitoring stations during September 1986. Flow estimates were not made on December 2, 1986 due to blizzard conditions and the presence of slush in many of the drainage channels.

As in 1985, the highest flows occurred in the main channel of Falcon Creek (Stations SW1, SW2, SW3, SW14) and in the control stream near Brant Street (Stations SW16 and SW17). Flows also occurred fairly consistently at the sedimentation pond outlet (Station SW12) but the flow rates were generally low. The remainder of the sampling stations are located in poorly defined drainage channels which generally do not flow except for brief periods during spring runoff and after long periods of wet weather.

A V-notch weir was installed on Falcon Creek at Station SW-3 in 1982. The construction details of the weir are presented in Appendix II. Regional staff read the staff gauge two or three times a week. These readings and corresponding, calculated flow rates are presented in Appendix II. There are some gaps in the data.



Legend

-  **SWI4** Surface Water Monitoring Station
-  Drainage Course (Intermittent)
-  Surface Watershed Divide
-  Property Boundary
-  Loading Facility Runoff Monitoring Stations
Established By The Region

SURFACE WATER STATIONS

6

Halton Region BURLINGTON LANDFILL SITE

Project 86-53
Scale 1:8,000 (approx)



Gartner
Lee
Associates
Limited

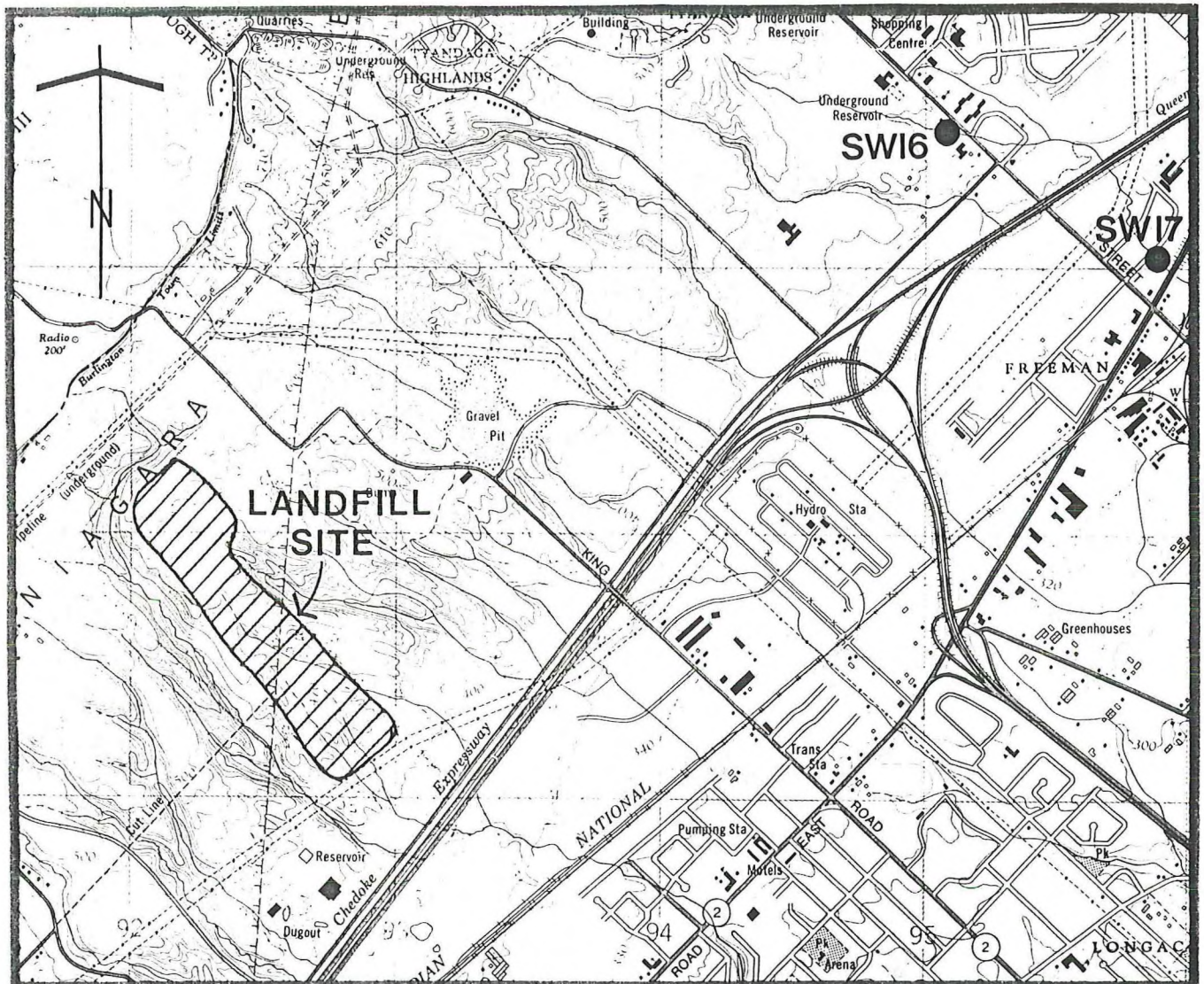


FIGURE 7

CONTROL STATIONS FOR SURFACE WATER SAMPLING

Project 86-53
Scale 1:25,000





Figure 8 is a plot of Falcon Creek discharge at station SW3 for the period 1982 to 1986. Streamflow is intermittent and ranges from zero during dry summer weather to a maximum peak flow of 236 L/s on February 25, 1985. Review of the available measurements suggest that flows in excess of 100 L/s probably occur each year for several days during spring runoff and during storms in the late fall.

Falcon Creek is either frozen or not flowing for over one third of each year. The stream is generally dry in August and September, with exceptions caused by significant rainfall events. There is essentially no ground water baseflow to the stream during the summer. Baseflow during the fall, winter and spring is estimated to be within the range of 1 to 10 L/s on average.

Daily precipitation data for 1986 from the Royal Botanical Gardens Meteorological Station are presented in Appendix II along with the Falcon Creek stream flow information. Comparison of precipitation and streamflow data suggests that streamflow responds rapidly to major storm events. Storms with more than 20 mm of precipitation generally cause significant increases in streamflow.

Falcon Creek carries a fairly high sediment load. Sedimentation behind the V-notch weir has caused inaccurate staff gauge measurements in the past. Sediment in the stream channel behind the weir should be cleaned out annually after spring runoff.

7.2 SURFACE WATER QUALITY

Surface water samples were collected in May, July, September and December 1986 as part of the routine monitoring program. Very few samples were obtained in September due to dry weather conditions.

Additional samples were collected in April 1986 at selected key locations. These were the last sets of samples collected as part of an intensive short-term surface water sampling program recommended in the 1984 Monitoring Report.

All collected samples were submitted to the MOE laboratory for analysis of general water quality parameters. These results are presented in Appendix V.

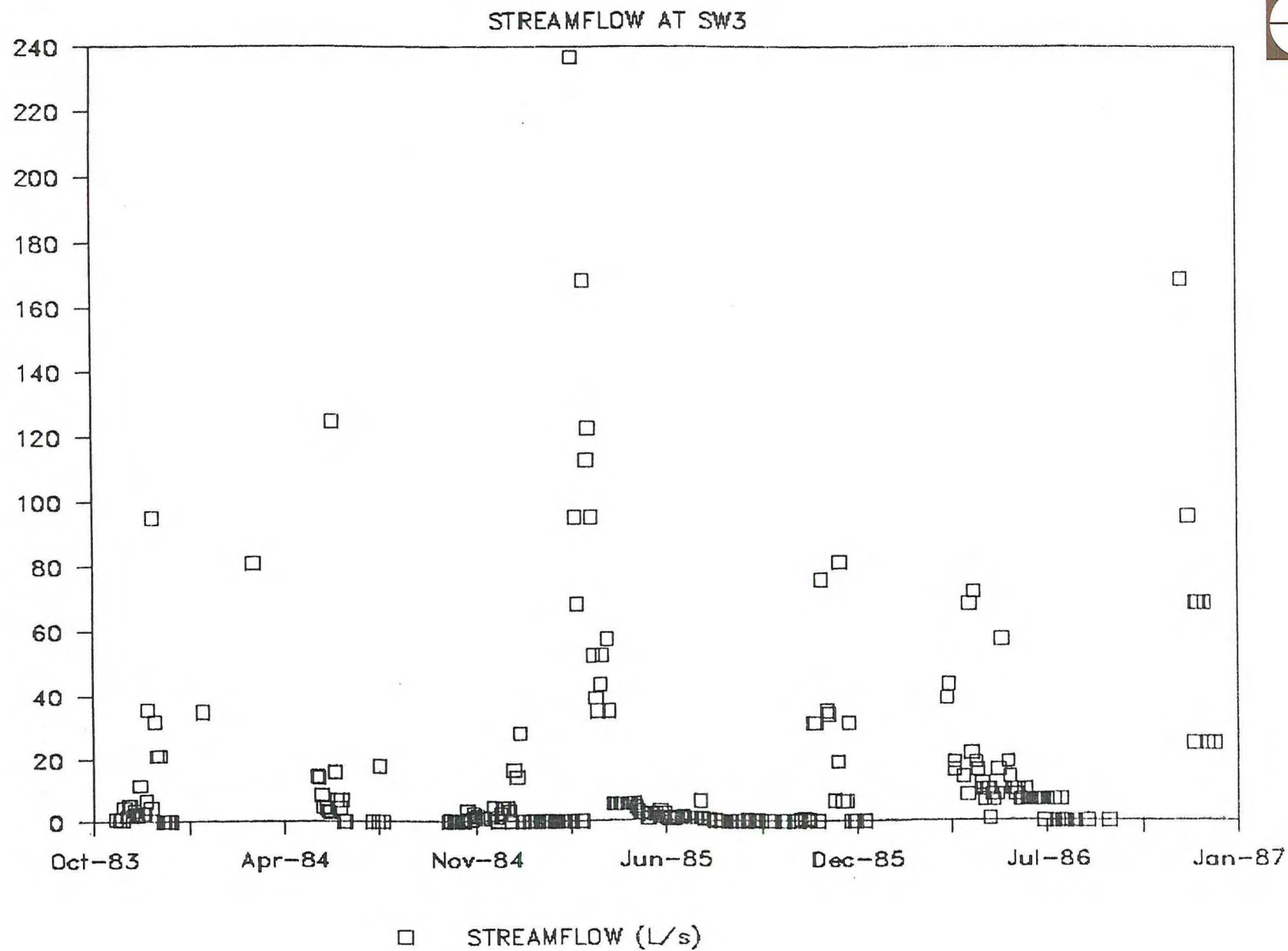


Figure 8
FALCON CREEK STREAMFLOW AT SW 3



7.2.1 FALCON CREEK WATERSHED

Falcon Creek water quality results are summarized in Figure 9. Average 1985 and 1986 water quality data for selected parameters are presented for three surface water stations: SW-1A located upstream of the landfill; SW3 located downstream of the landfill and; SW14 located further downstream on the south side of Highway 403. The 1985 averages were calculated using May, July, November and December data only. Data from September and October 1985 was not included due to the stagnant conditions present at these times.

Review of Figure 9 suggests that very little landfill impact on Falcon Creek occurs between stations SW1A and SW3. Some parameters such as conductivity, hardness, alkalinity and bacteria increase slightly as the stream flows past the landfill. However, average concentrations for many other parameters remain within the same range, or decrease. Concentrations of some parameters increase further at station SW14 downstream from SW3. However the SW14 average 1986 concentrations of many other leachate indicator parameters, such as TKN, ammonia, nitrate, COD, DOC and phenols, were similar or less than background concentrations at SW1-A.

Figure 10 presents conductivity values for key surface water stations on Falcon Creek plotted versus time. Conductivity is a general indicator of overall water quality. Figure 10 illustrates seasonal variations in conductivity levels in Falcon Creek. The range of conductivities in 1986 is similar to those found in 1985 except for two anomalously high values in the September and October 1985 samples from SW14. These samples were collected during stagnant flow conditions. The cause of these elevated levels is not known.

SW15 is a small area of seasonal seepage near the bottom of the Falcon Creek ravine located between SW1 and SW3 (see Figure 6). Iron staining, suggestive of leachate discharge, is present in this seepage area. It is possible that diluted, attenuated leachate has reached this location. However, the two samples which were collected from this location during 1986 had water quality similar to the background surface water station SW1-A.

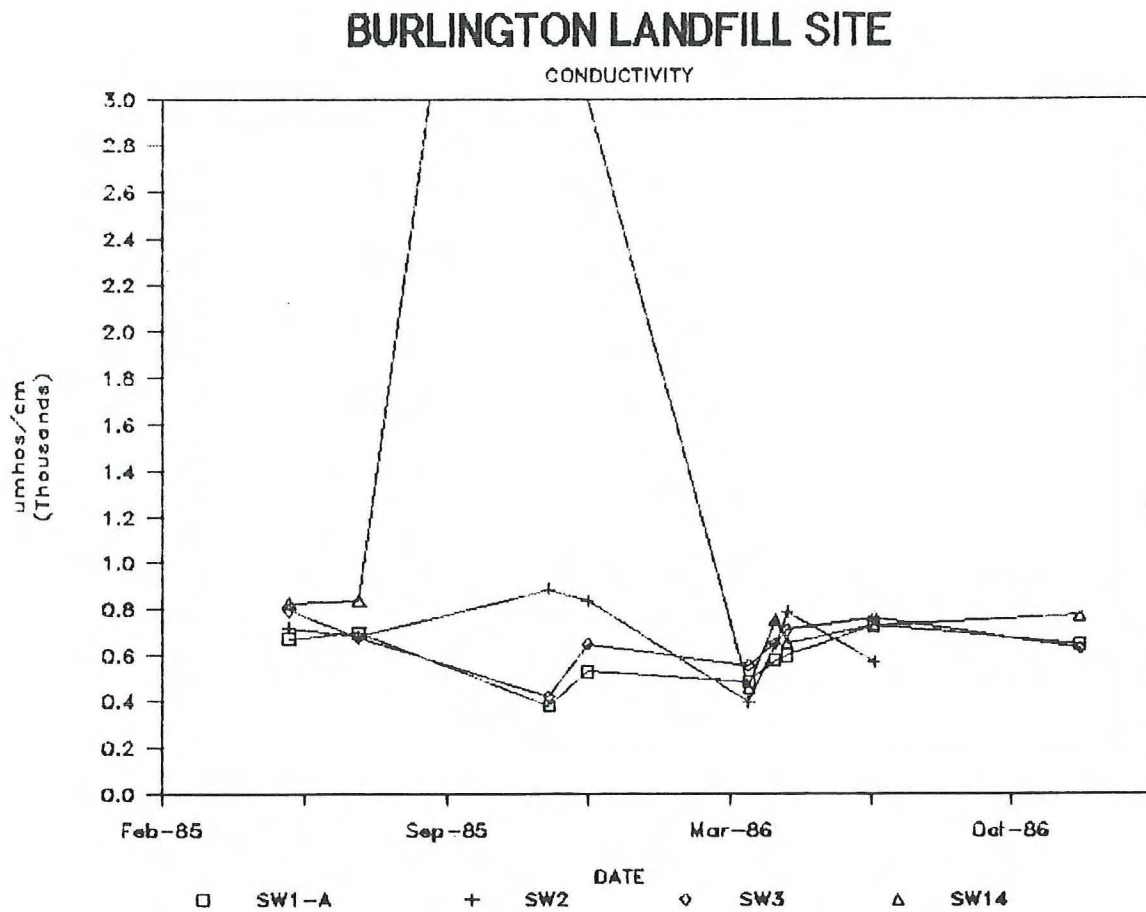


FIGURE 9 : SUMMARY OF FALCON CREEK WATER QUALITY
AVERAGE OF 1985 AND 1986 DATA

PARAMETER	UNITS	SW1-A UPSTREAM OF LANDFILL		SW3 DOWNSTREAM OF LANDFILL		SW14 DOWNSTREAM SOUTH OF 403	
		1985	1986	1985	1986	1985	1986
CONDUCTIVITY	umho/cm	569	604	634	659	718	752
HARDNESS	mg/L (CaCO ₃)	261	275	300	319	305	346
ALKALINITY	mg/L (CaCO ₃)	214	233	246	272	229	272
CHLORIDE	mg/L	37	45	30	34	57	59
TKN	mg/L (N)	0.3	0.28	0.3	0.28	0.3	0.3
AMMONIA	mg/L (N)	0.05	0.40	0.05	0.07	0.05	0.05
NITRATE	mg/L (N)	0.35	0.13	0.24	0.16	0.21	0.06
COD	mg/L (O)	15	22.1	24	5.2	20	6.0
DOC	mg/L (C)	3.1	3.8	3.9	3.1	4.1	3.1
PHENOLS	ug/L	0.5	0.7	1.8	0.92	2.6	0.7
FECAL COLIFORMS	counts/100 ml	179	87	179	267	177	190
FECAL STREPTOCOCCI	counts/100 ml	92	34	163	126	49	79



Figure 10
Falcon Creek Conductivity Values for
Key Stations Versus Time





SW14 is located downstream from SW3 and the landfill on the south side of Highway 403. Falcon Creek receives leachate-affected discharge from the sedimentation pond outlet (SW12) just upstream of SW14. However, this leachate-affected discharge is diluted sufficiently so that there is only a slight increase in the concentration of conductivity and chloride. Most of the other parameters have concentrations in the same range as SW3 or even SW1-A.

Three samples were collected from the sedimentation pond outlet SW12 during 1986. Elevated concentrations of conductivity, hardness, chloride, TKN and phenols indicate impact from leachate seepages at the southwest end of the landfill. The 1986 data for station SW12 were generally within the same range as in 1985 except for TKN, ammonia and phenol concentrations which were considerably less than peak concentrations measured in December 1985. Concentrations decreased somewhat in December 1986. This was the first sample collected after completion of leachate seepage repair work carried out by the Region in July 1986.

Runoff from the southeast end of the landfill also discharges into Falcon Creek just upstream of SW14. Drainage from the landfill east perimeter ditch flows from station SW10 to SW11 to SW13 and then via a culvert under Highway 403 to SW14 (see Figure 6). SW10, SW11 and SW13 are dry for most of the year, except for spring runoff and during major precipitation events. As a result no samples were collected during 1986 from SW10 and SW11. Only two samples were collected from SW13. The limited monitoring data available indicates some water quality degradation in this drainage, however, the lack of flow suggests that it has minimal impact on water quality in the main channel of Falcon Creek.

During 1985 and 1986 water samples were also collected from two control stations on a stream near Brant Street, far removed from the landfill (see Figure 7). Samples were collected upstream (SW16) and downstream (SW17) of Highway 403. Review of the SW16 and SW17 data in Appendix V indicates that water quality in these control stations is similar to or worse than water quality in Falcon Creek downstream from the landfill. Test results of samples collected from stations SW16 and SW17 on December 2, 1986 during a snow storm illustrate the impact of road salting and highway runoff.



Chloride concentrations increased from 40.5 mg/L upstream at SW16 to 644 mg/L downstream at SW17. Similarly, phenol concentrations increased from upstream 0.2 ug/L to 15.2 ug/L downstream.

7.2.2 INDIAN CREEK WATERSHED

Drainage from the northeastern part of the landfill discharges into two tributary channels (SW6-SW7 and SW4-SW5) of Indian Creek as shown on Figure 6.

The SW6-SW7 channel is usually dry and no samples were collected from station SW6 in 1986 due to lack of flowing water. Station SW7 was sampled once in May 1986 and exhibited degraded water quality relative to that previously found in November 1985. Additional monitoring is required to confirm this water quality degradation and to determine if it is related to the landfill.

The SW4-SW5 tributary has slightly higher flows but is also usually dry. One sample was collected from SW4 and two samples were collected from SW5 in 1986. Water quality at SW4 and SW5 in 1986 was relatively good and does not appear to be affected by the landfill.

Three samples for SW5 were collected in 1985 at the culvert just north of the North Service Road. This is downstream from the confluence with another tributary which drains the west side of the Bayview Landfill and is not the proper SW5 sampling location. This incorrect 1985 data has been deleted from the results and the correct sampling station has been staked for easy identification by sampling staff.



8.0 SELECTED REFERENCES

Gartner Lee Limited

1986: Burlington Regional Landfill Plume Delineation Report, GLL 85-61

1986: Burlington Landfill - 1985 Monitoring Report GLL 85-61

1985: Burlington Landfill - 1984 Monitoring Report, GLL 85-22

1985: Burlington Regional Landfill Site, Monitoring Program Terms of Reference, GLL 84-101

1984a: Burlington Landfill - 1983 Monitoring Report GLL 84-2

1984b: Hydrogeological Study, Burlington Landfill Continued Use. GLL 83-66

1983: Burlington Landfill - 1982 Monitoring Report GLL 82-71

1982: Burlington Landfill - 1981 Monitoring Report, GLL 80-96

1981: Burlington Landfill Site, (1980) Monitoring Program - Interim Report, GLL 80-96

1980: Monitoring Program Report, Burlington Regional Landfill Site. GLL 80-39

1979: Burlington Landfill Site, Hydrogeological Study, GLL 78-92

APPENDIX I

GROUND WATER MONITOR DETAILS

GROUND WATER LEVELS

WELL DEVELOPMENT AND PURGING NOTES

GROUND WATER MONITOR DETAILS

BOREHOLE NO.	MONITOR				LOCATION OF TIP		LOCATION OF SEAL	
	No.	Diameter mm	Type	Elev. (m. a. s. /)	Depth (m)	Elev. (m. a. s. /)	Depth (m)	Elev. (m. a. s. /)
11A	I	31	●	135.33	13.11	122.22	12.04	123.29
	II	31	▲	135.00	6.10	128.90	6.10 1.37	128.90 133.63
12	I	32	●	127.9	12.7	115.2	12.0	115.9
	II	32	●	127.7	7.3	120.4	7.3, 7.0	120.4, 120.7
	III	19	▲	127.9	2.5	125.4	1.1	126.8
13	I	19	●	122.6	9.8	112.8	9.1	113.5
	II	19	▲	122.6	6.1	116.5	3.0, 1.2	119.6, 121.4
14	I	31	●	125.73	10.97	114.76	9.91	115.82
	II	31	▲	125.74	6.10	119.64	6.10 1.07	119.64 124.67
15	I	31	●	121.39	10.94	110.45	9.88	111.51
	II	31	▲	121.81	6.10	115.71	6.10 1.43	115.71 120.38
16	I	31	●	123.61	28.86	94.75	27.04	96.57
	II	31	●	124.03	17.74	106.29	17.74 16.22	106.29 107.81
	III	31	●	123.92	9.91	114.01	8.84	115.08
	IIII	31	▲	123.91	6.10	117.81	6.10, 1.52	117.81, 122.3
18	I	31	●	157.75	16.72	141.03	15.81	141.94
	II	31	●	157.75	11.24	146.51	6.67	151.08
	III	31	▲	157.75	6.67	151.08	0.87	156.88
21	I	31	●	184.68	18.52	166.16	17.60	167.08
	II	31	●	184.92	14.79	170.13	0.76	184.16
	III	31	▲	184.91	9.59	175.32	0.75	184.16
22	I	31	●	182.68	16.67	166.09	15.76	167.00
	II	31	●	182.76	11.80	170.96	0.82	181.94
	III	31	▲	182.47	7.24	175.23	0.53	181.94

* All elevations and measurements taken from the top of each monitor

MONITOR DETAILS

BOREHOLE NO.	MONITOR NO.	DIAMETER (mm)	TOP OF PIPE ELEV. (m)	STICKUP (m)	Surveyed GROUND ELEV. (m)	TYPE	SCREENED INTERVAL		GRAVEL PACK	SEAL
							DEPTH FROM GRADE (m)	ELEVATION (m)	DEPTH FROM GRADE (m)	DEPTH FROM GRADE (m)
23	I	51	185.77	0.83	184.96	●	17.6-18.2	167.4-166.8	16.7-18.2	0 - 16.7
	II	51	185.54	0.61	184.96	●	11.7-12.3	174.3-173.7	11.1-12.3	0 - 11.1
	III	51	185.60	0.61	184.96	▲	6.4-7.6	179.6-178.4	1.5-7.6	0 - 1.5
24	I	51	127.96	0.60	127.32	●	17.7-18.3	109.6-109.0	17.1-18.3	0 - 17.1
	II	51	128.10	0.61	127.32	●	11.8-12.4	115.5-114.9	11.2-12.4	0 - 11.2
	III	51	128.16	0.67	127.32	▲	5.0-6.2	122.3-121.1	2.1-6.2	0 - 2.1
25	I	51	183.29	0.61	182.64	▲	17.4-18.6	165.2-164.0	12.5-18.6	1.5 - 2.3
26	I	51	120.46	0.61	119.80	●	17.9-18.5	101.9-101.3	17.3-18.5	0 - 17.3
	II	51	120.51	0.61	119.80	●	11.8-12.4	108.0-107.4	11.2-12.4	0 - 11.2
	III	51	120.44	0.61	119.80	▲	5.0-6.2	114.8-113.6	0.9-6.2	0 - 0.9
27	I	51	116.31	0.61	115.73	●	17.9-18.5	97.8-97.2	17.3-18.5	0 - 17.3
	II	51	116.36	0.61	115.73	●	11.8-12.4	103.9-103.3	11.2-12.4	0 - 11.2
	III	51	116.35	0.61	115.73	▲	4.9-6.1	110.8-109.6	1.5-6.1	0 - 1.5
28	I	51	134.48	0.30	134.23	▲	5.8-7.0	128.4-127.2	1.0-7.0	0 - 1.0
29	I	51	174.41	0.32	174.14	▲	7.6-8.8	166.5-165.3	0.6-8.8	0 - 0.6
30	I	51	170.75	0.60	170.03	▲	7.8-9.0	162.2-161.0	0.6-9.0	0 - 0.6
31	I	51	173.10	0.46	172.52	▲	6.9-8.1	165.6-164.4	1.0-8.1	0 - 1.0

* Each monitor (BH 23 to 31) is placed in a separate borehole and is completed at surface with a 130 mm diameter steel protective casing and locking cap.

* Monitors 11A to 22-III are constructed of PVC Plastic. Monitors 23-I to 31-I are constructed of stainless steel.

GROUND WATER LEVELS

BOREHOLE NO.	DATE			Oct. 25/85		Feb. 17/86		July 16/86							
	MONITOR NO.	TOP OF MONITOR ELEV.	TYPE	DEPTH (m)	ELEV. (m)	DEPTH (m)	ELEV. (m)	DEPTH (m)	ELEV. (m)	DEPTH (m)	ELEV. (m)	DEPTH (m)	ELEV. (m)	DEPTH (m)	ELEV. (m)
11A	I		●	8.72											
	II		▲	2.84											
12	I	127.9	●	7.35	120.55	6.18	121.72	6.56	121.34						
	II	127.7	●	4.40	123.3	2.41	125.29	3.44	124.26						
	III	127.9	▲	dry	--	1.08	126.82	2.32	125.58						
13	I	122.6	●	5.00	117.60	3.55	119.05	4.42	118.18						
	II	122.6	▲	3.95	118.65	2.59	120.01	3.30	119.30						
14	I	125.73	●	1.78	123.95	1.46	124.27	1.52	124.21						
	II	125.74	▲	1.35	124.39	0.86	124.88	1.08	124.66						
15	I	121.39	●	1.61	119.78	1.08	120.31	1.43	119.96						
	II	121.81	▲	1.56	120.25	Frozen	--	1.40	120.41						
16	I	123.61	●	10.09	113.52	9.37	114.24	9.88	113.73						
	II	124.03	●	10.05	113.98	9.19	114.84	9.65	114.38						
	III	123.92	●	5.37	118.55	4.64	119.28	4.96	118.96						
	IV	123.91	▲	5.37	118.54	2.03	121.88	2.44	121.47						
18	I	157.75	●	5.98	151.77	5.08	152.67	4.26	153.49						
	II	157.75	●	4.42	153.33	3.05	154.70	3.80	153.95						
	III	157.75	▲	4.27	153.48	2.42	155.33	3.44	154.31						
21	I		●	10.25		8.87		9.02							
	II		●	8.61		6.64		7.26							
	III		▲	4.59		1.90		2.63							

● - Piezometer ▲ - Standpipe

GROUND WATER LEVELS

BOREHOLE NO.	DATE			Oct. 25/85		Feb. 17/86		July 16/86							
	MONITOR			DEPTH (m)	ELEV. (m)	DEPTH (m)	ELEV. (m)	DEPTH (m)	ELEV. (m)	DEPTH (m)	ELEV. (m)	DEPTH (m)	ELEV. (m)	DEPTH (m)	ELEV. (m)
	NO.	TOP OF MONITOR ELEV.	TYPE												
22	I		●	5.18		bent	--	3.15							
	II		●	6.03		bent	--	3.59							
	III		▲	5.72		bent	--	3.67							
23	I	185.77	●	9.77	176.00	8.31	177.46	8.58	177.19						
	II	185.54	●	7.49	178.05	2.69	182.85	3.02	182.52						
	III	185.60	▲	5.52	180.08	1.62	183.98	3.22	182.38						
24	I	127.96	●	11.09	116.87			11.04	116.92						
	II	128.10	●	8.25	119.85			7.81	120.29						
	III	128.16	▲	5.59	122.57	4.03	124.13	4.52	123.64						
25	I	183.29	▲	Dry	--	Dry	--	Dry	--						
26	I	120.46	●	6.85	113.61	6.10	114.36	6.63	113.83						
	II	120.51	●	5.66	114.85	4.79	115.72	5.44	115.07						
	III	120.44	▲	5.60	114.84	1.65	118.79	2.36	118.08						
27	I	116.31	●	2.64	113.67	1.94	114.37	2.47	113.84						
	II	116.36	●	2.66	113.70	1.95	114.41	2.49	113.87						
	III	116.35	▲	1.62	114.73	1.12	115.23	1.66	114.69						
28	I	134.48	▲	4.82	129.66	2.29	132.19	2.72	131.76						
29	I	174.41	▲	8.40	166.01	6.42	167.99	7.74	166.67						
30	I	170.75	▲	8.86	161.89	7.73	163.02	7.53	163.22						
31	I	173.10	▲	dry	--	8.36	164.74	8.34	164.76						

● - Piezometer ▲ - Standpipe

BURLINGTON LANDFILL

1986 MONITORING PROGRAM

WELL DEVELOPMENT AND PURGING NOTES - JULY 16-25, 1986

Monitor Number	Well Bore Volume L	Volume Removed L	
12-II	4	9	
13-II	1	2	
14-I	7	20	
14-II	4	13	
15-I	8	29	
15-II	4	27	
16-IV	3	34	
18-II	9	25	
18-III	3	12	
21-I	9	30	
21-II	8	25	
21-III	6	55	
22-I	10	31	
22-II	8	35	
22-III	4	10	
23-I	18	55	
23-II	9	60	
23-III	2	50	
24-I	16	32	
24-II	10	25	
24-III	3	20	
26-I	25	55	
26-II	15	36	
26-III	2	34	
27-I	33	102	
27-II	21	70	
27-III	10	65	
28-I	5	44	
29-I	1	7	
30-I	<1	<1	
31-I	<1	<1	insufficient water for sampling

APPENDIX II

LEACHATE FLOW RATES

SW3 WEIR SPECIFICATIONS AND EQUATIONS

FALCON CREEK STREAMFLOW DATA AND PRECIPITATION

BURLINGTON LANDFILL LEACHATE FLOW RATES

OCTOBER 1986 TO FEBRUARY 1987

DATE	DAILY VOLUME (L)	MEAN DAILY DISCHARGE L/s
09-Oct	35,015	0.41
10-Oct	52,049	0.60
11-Oct	45,425	0.53
12-Oct	45,425	0.53
13-Oct	57,254	0.66
14-Oct	327,438	3.79
15-Oct	110,723	1.28
16-Oct	62,459	0.72
17-Oct	45,425	0.53
18-Oct	23,186	0.27
19-Oct		MISSING DATA
20-Oct	18,927	0.22
21-Oct	45,425	0.53
22-Oct	35,488	0.41
23-Oct	34,069	0.39
24-Oct	34,069	0.39
25-Oct	34,069	0.39
26-Oct	33,596	0.39
27-Oct	198,261	2.29
28-Oct	187,378	2.17
29-Oct	65,298	0.76
30-Oct	49,210	0.57
31-Oct	45,425	0.53
01-Nov	45,425	0.53
02-Nov	60,093	0.70
03-Nov	124,256	1.44
04-Nov	69,084	0.80
05-Nov	68,137	0.79
06-Nov	65,298	0.76
07-Nov	56,781	0.66
08-Nov	54,415	0.63
09-Nov	65,298	0.76
10-Nov	31,230	0.36
11-Nov	65,298	0.76
12-Nov	73,815	0.85
13-Nov	79,494	0.92
14-Nov	58,674	0.68
15-Nov	63,406	0.73
16-Nov	68,137	0.79
17-Nov	68,137	0.79
18-Nov	68,137	0.79
19-Nov	80,913	0.94
20-Nov	56,308	0.65
21-Nov	46,371	0.54
22-Nov	80,913	0.94
23-Nov	80,913	0.94
24-Nov	280,594	3.25
25-Nov	248,891	2.88
26-Nov	953,450	11.04
27-Nov	333,116	3.86

BURLINGTON LANDFILL LEACHATE FLOW RATES

OCTOBER 1986 TO FEBRUARY 1987

DATE	DAILY VOLUME (L)	MEAN DAILY DISCHARGE L/s
28-Nov	141,480	1.64
29-Nov	120,660	1.40
30-Nov		MISSING DATA
01-Dec		MISSING DATA
02-Dec		MISSING DATA
03-Dec		MISSING DATA
04-Dec		MISSING DATA
05-Dec		MISSING DATA
06-Dec	93,689	1.08
07-Dec	122,553	1.42
08-Dec	137,694	1.59
09-Dec	94,162	1.09
10-Dec	0	0.00
11-Dec	14,195	0.16
12-Dec	63,879	0.74
13-Dec	95,582	1.11
14-Dec	90,850	1.05
15-Dec	90,850	1.05
16-Dec	95,108	1.10
17-Dec	123,972	1.43
18-Dec	352,989	4.09
19-Dec	181,700	2.10
20-Dec	143,372	1.66
21-Dec	136,275	1.58
22-Dec	136,275	1.58
23-Dec	306,618	3.55
24-Dec	964,333	11.16
25-Dec	290,057	3.36
26-Dec	259,774	3.01
27-Dec	212,929	2.46
28-Dec	184,539	2.14
29-Dec	187,378	2.17
30-Dec	187,378	2.17
31-Dec	181,700	2.10
01-Jan	187,378	2.17
02-Jan	195,895	2.27
03-Jan	156,148	1.81
04-Jan	136,275	1.58
05-Jan	140,060	1.62
06-Jan	144,792	1.68
07-Jan		MISSING DATA
08-Jan		MISSING DATA
09-Jan		MISSING DATA
10-Jan		MISSING DATA
11-Jan		MISSING DATA
12-Jan		MISSING DATA
13-Jan	176,022	2.04
14-Jan	253,149	2.93
15-Jan	622,227	7.20
16-Jan	250,783	2.90

BURLINGTON LANDFILL LEACHATE FLOW RATES

OCTOBER 1986 TO FEBRUARY 1987

DATE	DAILY VOLUME (L)	MEAN DAILY DISCHARGE L/s
17-Jan	144,792	1.68
18-Jan		MISSING DATA
19-Jan		MISSING DATA
20-Jan	181,700	2.10
21-Jan	181,700	2.10
22-Jan	201,573	2.33
23-Jan	197,314	2.28
24-Jan		MISSING DATA
25-Jan		MISSING DATA
26-Jan		MISSING DATA
27-Jan	212,929	2.46
28-Jan	224,286	2.60
29-Jan	227,125	2.63
30-Jan	224,286	2.60
31-Jan	215,768	2.50
01-Feb	224,286	2.60
02-Feb	221,446	2.56
03-Feb	210,090	2.43
04-Feb	198,734	2.30
05-Feb	181,700	2.10
06-Feb	194,475	2.25
07-Feb	233,276	2.70
08-Feb	298,574	3.46
09-Feb		MISSING DATA
10-Feb		MISSING DATA
11-Feb		MISSING DATA
12-Feb		MISSING DATA
13-Feb	198,261	2.29
14-Feb	190,217	2.20
15-Feb	181,700	2.10
16-Feb	187,378	2.17
17-Feb	207,251	2.40
18-Feb	129,650	1.50
19-Feb	68,137	0.79
20-Feb	74,762	0.87
21-Feb	90,850	1.05
22-Feb	107,884	1.25
SUM	17,415,063	202
COUNT	115	115

SW3 WEIR SPECIFICATIONS AND EQUATIONS

Weir 90 , V-notch weir

for $H \leq 0.305$ m, $Q = 1.38^{2.5}$

for $H > 0.305$ m,

$Q = 0.071 + 1.836 \{1.83 - 0.2(H - 0.305)\}(H - 0.305)^{1.5}$

H = depth of water measured from notch of V in metres, in both cases.

Q = discharge in m³/s.

FALCON CREEK STREAMFLOW
BURLINGTON L.F. 11/83 - 12

	DATE	PRECIP	H	Q (L/S)
=====				
1983	11/03		0.05	0.8
	11/07		0.04	0.4
	11/09		0.04	0.4
	11/11		0.10	4.5
	11/14		0.07	1.8
	11/16		0.11	5.3
	11/18		0.11	5.3
	11/21		0.09	3.5
	11/23		0.08	2.5
	11/25		0.07	1.9
	11/28		0.15	11.6
	11/30		0.08	2.5
	12/02		0.08	2.7
	12/05		0.12	6.6
	12/07		0.23	35.8
	12/09		0.10	4.4
	12/12		0.35	95.0
	12/14		0.22	32.0
	12/16		0.19	21.1
	12/19		0.19	21.1
	12/21			0.0
	12/23			0.0
	12/26			0.0
	12/28			0.0
	12/30			0.0
1984	02/02		0.23	35.0
	03/27		0.33	81.0
	06/01		0.16	14.6
	06/04		0.16	14.1
	06/06		0.13	8.4
	06/08		0.10	4.6
	06/11		0.10	4.4
	06/13		0.09	3.4
	06/15		0.09	3.0
	06/18		0.38	124.5
	06/20		0.17	16.0
	06/22		0.12	6.9
	06/25		0.10	4.4
	06/27		0.12	6.9
	06/29		0.00	0.0
	07/02		0.00	0.0
	07/30		0.00	0.0
	08/04		0.00	0.0
	08/06		0.18	17.7
	08/09			0.0
	10/17		0.00	0.0
	10/19		0.02	0.1
	10/22		0.00	0.0
	10/24		0.00	0.0
	10/26		0.00	0.0

FALCON CREEK STREAMFLOW
BURLINGTON L.F. 11/83 - 12

	DATE	PRECIP	H	Q (L/S)
=====				
1984	10/29		0.00	0.0
	10/31		0.00	0.0
	11/02		0.00	0.0
	11/05		0.09	3.4
	11/07		0.04	0.4
	11/09		0.02	0.1
	11/12		0.08	2.5
	11/14		0.06	1.2
	11/16		0.07	1.8
	11/19		0.06	1.2
	11/21		0.05	0.8
	11/23		0.05	0.8
	11/26		0.06	1.2
	11/28		0.06	1.2
	11/30		0.06	1.2
	12/03		0.10	4.4
	12/05		0.06	1.2
	12/07			0.0
	12/10		0.08	2.5
	12/12		0.10	4.4
	12/14		0.10	4.4
	12/17		0.10	4.4
	12/19		0.09	3.4
	12/21			0.0
	12/24		0.17	16.4
	12/28		0.16	14.1
	12/31		0.21	27.9
1985	01/01			0
	01/09			0.0
	01/11			0.0
	01/14			0.0
	01/16			0.0
	01/21			0.0
	01/23			0.0
	01/25			0.0
	01/28			0.0
	01/30			0.0
	02/01			0.0
	02/04			0.0
	02/06			0.0
	02/08			0.0
	02/11			0.0
	02/13			0.0
	02/15			0.0
	02/18			0.0
	02/20			0.0
	02/22			0.0
	02/25		0.47	236.8
	02/27		0.35	95.0
	03/01		0.30	68.0

FALCON CREEK STREAMFLOW
BURLINGTON L.F. 11/83 - 12

DATE	PRECIP	H	Q (L/S)
03/04			0.0
03/06			0.0
03/08	0.42		168.2
03/11	0.37		112.6
03/13	0.38		122.5
03/15	0.35		95.0
03/18	0.27		52.3
03/20	0.24		38.9
03/22	0.23		35.0
03/25	0.25		43.1
03/27	0.27		52.3
04/01	0.28		57.2
04/03	0.23		35.0
04/08	0.11		5.5
04/10	0.11		5.5
04/12	0.11		5.5
04/15	0.11		5.5
04/17	0.11		5.5
04/19	0.11		5.5
04/22	0.11		5.5
04/24	0.11		5.5
04/26	0.11		5.5
04/29	0.11		5.5
05/01	0.10		4.4
05/03	0.09		3.4
05/06	0.08		2.5
05/08	0.08		2.5
05/10	0.08		2.5
05/13	0.05		0.8
05/15	0.05		0.8
05/17	0.08		2.1
05/21	0.08		2.5
05/22	0.08		2.1
05/27	0.09		3.4
05/29	0.06		1.2
05/31	0.08		2.5
06/03	0.05		0.8
06/05	0.04		0.4
06/07	0.04		0.4
06/10	0.04		0.4
06/12	0.06		1.2
06/14	0.06		1.2
06/17	0.06		1.2
06/19	0.07		1.5
06/21	0.05		0.8
06/24	0.05		0.8
06/26	0.05		0.8
07/02			
07/08	0.12		6.3
07/10	0.05		0.8

1985

FALCON CREEK STREAMFLOW
BURLINGTON L.F. 11/83 - 12

DATE	PRECIP	H	Q (L/S)
=====			
1985 07/12		0.04	0.4
07/15		0.04	0.4
07/17		0.04	0.4
07/22		0.02	0.1
07/24			0.0
07/26			0.0
07/29			0.0
07/31			0.0
08/06			0.0
08/07			0.0
08/09			0.0
08/12			0.0
08/14			0.0
08/16			0.0
08/21			0.0
08/23			0.0
08/26		0.04	0.4
08/28		0.02	0.1
08/30			0.0
09/03		0.01	0.01
09/05		0.02	0.1
09/09		0.01	0.01
09/16			0.0
09/17			0.0
09/18			0.0
09/20			0.0
09/23			0.0
09/30			0.0
10/02			0.0
10/04			0.0
10/07			0.0
10/17			0.0
10/18			0.0
10/21		0.04	0.4
10/25		0.05	0.8
10/28		0.03	0.2
10/30		0.04	0.4
11/04		0.22	31.3
11/06		0.22	31.3
11/08		0.02	0.04
11/13		0.32	75.6
11/18		0.23	35.0
11/20		0.23	33.9
11/26		0.12	6.6
11/29		0.18	19.0
12/02		0.33	81.0
12/04		0.12	6.2
12/09		0.12	6.3
12/11		0.22	31.3
12/13			0.0

FALCON CREEK STREAMFLOW
BURLINGTON L.F. 11/83 - 12

	DATE	PRECIP	H	Q (L/S)
=====				
1985	12/16			0.0
	12/18			0.0
	12/27			0.0
1986	01/02	2.2		
	01/03	2.8		
	01/04	1.8		
	01/05	1.0		
	01/07	T		
	01/12	0.4		
	01/13	0.4		
	01/14	0.6		
	01/17	4.0		
	01/18	0.4		
	01/19	14.0		
	01/20	0.2		
	01/22	T		
	01/24	T		
	01/25	1.0		
	01/26	0.4		
	01/27	3.4		
	01/28	0.2		
	01/29	0.4		
	02/01	18.0		
	02/04	19.3		
	02/05	0.2		
	02/06	0.2		
	02/07	1.6		
	02/08	1.2		
	02/09	0.4		
	02/13	T		
	02/14	0.6		
	02/15	0.4		
	02/16	7.2		
	02/17	1.2		
	02/18	0.2		
	02/19	0.2		
	02/20	12.0		
	02/21	T		
	02/22	T		
	02/23	T		
	02/25	T		
	02/27	0.4		
	02/28	T		
	03/03	0.8		
	03/05	5.8		
	03/06	5.0		
	03/08	0.6		
	03/09	6.0		
	03/10	3.8		
	03/12	12.4		

FALCON CREEK STREAMFLOW
BURLINGTON L.F. 11/83 - 12

DATE	PRECIP	H	Q (L/S)
=====	=====	=====	=====
1986 03/13	6.0		
03/14	0.2		
03/15	T		
03/18	13.8		
03/19	T		
03/22	0.2		
03/23	0.6		
03/24		0.24	38.9
03/26	9.9		
03/26		0.25	43.1
03/30	T		
03/31		0.18	19.0
04/01	0.4		
04/01		0.17	16.4
04/03	1.8		
04/04	0.4		
04/05	13.2		
04/06	T		
04/07	1.4		
04/08	T		
04/09		0.16	14.1
04/09	T		
04/10	2.0		
04/11	1.4		
04/14		0.13	8.4
04/14	4.1		
04/15	13.4		
04/16	8.4		
04/16		0.3	68.0
04/18		0.19	21.7
04/20	15.8		
04/21		0.31	71.9
04/21	0.8		
04/23		0.18	19.0
04/25		0.17	16.4
04/28		0.14	10.1
04/29	T	0.15	12.0
04/30		0.14	10.1
05/01	1.0		
05/02		0.12	6.9
05/05		0.14	10.1
05/06	3.2		
05/07		0.14	10.1
05/08		0.05	0.8
05/09		0.13	8.4
05/12		0.12	6.9
05/14		0.13	8.4
05/14	2.8		
05/15	9.6		
05/16		0.17	16.4

FALCON CREEK STREAMFLOW
BURLINGTON L.F. 11/83 - 12

DATE	PRECIP	H	Q (L/S)
=====			
1986 05/16	0.4		
05/17	0.2		
05/18	23.2		
05/19	9.8		
05/20		0.28	57.2
05/20	12.2		
05/22	6.0		
05/23	11.0		
05/26		0.18	19.0
05/28		0.16	14.1
05/30		0.14	10.1
06/01	8.8		
06/02		0.14	10.1
06/04		0.13	8.4
06/05	13.2		
06/06		0.14	10.1
06/07	11.2		
06/09		0.12	6.9
06/11		0.12	6.9
06/11	18.6		
06/12	0.4		
06/13		0.14	10.1
06/14	0.2		
06/15	0.2		
06/16	12.6		
06/16		0.12	6.9
06/18		0.12	6.9
06/19	0.4		
06/20		0.12	6.9
06/21	1.2		
06/22	1.6		
06/23		0.12	6.9
06/23	5.6		
06/25		0.12	6.9
06/27	8.4		
06/27		0.12	6.9
06/29	0.8		
06/30		0.12	6.9
07/01	5.6		
07/02		0.12	6.9
07/04	0.4	0.01	0.0
07/07	4.2		
07/08	T		
07/11	14.8		
07/12	5.2		
07/13	4.2		
07/14		0.12	6.9
07/17		0	0.0
07/17	33.4		
07/18	18.8		

FALCON CREEK STREAMFLOW
BURLINGTON L.F. 11/83 - 12

	DATE	PRECIP	H	Q (L/S)
=====				
1986	07/19	2.6		
	07/21		0.12	6.9
	07/22		0	0.0
	07/23		0	0.0
	07/24		0	0.0
	07/25		0	0.0
	07/25	9.2		
	07/28		0	0.0
	07/31	T		
	08/01	0.4		
	08/01		0	0.0
	08/02	9.4		
	08/03	2.4		
	08/04	T		
	08/05	0.2		
	08/06		0	0.0
	08/06	23.4		
	08/07	21.4		
	08/08	2.0		
	08/10	24.0		
	08/14	2.8		
	08/15	8.4		
	08/18		0	0.0
	08/21	0.6		
	08/22	7.2		
	08/23	3.8		
	08/25	T		
	08/26	16.4		
	08/28	1.2		
	09/04	3.0		
	09/06	0.2		
	09/09	T		
	09/10	43.8	0	0
	09/11	10.2		
	09/12	0.4		
	09/13	T		
	09/14	2.4		
	09/15	26.4		
	09/16	0.2		
	09/19	4.4		
	09/20	0.6		
	09/21	2.6		
	09/22	7.3		
	09/23	0.6		
	09/25	0.8		
	09/26	4.2		
	09/27	T		
	09/28	6.0		
	09/29	27.8		
	09/30	3.2		

FALCON CREEK STREAMFLOW
BURLINGTON L.F. 11/83 - 12

	DATE	PRECIP	H	Q (L/S)
1986	12/22		0.2	24.7
	12/24	24.2		
	12/25	0.4		
	12/26	T		
	12/27	T		
	12/29		0.2	24.7
	12/30	T		
	12/31	T		

APPENDIX III

LEACHATE ANALYSES - ROUTINE PARAMETERS

LEACHATE ANALYSES - METALS

LEACHATE ANALYSES - VOLATILE ORGANICS

LEACHATE ANALYSES - EXTRACTIBLE ORGANICS

LEACHATE ANALYSES - PCB AND PESTICIDES

BURLINGTON LANDFILL
PROJECT 86-53
LEACHATE ANALYSES

STATION	DATE	CONDUCTIVITY	HARDNESS	ALKALINITY	PH	CHLORIDE	TOTAL	DISSOLVED	SUSPENDED	IRON	PHOSPHOROUS	SOLUBLE	TOTAL	AMMONIUM	NITRATES	NITRITE	PHENOLICS	BOD5
		COND25	CaCO3	CaCO3		Cl	SOLIDS	SOLIDS	SOLIDS	FE	(TOTAL)	PHOSPHATES	KJELDAHL					
		umho's/cm	mg/l	mg/l		mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	TKN	NH3	NO3	NO2	ug/l	mg/l
Toedrain	22-May-85	10050	1040	3928	6.8	1368	8970	8620	351	148	2.88		325		0.55	0.08	2140	>3835
Leachate	10-Jul-85	9020	3028	3676	6.8	1310	7770	7640	124	48	1.00	0.08		300	0.55	0.11	1600	3000
	17-Sep-85	11130	3571	4058	6.7	1457	9240	9030	204	41	1.10	<.01	385	328	0.80	0.09	18	9860
	13-Nov-85	4920	1830	1844	6.3	441					0.90		108	100	0.40	0.09		2830
	20-Nov-85	5490	2120	2082	7.3	497	4800	4300	497	17	1.25	<.01	153	120	0.40	0.11	1440	18
	05-Dec-85	5940	2050	2210	6.8	631					3.50		136	130	0.25	0.07	810	1925
	18-Dec-85	6300	1780	2270	7.3	779					1.00		175	143	0.15	0.04	775	2360
	08-May-86	9050	1737	3100	7.7	819	7610	7160	450			0.17	203	178	0.55	0.07	1980	4330
	09-Jul-86	8900	3398	3508	7.0	1110	8946	8616	329		1.50	0.08	268	237	0.10	0.17	2360	1440
	10-Sep-86	9140	1230		6.8		8810	8640	165		2.00	<.01	283	5.35	<.05	<.005	3	4500
	02-Dec-86	6120	2024	2476	7.6	677		5070			0.20	<0.05	154	140	0.75	0.025	1290	

FD 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
=====							

PROJECT: 86-53
BURLINGTON LANDFILL

Metal concentrations in Leachate Samples Collected from
the Toe-drain. Results in mg/L Unfiltered Totals.

=====					
PARAMETER	1986				

	08-May	09-Jul	10-Sep	02-Dec	
=====					
Iron	90	140	83	53	
Manganese	8.0	9.9	8.8	5.6	
Aluminum	0.97	0.56	0.49	<0.15	
Cadium	0.005	0.003	<0.015	<0.015	
Chromium	0.26	0.28	0.27	0.33	
Copper	0.53	0.024	<0.05	<0.050	
Nickel	0.08	0.089	0.1	<0.050	
Lead	<0.03	0.041	<0.15	<0.150	
Zinc	5.4	6.1	4.4	1.6	
=====					

Burlington Landfill Volatile Organic Concentrations in Leachate
Samples Collected from the Toe-drain. Results in ug/L.
Analyses by the MOE Using Method OP15-0038

[illegible]

PROJECT: 86-53
BURLINGTON LANDFILL LEACHATE

EXTRACTIBLE ORGANICS - results in ug/L

PARAMETER	1986			
	08-May	09-Jul	10-Sep	02-Dec
Dibenzo(a,h)anthracene	MS		<2.	
Benzo(g,h,i)perylene	MS		<1.	
Phenol	MS		<2.	
2,4-Dimethyphenol	MS		<5.	
p-Chloro-m-cresol	MS		!NP	
2,3-Dichlorophenol	MS		<1.	
2,3-Dichlorophenol	MS		<1.	
2-Nitrophenol	MS		<5.	
4-Nitrophenol	MS		<6.	
2,3,4,6-Trichlorophenol	MS		<2.	
2,4-Dinitrophenol	MS		!NP	
4,6-Dinitro-o-cresol	MS		!NP	
Bis(2-chloromethyl)Ether	MS		!NP	
Bis(2chloroipropyl)Ether	MS		!NP	
Nitrobenzene	MS		10.	
Bis(2-chloroethoxy)methn	MS		<1.	
Naphthalene	MS		<1.	
1-Methylnaphthalene	MS		<1.	
Dimethyl Phthalate	MS		<1.	

PROJECT: 86-53
BURLINGTON LANDFILL LEACHATE

EXTRACTIBLE ORGANICS - results in ug/L

PARAMETER	1986			
	08-May	09-Jul	10-Sep	02-Dec
Acenaphthylene	MS		<1.	
2,6-Dinitrotoluene	MS		<2.	
Acenaphthene	MS		<1.	
4-Chlorophenylphenylether	MS		<1.	
2,4-Dinitrotoluene	MS		<2.	
Diethyl Phthalate	MS		<1.	
2-Chloroethylvinylether	MS		!NP	
Fluorene	MS		<1.	
N-Nitrosodiphenylamine	MS		<2.	
4-Bromophenylphenylether	MS		<1.	
Phenanthrene	MS		<1.	
Anthracene	MS		<1.	
Di-isobutylphthalate	MS		<1.	
Di-n-butylphthalate	MS		<1.	
Flouranthene	MS		<1.	
Pyrene	MS		<1.	
Butylbenzylphthalate	MS		!NP	
Benzo(a)anthracene	MS		<1.	

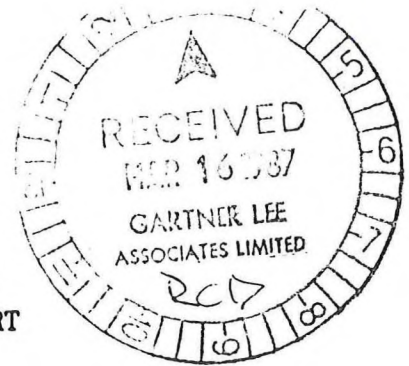
PROJECT: 86-53
BURLINGTON LANDFILL LEACHATE

EXTRACTIBLE ORGANICS - results in ug/L

PARAMETER	1986			
	08-May	09-Jul	10-Sep	02-Dec
Chrysene	MS		<1.	
Bis-2-ethylhexylphthalat	MS		30.	
Di-n-octylphthalate	MS		<1.	
Benzo(k)fluoranthene	MS		<1.	
Benzo(b)fluoranthene	MS		<1.	
Benzo(a)pyrene	MS		<1.	
Indeno(1,2,3-cd)pyrene	MS		<1.	
2,4,6,Trichlorophenol	MS		<1.	
2345 Tetrachlorophenol	MS		<1.	
Pentcahlorophenol	MS		<1.	

NOTES : MS - referred to Mass Spectroscopy Laboratory,
see report attached.
NP - No appropriate procedure available

MINISTRY OF THE ENVIRONMENT
LABORATORY SERVICES BRANCH
DRINKING WATER ORGANICS SECTION
MASS SPECTROMETRY ANALYTICAL REPORT



To: John Budz, MOE, 1235 Trafalgar Road Suite 401
Oakville, Ont.

Re: GC/MS Analysis of sample from the
Burlington Landfill Site

Submission No: CL 04047 (formerly CL 65053)

MS Reference No.	Other Lab No.	Sample Description
<u>My 19 - 0242</u>	<u></u>	<u></u>
<u></u>	<u></u>	<u></u>
<u></u>	<u></u>	<u></u>
<u></u>	<u></u>	<u></u>
<u></u>	<u></u>	<u></u>
<u></u>	<u></u>	<u></u>

For additional information contact: Dr. V.Y. Taguchi
(416) 248-3755
(416) 248-7484

cc. H. Tosune
L.I.S.
Dr O. Meres
Ian Carter etc

Extractable organics were determined in the following manner:

Internal standards were added to the samples to permit quantification of the components present. The samples were extracted under basic and acid conditions and the extracts concentrated prior to GC/MS analysis of the extractable fractions. The compounds were separated using capillary GC and were identified using mass spectrometry. The components isolated have only approximate concentrations marked. This approximation is based on three major assumptions which are:

1. The extraction efficiency of the compound is identical to that of the internal standard added to each sample.
2. The GC behaviour of the compound is identical to that of the internal standard.
3. The MS response of the compound is identical to that of the internal standard.

These assumptions may not hold and any deviation will affect the estimate of concentration.

The results for the analysis are indicated in the attached table(s).

The analytical data are presented in the attached table. The carboxylic acids are typical degradation products of the organic material found in land fill sites.

Reference:

LIS Submission No: CL 04047 (formerly CE 65053)

Date of Analysis: 86 09 23

V.Y. Taguchi
V.Y. Taguchi, Ph.D.

C.C. A. Tosini

L.I.S.

Dr. O. Meres

Ian Carter OTC



Ontario

Ministry
of the
EnvironmentExtractable
OrganicComponents Found & Their Concentration in ^{mg} / L

Approximate

Date Sampled: 86 05 08

Date Analyzed: 86 09 23

Sample MY19 - 0242

CL04047

BURLINGTON LIF

Compound				MY19 - 0242	
Carboxylic acids:-					
- C ₃ acid				61	
- C ₄				290 ³	
- C ₅				75 ²	
- C ₆				660 ³	
- C ₇				620 ³	
- C ₈				31	
- C ₉				16	
- C ₁₀				2.7	
- benzoic acid				170	
- benzoic acetic acid				22	
- benzoic propanoic acid				60	
- cyclohexane carboxylic acid				148	
Phenolics:-					
- phenol				4.2	
- cresol				3.2 ²	
- C ₂ alkyl phenol				0.1	
Miscellaneous:-					
- α-terpineol				0.4	
- triethyl phosphate				0.2	
- tributyl phosphate				0.1	
- sulfur				17	
- diethyl phthalate				0.2	

ND — not detected — less than 0.05 ug/litre

ND1 — not detected — less than 5 ug/litre

tr — trace — less than 0.1 ug/litre

* — approximate — response of standard not determined

NOTES

1286 (10/84) Superscript # — number of compounds.

PROJECT: 86-53
BURLINGTON LANDFILL LEACHATE

PCB AND PESTICIDES (concentrations in ng/L)

PARAMETER	1986			
	08-May	09-Jul	10-Sep	02-Dec
PCB, TOTAL	SM	<20.	<20.	
HEXACHLOROBENZENE	SM	<1.	<1.	
HEPTACHLOR	SM	<1.	<1.	
ALDRIN	SM	<1.	<1.	
PP-DDE	SM	<1.	<1.	
MIREX	SM	<5.	<5.	
A-BHC HEXACHLOROCYCLOHEX	SM	<1.	<1.	
B-BHC HEXACHLOROCYCLOHEX	SM	<1.	<1.	
G-BHC HEXACHLOROCYCLOHEX	SM	<1.	<1.	
A-CHLORDANE	SM	2.	5.	
G-CHLORDANE	SM	2.	<2.	
OXYCHLORDANE	SM	<2.	<2.	
OP-DDT	SM	<5.	<5.	
PP-DDD	SM	<5.	<5.	
PP-DDT	SM	<5.	<5.	
DMDT METHOXYCHLOR	SM	<5.	<5.	
HEPTACHLOREPOXIDE	SM	<1.	<1.	
ENDOSULFAN I	SM	<2.	<2.	
DIELDRIN	SM	4.	<2.	
ENDRIN	SM	<4.	<4.	
ENDOSULFAN II	SM	<4.	<4.	
ENDOSULFAN SULPHATE	SM	8.	<4.	

NOTE : SM - Sample missing - lost at lab

APPENDIX IV

GROUND WATER ANALYSES - ROUTINE PARAMETERS

GROUND WATER ANALYSES - VOLATILE ORGANICS

BURLINGTON LANDFILL
GLAL 85-61
GROUND WATER - ROUTINE PARAMETERS

STATION	DATE	CONDUCTIVITY	HARDNESS	ALKALINITY	PH	CHLORIDE	TOTAL SOLIDS	DISSOLVED SOLIDS	SUSPENDED SOLIDS	PHOSPHOROUS (TOTAL)	SOLUBLE PHOSPHATES	TOTAL KJELDAHL NITROGEN	AMMONIUM	NITRATES	NITRITE	PHENOLICS	BOD5	COD	DOC	DIC
		COND25 umho's/cm	(CaCO3) mg/L	(CaCO3) mg/L		CL mg/L	RST mg/L	RSF mg/L	RSP mg/L	P mg/L	P mg/L	TKN mg/L	NH3 mg/L	NO3 mg/L	NO2 mg/L	ug/L	mg/L	mg/L	mg/L	mg/L
12-II	14-Nov-85	4310	1920	743.0	6.77	348.8	3450	3290	162.0	<.01	<.010	1.50	<.05	<.05	<.005	1.4	1.4	34.0	3.8	196.0
	29-Jul-86	4180	2094	726.5	7.51	347.0	3520	3470	41.3	<.02		1.20	0.70	<.05	<.005	0.8	2.1		3.9	100.0
13-II	14-Nov-85	2000	689	374.8	7.42	300.6	1310	1110	203.0	0.06	<.01		1.40	0.40	0.320	-0.6	6.5	34.0	3.7	100.0
	29-Jul-86	1880	622	793.7	8.07	307.0	1440	1360	81.1	0.12		1.20	0.70	<.05	<.005	0.4	4.1		2.4	61.0
14-I	14-Nov-85	7250	2000	114.0	7.16	1585.0	5530	5520	14.3	0.04	<.01	4.70	<.05	0.30	0.280	2.8	2.9	84.0	0.6	30.0
	29-Jul-86	7200	1057	115.4	8.07	1612.0	5670	5520	153.0	0.08		4.60	2.80	<.05	0.020	2.6	1.9			22.6
14-II	14-Nov-85	2950	1200	536.8	6.95	219.8	2270	2120	146.0	0.02	<.01	0.30	<.05	<.05	0.010	-0.2	0.9	24.0	2.9	142.0
	29-Jul-86	2670	1222	527.3	8.09	232.0	3130	2460	671.0	0.38	0.12	1.00	<.05	<.05	<.005	<.2	5.1		2.7	60.0
15-I	14-Nov-85	4460	1230	241.4	7.00	1155.0	3050	2980	69.1	0.02	<.01	3.00	<.05	0.30	0.260	-0.2	6.5	68.0	0.4	64.0
	29-Jul-86	4310	976	195.2	7.99	1105.0	3930	3680	253.0	0.14	0.09	3.20	2.70	<.05	0.075	2.4	5.5		0.7	28.6
15-II	14-Nov-85	1970	733	396.0	7.05	189.0	1310	1280	33.9	0.06	<.01	0.60	<.05	<.05	0.010	-0.2	0.6	16.0	4.3	105.0
	29-Jul-86	2340	709	573.2	7.84	380.0	1790	1590	199.0	0.22	0.09	1.00	0.05	<.05	0.040	1.0	7.0		1.8	62.0
16-IV	14-Nov-85	2780	899	470.0	7.04	282.8	2170	1880	293.0	0.14	<.01	0.50	<.05	<.05	0.025	0.6	<.5	20.0	2.8	120.0
	29-Jul-86	3090	997	529.0	7.79	322.0	2350	2320	30.0	<.02		0.20	<.05	<.05	<.005	0.8	3.3		2.5	121.0
18-II	19-Dec-85	2980	938	569.0	7.34	375.6	5290	2040	3260.0	2.05	<.01	3.70	2.30	0.20	0.130		3.2		1.8	99.0
	29-Jul-86	1600	617	642.1	7.73	113.0	1370	1250	117.0	0.06	0.23	1.20	0.75	<.05	<.005	0.4	6.2		3.1	110.0
18-III	19-Dec-85	935	534	502.0	7.18	6.2	1130	591	540.0	0.65	<.01	1.00	<.05	0.15	0.025		4.2		4.5	109.0
	29-Jul-86	954	490	373.0	8.10	19.6	2290	840	1450.0	0.48	0.19	1.00	<.05	0.10	<.005	0.2	3.1		3.2	80.0
21-I	29-Jul-86	4220	2260	177.2	8.07	9.9	4360	4330	26.1	0.36	0.19	8.80	7.70	<.05	<.005	5.0	23.7		2.8	34.0
21-III	29-Jul-86	4220	310	159.8	7.95	2.5	7590	1130	6460.0	3.80	0.25	2.50	<.05	<.05	0.050	0.4	15.7		2.3	69.0
22-I	29-Jul-86	2110	470	483.2	8.50	15.2	1790	1630	159.0	0.12		3.40	2.40	<.05	<.005	3.2	31.7		4.9	98.0
22-II	29-Jul-86	911	517	462.0	7.90	7.5	790	682	108.0	0.04		0.40	0.05	<.05	<.005	<.2	6.5		2.5	105.0
22-III	29-Jul-86	779	423	349.3	8.21	6.0	4470	798	3670.0	1.45	0.22	1.00	<.05	<.05	<.005	<.2	5.2		1.7	78.0
23-I	05-Dec-85	3340	1140	371.0	8.57	6.6				0.86			4.00	0.10	0.025	0.6	4.1	300.0	1.7	
	18-Dec-85	3330	267	245.6	7.10	6.6				0.02		2.85	1.60	0.10	0.010	1.6	1.8			
	29-Jul-86	3220	1406	99.1	8.43	11.9	3210	3140	71	0.02	0.21	2.60	2.15	<.05	<.005	2.4	1.5		1.2	25.0

BURLINGTON LANDFILL
GLAL 85-61
GROUND WATER - ROUTINE PARAMETERS

STATION	DATE	CONDUCTIVITY	HARDNESS	ALKALINITY	PH	CHLORIDE	TOTAL	DISSOLVED	SUSPENDED	PHOSPHOROUS	SOLUBLE	TOTAL	KJELDAHL	AMMONIUM	NITRATES	NITRITE	PHENOLICS	BOD5	COD	DOC	DIC	
		COND25	(CaCO3)	(CaCO3)		CL	SOLIDS	SOLIDS	SOLIDS	(TOTAL)	PHOSPHATES	NITROGEN										
		umho's/cm	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ug/L	mg/L	mg/L	mg/L	mg/L
23-II	05-Dec-85	1620	718	805.2	7.37	1.8				0.08		1.70	1.20	<.05	0.010	<.2	3.1	42.0	6.2			
	18-Dec-85	1583	722	839.2	8.12	1.2				0.04		1.50	1.00	0.15	0.010	0.2	1.5					
	29-Jul-86	1320	705	752.8	8.41	3.5	2920	969	1950	1.40	0.27	2.00	<.05	0.80	0.360	0.4	31.1		5.6	149.0		
23-III	13-Nov-85	959	516	492.6	7.44	4.8				0.04		0.50	0.05	<.05	0.025	41.0	3.6	16.0	3.7			
	05-Dec-85	941	466	486.6	7.23	3.2				0.02		0.30	0.05	0.10	0.060	7.8	1.7	84.0	3.5			
	18-Dec-85	915	506	495.4	7.28	4.2				0.02		0.40	0.10	0.10	0.010	3.6	1.3					
	29-Jul-86	871	475	486.5	8.10	4.5	646	598	48	0.04		0.40	<.05	<.05	<.005	0.2	0.6		0.9	106.0		
24-I	05-Dec-85	76400	23100	103.8	6.52	34820.2				1.28				31.50	<.05	0.020	25.0	1.8				
	18-Dec-85	57800	15800	93.6	7.38	24340.2				0.08				22.00	<.05	0.020	10.6	1.3				
	29-Jul-86	79400	25773	1.0	5.84		82400	82300	121	0.10	0.05		31.50	0.75	<.005	3.4	0.9			5.0		
24-II	05-Dec-85	25900	6240	131.0	7.68	9320.0				0.24		11.70	11.30	0.15	0.150	4.6	3.2					
	18-Dec-85	78800	23800	36.4	6.66	35860.2				0.12			33.00	<.05	0.020	10.6	1.9					
	29-Jul-86	88200	23170	27.7	7.15		72200	72000	274	0.10	0.03		30.50	0.65	<.005	3.4	2.7			0.4		
24-III	13-Nov-85	3930	1210	816.0	7.24	492.0				2.75		3.30	0.60	0.50	0.120		6.8	62.0	4.4			
	05-Dec-85	2210	568	508.8	7.31	127.4				0.24		0.70	0.20	0.40	0.030	0.2	1.9	30.0	4.2			
	18-Dec-85	2150	564	562.0	7.37	121.2				0.48		0.70	0.10	0.25	0.030	<.2	2.3					
	29-Jul-86	2280	550	1.0	8.30	209.0	6540	1930	4620	0.50	0.24	1.00	0.05	1.20	<.005	0.4	5.9		2.5	80.0		
26-I	05-Dec-85	4130	473	223.2	7.60	525.6				0.40		4.20	4.10	0.10	0.065	0.2	2.2	138.0	1.2			
	18-Dec-85	4020	437	162.8	8.10	525.6				0.06		4.00	4.00	<.05	0.010	1.0	1.2					
	29-Jul-86	3980	598	214.0	8.16	487.0	3310	3210	102	0.04		4.20	3.70	1.00	0.005	2.0	3.7		0.9	46.0		
26-II	13-Nov-85	1970	357	532.4	9.04	44.4				0.65		3.75	3.80	0.10	0.060	2.0	5.6	80.0	2.9			
	05-Dec-85	1840	486	1583.6	7.69	41.8				8.95		12.00	4.30	0.10	0.095	0.2	2.4		3.9			
	18-Dec-85	1840	458	481.2	8.04	52.4				0.08			2.90	<.05	0.015	0.4	2.1					
	29-Jul-86	1700	424	385.8	8.23	88.3	1590	1390	194	0.06		2.60	2.35	1.20	<.005	0.2	0.3		0.7	78.0		
26-III	13-Nov-85	2290	1180	888.0	7.24	9.6				<.01		0.40	0.10	<.05	<.005	<.2	0.3	6.0	3.7			
	05-Dec-85	2690	1500	895.6	7.80	16.0				0.10		0.50	0.20	<.05	0.010	-0.6	0.4	62.0	3.3			
	18-Dec-85	2590	1440	904.0	7.63	16.4				0.04		0.40	0.10	<.05	0.010	-0.2	0.6					
	29-Jul-86	2380	1243	714.0	8.45	19.2	7430	2430	5000	0.38	0.25	0.60	0.05	1.45	0.115	-0.2	13.3		2.6	142.0		
27-I	05-Dec-85	9690	1750	50.4	8.51	2878.0				0.04		10.00	10.00	<.00	0.015	1.0	3.2	102.0				
	18-Dec-85	10430	2040	97.6	7.78	3220.0				0.04			9.80	0.55	0.520	0.8	16.0					
	29-Jul-86	11110	2246	166.3	7.84	2195.0	8440	8380	57	0.02		8.80	8.55	<.05	0.020	1.6	0.4			36.0		

BURLINGTON LANDFILL
 BLAL 85-61
 GROUND WATER - ROUTINE PARAMETERS

STATION	DATE	CONDUCTIVITY	HARDNESS	ALKALINITY	PH	CHLORIDE	TOTAL SOLIDS	DISSOLVED SOLIDS	SUSPENDED SOLIDS	PHOSPHOROUS (TOTAL)	SOLUBLE PHOSPHATES	TOTAL KJELDAHL NITROGEN	AMMONIUM NH3	NITRATES NO3	NITRITE NO2	PHENOLICS	BOD5	COD	DOC	DIC
		COND25 uaho's/cm	(CaCO3) mg/L	(CaCO3) mg/L		CL mg/L	RST mg/L	RSF mg/L	RSP mg/L	P mg/L	P mg/L	TKN mg/L	mg/L	mg/L	mg/L	ug/L	mg/L	mg/L	mg/L	mg/L
27-II	05-Dec-85	3460	643	174.8	7.58	795.0				0.10			4.10	<.05	0.050	0.2	4.3	42.0	0.7	
	18-Dec-85	3370	625	163.4	7.51	810.0				0.02			2.70	1.65	1.630	0.6	11.7			
	29-Jul-86	3500	635	172.1	8.09	822.0	2380	2360	24	<.02		4.20	3.80	<.05	0.060	1.2	0.9		1.9	36.0
27-III	13-Nov-85	2790	0	591.8	6.98	540.4				2.80		1.90	0.05	0.40	0.015	0.2	10.0	40.0	0.8	
	05-Dec-85	2810	1130	385.8	6.88	584.8				0.50		0.50	<.05	0.40	0.030	<.2	1.1	22.0	1.2	
	18-Dec-85	2740	1130	482.8	7.32	558.0				0.98		0.80	<.05	0.35	0.030	<.2	8.7			
	29-Jul-86	2410	995	820.3	7.72	430.0	2000	1920	83	0.04		0.40	<.05	0.25	0.010	<.2	0.7		1.2	82.0
28-I	14-Nov-85	3240	1300	524.0	7.16	310.8	2680	2350	326.0	0.18	<.01	0.60	<.05	0.10	0.040	0.4	4.3	36.0	2.5	135.0
	29-Jul-86	3180	1303	586.9	8.19	327.0	2860	2630	234.0	0.10		0.20	<.05	<.05	<.005	0.4	0.8		2.0	131.0
29-I	14-Nov-85	747	386	354.2	7.52	3.6	545	453	91.7	0.08	<.01	0.40	<.05	0.15	0.010	0.8	3.8	62.0	2.6	93.0
	29-Jul-86	834	460	441.0	8.62	4.1	5090	688	4400.0	0.08		0.20	<.05	0.15	0.005	1.2	8.7		1.3	115.0
30-I	14-Nov-85	2060	1040	630.0	6.94	10.2	5610	1480	4130.0	2.88	<.01	5.00	<.05	0.40	0.370	0.6	8.9	162.0	6.8	154.0
	29-Jul-86	1740	867	381.8	8.32	15.5	5360	1830	3530.0	0.10		1.60	0.05	3.75	0.220	0.4	21.6		4.0	72.0

BURLINGTON LANDFILL
86-53
VOLATILE ORGANIC COMPOUNDS IN GROUND WATER

MONITOR	DATE	1,1,1 TRICHLORO- ETHANE (ug/L)	TRICHLORO- ETHYLENE (ug/L)	TETRA- CHLORO ETHYLENE (ug/L)	1,1 DICHLORO- ETHYLENE (ug/L)
23-I	05-Dec-85	<1	<1	<1	<1
	18-Dec-85	5	<1	<1	<1
	29-Jul-86	<1	<1	<1	<1
23-II	05-Dec-85	2	<1	<1	<1
	18-Dec-85	1	<1	<1	<1
	29-Jul-86	<1	<1	<1	<1
23-III	13-Nov-85	<1	<1	<1	<1
	05-Dec-85	<1	<1	<1	<1
	18-Dec-85	<1	<1	<1	<1
	29-Jul-86	<1	<1	<1	<1
24-I	05-Dec-85	<1	<1	<1	<1
	18-Dec-85	<1	<1	<1	<1
	29-Jul-86	<1	<1	<1	<1
24-II	05-Dec-85	<1	<1	<1	<1
	18-Dec-85	<1	<1	<1	<1
	29-Jul-86	<1	<1	<1	<1
24-III	13-Nov-85	3	9	3	<1
	05-Dec-85	<1	<1	<1	<1
	18-Dec-85	1	<1	<1	<1
	29-Jul-86	<1	9	<1	1
26-I	05-Dec-85	<1	<1	<1	<1
	18-Dec-85	<1	<1	<1	<1
	29-Jul-86	<1	<1	<1	<1
26-II	13-Nov-85	<1	<1	<1	<1
	05-Dec-85	1	<1	<1	<1
	18-Dec-85	<1	<1	<1	<1
	29-Jul-86	<1	<1	<1	<1
26-III	13-Nov-85	<1	<1	<1	<1
	05-Dec-85	<1	<1	<1	<1
	18-Dec-85	<1	<1	<1	<1
	29-Jul-86	<1	<1	<1	<1
27-I	05-Dec-85	2	<1	<1	<1
	18-Dec-85	<1	<1	<1	<1
	29-Jul-86	<1	<1	<1	<1
27-II	05-Dec-85	<1	<1	<1	<1
	18-Dec-85	<1	<1	<1	<1
	29-Jul-86	<1	<1	<1	<1
27-III	13-Nov-85	<1	<1	<1	<1
	05-Dec-85	<1	<1	<1	<1
	18-Dec-85	<1	<1	<1	<1
	29-Jul-86	<1	<1	<1	<1
28-I	29-Jul-86	<1	<1	<1	<1
29-I	29-Jul-86	<1	<1	<1	<1
30-I	29-Jul-86	<1	<1	<1	<1

NOTE : All samples tested for 25 volatile compounds.
Only the four components detected are listed.

APPENDIX V

SURFACE WATER ANALYSES AND FLOW ESTIMATES

RURLINGTON LANDFILL SITE
PROJECT 86-53
SURFACE WATER ANALYSES - MOE LABORATORY

STATION	DATE	CONDUCTIVITY	HARDNESS	ALKALINITY	pH	CHLORIDE	TOTAL DISSOLVED			SUSPENDED	IRON PHOSPHOROUS		SOLUBLE	TOTAL	AMMONIUM	NITRATES	NITRITE	PHENOLICS
		COND25				CL	SOLIDS	SOLIDS	SOLIDS		(TOTAL)	P		KJELDAHL				
		uohm's/cm	mg/L	mg/L	mg/L	RST	RSF	RSP	FE	P	P	TKN	NH3	NO3	NO2			
						mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ug/L	
SW1-A	22-May-85	669	316.0	259.8	8.11	42.2	452	452	0.0	0.16	0.04	<.01	0.40	<.05	0.40	0.005	0.4	
	10-Jul-85	696	321.0	276.2	8.13	53.0	487	474	12.9						0.20	0.010	0.6	
	22-Nov-85	381	169.0	137.0	8.08	16.6	248	248	0.0		0.06	<.01	0.30	<.05	0.50	<.005	0.2	
	19-Dec-85	528	238.0	183.4	8.20	35.0	318	318	0.0		0.02	<.01	0.30	<.05	0.30	<.005	0.6	
	11-Apr-86	483	223.0	179.7	8.50		307	301	5.8			0.02		<.05	0.30	0.08	0.4	
	29-Apr-86	577	273.5	233.5	8.53	38.7	333	319	14.4		<.02	<.01	<.20	<.05	<.05	0.005	0.8	
	08-May-86	596	286.0	244.9	8.52	39.2	393	389	4.3		0.20	<.01	0.20	1.35	0.05	0.010	0.6	
	09-Jul-86	723	314.5	281.5	8.24	54.8	604	545	59.4		0.10	0.01	0.40	<.05	0.05	0.015	1.2	
	02-Dec-86	642	279.5	224.1	8.16	46.5		395			0.05	0.05	0.30	0.15	0.45	0.010	0.6	
SW2	22-May-85	714	335.0	279.6	8.13	38.0	516	516	0.0	0.11	0.04	<.01	0.20	<.05	0.55	0.010	0.4	
	10-Jul-85	678	328.0	275.4	8.15	39.4	483	474	9.1			0.01		<.05	0.30	0.030	8.0	
	17-Sep-85	883	419.9	323.6	7.98	50.6			23.2	<.03	0.02		0.60	<.05	<.05	<.005	0.4	
	17-Oct-85	834	383.0	290.6	7.84	42.4	522	522	0.0	<.03	0.12	<.01	0.30	<.05	0.20	<.005	0.2	
	22-Nov-85	397	177.0	145.6	8.06	15.8	258	258	0.0		0.08	<.01	0.40	<.05	0.50	<.005	0.2	
	08-May-86	646	325.5	275.1	8.55	34.0	422	417	5.1		0.04	<.01	0.40	0.20	<.05	0.010	0.8	
	09-Jul-86	785	374.0	310.1	8.13	49.1	548	523	25.1		0.08	0.08	0.20	0.15	0.40	0.015	1.8	
	02-Dec-86	570	272.0	229.6	8.25	30.9		361			0.05	0.06	0.20	0.15	0.45	0.005	0.6	
SW3	22-May-85	792	385.0	316.8	8.15	35.6	530	530	0.0	0.08	0.04	<.01	0.20	<.05	0.10	0.005	0.4	
	10-Jul-85	676	322.0	280.8	8.22	33.6	473	466	7.0	0.32		0.01		<.05	0.10	0.010	6.4	
	22-Nov-85	420	190.0	152.0	7.98	16.0	274	264	10.5		0.08	<.01	0.40	<.05	0.40	<.005	0.2	
	19-Dec-85	647	303.0	233.6	8.26	34.6	403	403	0.0		0.04	<.01	0.30	<.05	0.35	<.005	0.2	
	11-Apr-86	555	267.0	219.3	8.57	31.6	366	356	10.0		0.02	0.01	0.20	<.05	0.10	<.005	0.2	
	29-Apr-86	651	311.0	269.1	8.48	32.9	409	347	61.6		<.02	0.01	<.20	<.05	<.05	0.005	2.0	
	08-May-86	707	351.5	297.9	8.46	33.4	496	423	73.2		0.08	<.01	0.40	<.05	<.05	0.015	0.6	
	09-Jul-86	759	367.0	328.1	8.36	38.9	664	616	47.9		0.12	0.06	0.40	<.05	0.20	0.040	1.4	
	02-Dec-86	625	299.0	246.0	8.10	31.8		398			0.05	0.08	0.20	0.15	0.40	0.005	0.4	
SW4	22-May-85	900	410.0	377.8	7.94	16.4	680	592	88.3	2.26	0.10	<.01	0.50	<.05	0.10	0.065	1.2	
	08-May-86	647	390.5	275.2	8.54	12.3	438	402	35.7		0.04	<.01	0.40	<.05	<.05	0.010	~.6	
SW5	08-May-86	797	394.5	319.7	8.33	21.8	551	474	77.4		0.06	<.01	0.40	<.05	<.05	0.005	1.0	
	02-Dec-86	931	297.0	362.0	8.26	20.7		557			0.03	0.09	0.20	0.15	0.15	0.005	0.2	
SW6	22-Nov-85	554	277.0	235.0	8.23	7.8	417	367	49.9		0.12	<.01	0.60	<.05	0.10	0.350	0.2	

BURLINGTON LANDFILL SITE
PROJECT 86-53
SURFACE WATER ANALYSES - MOE LABORATORY

STATION	DATE	BOD5	COD	DOC	DIC	TOTAL COLIFORMS	FECAL COLIFORMS	FECAL STREPT	FLOW
		mg/L	mg/L	mg/L	mg/L	cnt/100ml	cnt/100ml	cnt/100ml	l/s
SW1-A	22-May-85	0.5	10	2.3	59.0	600	370	100	0.6
	10-Jul-85	0.8	22	2.9	65.0	50000	3500	520	<.01
	22-Nov-85	0.3	12	4.3	33.2	1200	40	70	NH
	19-Dec-85	0.6		2.8	45.0	180	20	20	15
	11-Apr-86	0.3	2			420	40	20	
	29-Apr-86	0.7	<2	3.1	43.0	120	16	8	43
	08-May-86	0.3	4	7.0	53.0	440	36	4	22
	09-Jul-86	4.0	94	3.4	55.0		610	560	<.01
	02-Dec-86		10	3.7	47.0		350	130	
SW2	22-May-85	0.3	26	2.5	65.0	1000	30	90	2.8
	10-Jul-85	0.8	22	2.9	64.0	16000	1020	480	1.0
	17-Sep-85	0.4	8	2.4	66.0	2300	60	220	<.01
	17-Oct-85	0.6	6	2.6	69.0	240	<10	<10	<.01
	22-Nov-85	0.3	16	4.6	34.8	2300	130	140	81
	08-May-86	0.3	<2	2.1	60.0	540	100	36	
	09-Jul-86	1.8	6	10.5	72.0		950	490	20
	02-Dec-86		<2	3.2	45.0		290	270	<.01
SW3	22-May-85	0.4	36	3.3	73.0	1500	120	170	2.1
	10-Jul-85	0.8	24	4.5	64.0	1900	460	420	0.8
	22-Nov-85	0.3	12	4.8	36.8	1400	460	100	0.2
	19-Dec-85	0.5		3.0	57.0	300	40	100	20
	11-Apr-86	0.1	12	2.1	40.6	170	<20	20	
	29-Apr-86	0.6	<2	2.7	44.0	370	132	136	12
	08-May-86	0.3	8	2.4	61.0	1000	410	80	0.8
	09-Jul-86	1.5	<2	4.7	67.0		5700	640	<.01
	02-Dec-86		<2	3.5	50.0		220	230	
SW4	22-May-85	0.6	18	3.0	76.0	129000	860	2800	<.01
	08-May-86	0.3	10	2.9	69.0	1400	96	72	<.01
SW5	08-May-86	0.3	14	3.8	61.0	5200	370	300	1.8
	02-Dec-86		<2	3.9	56.0		110	170	
SW6	22-Nov-85	1.3	30	8.2	59.0	1300	300	700	<.08

BURLINGTON LANDFILL SITE
PROJECT 86-53
SURFACE WATER ANALYSES - MDE LABORATORY

STATION	DATE	CONDUCTIVITY	HARDNESS	ALKALINITY	pH	CHLORIDE	TOTAL SOLIDS	DISSOLVED SOLIDS	SUSPENDED SOLIDS	IRON	PHOSPHOROUS (TOTAL)	SOLUBLE PHOSPHATES	TOTAL KJELDAHL NITROGEN	AMMONIUM	NITRATES	NITRITE	PHENOLICS
		COND25				CL	SOLIDS	SOLIDS	SOLIDS	FE	P	P	TKN	NH3	NO3	NO2	
		umho's/cm	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
SM7	22-Nov-85	647	242.0	178.0	8.31	37.8	438	411	27.2		0.10	<.01	0.50	<.05	<.05	0.030	0.2
	08-May-86	1139	521.0	329.3	8.48	67.7	863	789	74.5		0.10	<.01	0.60	<.05	<.05	0.035	12.8
SM10	22-Nov-85	975	471.0	269.6	8.27	45.6	756	699	56.8		1.42	1.02	1.05	<.05	1.15	0.235	0.2
SM11	22-Nov-85	950	442.0	259.0	8.16	45.8	721	672	49.2		1.74	1.20	0.85	<.05	1.15	0.235	<.2
SM12	10-Jul-85	928		67.6	8.07	132.0	759	724	35.4	0.96					0.55	0.050	1.4
	17-Oct-85	1560	643.0	118.6	8.04	206.6				<.03							0.2
	22-Nov-85	781	317.0	176.8	7.88	56.6	577	510	66.9		0.50	0.18	1.35	<.05	1.50	0.130	8.2
	19-Dec-85	2750	927.0	481.0	7.64	418.0					0.15	<.01	9.60	7.10	<.05	0.025	68.0
	11-Apr-86	2840	843.0	217.0	8.16		2080	2000	82.6								3.2
	29-Apr-86	1930	548.0	199.3	8.34	172.0	1470	1240	229.0		0.15	0.02	1.00	<.05	0.40	0.025	5.2
	08-May-86	2060	584.0	274.1	8.36	341.5	1780	1410	376.0		0.44	<.01	1.20	<.05	0.45	0.015	6.2
	02-Dec-86	1395	555.5	319.2	7.98	142.0		965			0.06	0.14	2.00	1.30	0.90	0.320	4.0
SM13	22-Nov-85	557	215.0	177.6	8.05	32.2	392	363	28.6		0.16	<.01	0.50	<.05	<.05	0.015	0.2
	29-Apr-86	3820	840.5	313.8	8.18	487.0	2410	2360	53.7		<.02	0.03	0.20	<.05	0.05	0.010	2.0
	08-May-86	4780	1068.5	329.9	8.18	1101.0	3390	3290	103.0		0.08	<.01	0.60	<.05	<.05	0.010	6.2
	02-Dec-86	930	275.0	261.6	7.98	82.8		599			0.06	0.04	0.50	0.10	0.15	0.010	0.4
SM14	22-May-85	826	362.0	263.4	8.19	54.8	566	566	0.0	0.04	0.02	<.01	0.20	<.05	0.10	<.005	1.0
	10-Jul-85	837	321.0	247.2	8.13	99.0	674	640	34.0	0.86		<.01		<.05	0.10	0.010	7.4
	17-Sep-85	6660	822.4	320.8	7.62	447.8			31.2	0.09	0.04	<.01	0.70	<.05	<.05	<.005	0.2
	17-Oct-85	3020	721.0	238.0	8.07	620.6				0.05		<.01	0.80	<.05	<.05	0.010	2.4
	22-Nov-85	459	200.0	159.2	8.11	21.8	304	283	20.7		0.14	<.01	0.50	<.05	0.35	0.015	0.8
	19-Dec-85	750	338.0	247.0	7.96	51.4	457	446	11.1		0.02	<.01	0.30	<.05	0.30	0.015	1.0
	11-Apr-86	650	291.0	221.5	8.60	57.0	446	410	36.3		0.04	<.01	0.20	<.05	0.05	<.005	0.2
	29-Apr-86	726	323.5	269.5	8.48	52.0	427	397	30.2		<.02	0.04	<.20	<.05	0.05	0.005	0.8
	08-May-86	771	369.0	295.0	8.46	51.2	519	488	30.9		0.06	<.01	0.40	<.05	<.05	0.050	1.2
	09-Jul-86	861	398.5	303.2	8.29	74.3	770	657	113.0		0.14	0.04	0.60	<.05	0.10	0.030	0.6
SM15	22-May-85	1390	610.0	458.2	7.59	57.8	973	964	9.6	0.30	0.05	<.01	0.75	<.05	0.10	<.005	1.8
	10-Jul-85	1293	690.0	497.8	7.81	63.8	1080	1040	45.0	0.82	0.15	0.01	1.00	0.10	0.10	0.015	5.0
	22-Nov-85	415	189.0	151.6	8.27	16.2	267	260	7.2		0.06	<.01	0.40	<.05	0.40	0.010	0.8
	11-Apr-86	552	258.0	214.2	8.64	32.5	353	341	11.9		0.02	<.01	0.20	<.05	<.05	0.005	0.6
	29-Apr-86	638	312.5	268.3	8.52	33.2	421	354	66.7		<.02	0.05	0.40	0.10	0.10	0.010	0.4
	08-May-86	690	342.5	294.7	8.52	34.4	433	426	7.4		0.04	<.01	0.20	<.05	<.05	0.005	1.2

BURLINGTON LANDFILL SITE
PROJECT 86-53
SURFACE WATER ANALYSES - MOE LABORATORY

STATION	DATE	BOD5	COD	DOC	DIC	TOTAL COLIFORMS	FECAL COLIFORMS	FECAL STREPT	FLOW
		mg/L	mg/L	mg/L	mg/L	cmt/100ml	cnt/100ml	cnt/100ml	l/s
SW7	22-Nov-85	1.1	18	7.0	45.0	22000	280	620	0.1
	08-May-86	0.5	32	4.6	67.0	22000	20	60	0.02
SW10	22-Nov-85	5.8	34	8.5	66.0	26000	500	580	<.08
SW11	22-Nov-85	3.3	62	8.7	62.0	34000	440	980	<.08
SW12	10-Jul-85	1.2	46	4.3	14.6	5000	200	100	<.01
	17-Oct-85	5.5		6.3	27.8	38000	80	100	<.01
	22-Nov-85	2.0	38	10.3	43.0	33000	480	720	0.0
	19-Dec-85	130.0		83.0	113.0	69000	<1000	7000	0.2
	11-Apr-86	2.3	90			100	<20	<20	
	29-Apr-86	7.5	34	5.2	28.6	180	40	10	0.45
	08-May-86	1.8	38	3.7	58.0	900	240	40	<.01
	02-Dec-86		6	8.6	60.0		80	340	
SW13	22-Nov-85	0.7	38	7.1	44.0	10000	240	360	0.3
	29-Apr-86	1.8	24	5.3	49.1	4200	180	310	<.01
	08-May-86	0.5	28	8.5	65.0	1200	<20	40	<.01
	02-Dec-86		6	7.4	48.0		<10	110	
SW14	22-May-85	0.4	14	3.3	63.0	340	40	20	2.3
	10-Jul-85	2.6	34	4.9	55.0	29000	2900	100	NM
	17-Sep-85	1.1	32		76.0	3100	600	960	<.01
	17-Oct-85	4.6	26	5.5	54.0	10000	40	<20	<.01
	22-Nov-85	1.0	6	5.0	36.8	2800	140	140	NM
	19-Dec-85	0.7		3.3	59.0	240	60	20	25.0
	11-Apr-86	0.1	18	2.1	39.4	100	20	20	
	29-Apr-86	0.8	<2	2.9	42.7	180	156	96	62.0
	08-May-86	0.2	2	2.4	59.0	620	130	30	13.0
	09-Jul-86	2.2	<2	5.0	64.0		3200	690	1.7
SW15	22-May-85	0.8	24	6.7	113.0	5200	1060	560	NF
	10-Jul-85	1.8	52	9.2	116.0	138000	1900	1300	NF
	22-Nov-85	0.7	12	5.3	36.8	2600	200	80	0.2
	11-Apr-86	0.1	<2	2.0	37.7	420	<20	20	
	29-Apr-86	0.9	14	2.6	46.6	320	108	56	54
	08-May-86	0.2	2	2.2	60.0	660	176	80	4.2

BURLINGTON LANDFILL SITE
PROJECT 86-53
SURFACE WATER ANALYSES - MDE LABORATORY

STATION	DATE	CONDUCTIVITY	HARDNESS	ALKALINITY	pH	CHLORIDE	TOTAL	DISSOLVED	SUSPENDED	IRON	PHOSPHOROUS	SOLUBLE	TOTAL	AMMONIUM	NITRATES	NITRITE	PHENOLICS
		COND25				CL	SOLIDS	SOLIDS	SOLIDS		(TOTAL)	PHOSPHATES	KJELDAHL				
		usho's/ca	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	P	P	TKN	NH3	NO3	NO2	mg/L
SM16	07-Aug-85	878	352.0	216.2	8.14	84.8	635	635	0.0	0.13	0.04	<.01	0.50	<.05	0.30	0.010	0.6
	17-Sep-85	883	347.2	213.4	8.13	85.0			6.8	0.04	0.06	<.01	0.80	<.05	0.20	<.005	0.2
	17-Oct-85	742	294.0	185.2	8.05	66.6	472	465	7.1	<.03		<.01	0.80	<.05	1.00	0.120	0.6
	22-Nov-85	626	296.0	183.4	8.35	33.6	448	429	19.0		0.08	<.01	0.60	<.05	0.90	0.035	<.2
	19-Dec-85	1035	418.0	258.0	8.13	109.6	650	632	18.3		0.06	<.01	0.50	<.05	1.15	0.100	0.6
	11-Apr-86		300.5	2.0	6.07												0.6
	29-Apr-86	824	355.0	243.1	8.45	62.2	494	481	13.3		<.02	0.05	0.40	0.05	0.40	0.185	2.0
	08-May-86	832	365.5	244.5	8.43	84.5	643	582	60.9		0.10	<.01	0.60	<.05	0.35	0.015	2.2
	09-Jul-86	778	306.5	192.7	8.23	84.8	536	518	17.6		0.12	0.02	0.60	<.05	0.65	0.020	0.8
	10-Sep-86	1080	447.0		8.00		808	803	5.4		0.04	0.01	0.60	1.25	<.05	<.005	0.8
	02-Dec-86	800	304.5	252.8	8.19	40.5		531			0.06	<.01	0.70	0.05	1.05	0.220	0.2
SM17	07-Aug-85	954	331.0	195.4	8.09	125.4	684	684	0.0	0.05	0.02	<.01	0.20	<.05	0.15	<.005	1.0
	17-Sep-85	1072	349.0	191.8	8.07	158.8	675	671	3.9	<.03	0.02	<.01	1.10	<.05	0.20	<.005	0.2
	17-Oct-85	747	256.0	167.0	8.59	84.8	476	476	0.0	0.05		<.01		<.05	0.20	0.010	<.2
	22-Nov-85	737	331.0	209.8	8.33	56.2	520	508	11.9		0.08	<.01	0.60	<.05	1.25	0.015	<.2
	19-Dec-85	1340	450.0	204.0	8.19	194.0	790	779	10.7		0.02	<.01	0.40	<.05	1.25	0.015	0.6
	11-Apr-86	900	291.0	158.1	8.50	145.0	605	590	15.5		0.02	<.01	0.20	<.05	0.20	0.105	0.8
	29-Apr-86	1044	394.5	253.0	8.39	78.4	613	608	5.1		<.02	0.03	0.20	0.10	0.30	0.025	0.8
	08-May-86	987	371.0	231.8	8.45	140.0	712	708	4.4		0.02	<.01	0.40	<.05	0.20	0.030	2.2
	09-Jul-86	976	346.0	209.9	8.21	137.0	670	663	7.4		0.08	<.01	0.60	<.05	0.45	0.015	1.8
	10-Sep-86	1410	474.0		7.76		719	709	10.3		<.02	0.03	0.40	0.25	<.05	<.005	0.6
	02-Dec-86	2570	305.5	196.8	8.65	644.0		1550			0.10	<.05	0.50	0.25	0.75	0.050	15.2
SM20	11-Apr-86	6740	2436.5	320.0	7.86	1519.0	5680	5650	25.9		0.14	<.01	2.00	0.30	1.20	1.260	10.6
	29-Apr-86	5380	1910.0	378.1	7.96	964.0	4230	4180	44.9		<.05	0.03	1.50	<.05	2.80	2.750	6.4
	09-Jul-86	3370	1141.5	232.7	7.97	619.0	2490	2470	18.0		0.15	<.01	1.00	<.05	<.05	0.010	11.6
SM21	11-Apr-86	2630	949.0	754.5	7.41	275.0	2800			17.00	0.77	90.00	<.05	<.05	0.010	780.0	
	29-Apr-86	2260	145.0	739.6	7.52	170.0	1300	250	1050.0	7.00	0.68	30.00	12.40	0.10	0.020	234.0	
	08-May-86	5900	1733.5	1206.0	7.67	567.0	5240	4430	817.0	1.40	0.24	106.00	45.90	0.20	0.155	1480.0	

BURLINGTON LANDFILL SITE
PROJECT 86-53
SURFACE WATER ANALYSES - MOE LABORATORY

STATION	DATE	BOD5	COD	DOC	DIC	TOTAL COLIFORMS	FECAL COLIFORMS	FECAL STREPT	FLOW
		mg/L	mg/L	mg/L	mg/L	cnt/100ml	cnt/100ml	cnt/100ml	l/s
SW16	07-Aug-85	0.8	20	6.1	49.0	4900	1040	790	11.0
	17-Sep-85	0.6	14	4.3	38.0	2900	900	580	NM
	17-Oct-85	1.2	12	3.9	43.0	2900	1420	140	NM
	22-Nov-85	1.9	24	5.5	46.0	4600	700	240	225.0
	19-Dec-85	0.9		3.7	63.0	1000	<100	<100	20.0
	11-Apr-86	0.3	6			280	<20	20	
	29-Apr-86	0.2	14	3.3	38.2	540	116	40	58
	08-May-86	0.9	8	3.2	53.0	1800	312	72	
	09-Jul-86	2.3	<2	4.8	42.0		860	560	40
	10-Sep-86	0.3	14				660	500	
	02-Dec-86		<2	3.8	37.0		1840	600	
SW17	07-Aug-85	0.4	16	3.8	45.0	1500	120	70	NM
	17-Sep-85	0.3	10	2.7	42.0	1400	40	160	NM
	17-Oct-85	1.1	10	3.3	39.0	2200	310	50	NM
	22-Nov-85	1.0	28	5.2	52.0	2900	260	100	NM
	19-Dec-85	0.6		3.2	61.0	540	60	<20	40
	11-Apr-86	0.3	30	2.0	31.8	<20	<20	40	
	29-Apr-86		10	2.9	26.7	540	116	40	81
	08-May-86	0.6	4	3.4	49.0	820	28	24	47
	09-Jul-86	1.6	<2	3.6	44.0		840	440	
	10-Sep-86	1.0	10				2000	210	
	02-Dec-86		<2	2.4	40.0		12300	5100	
SW20	11-Apr-86	7.9	172	10.5	25.2	600	20	80	
	29-Apr-86		84	6.8	75.9	7000	1010	512	<.01
	09-Jul-86	6.2	50	5.1	50.0		660	870	
SW21	11-Apr-86	863.0	1546	90.7	114.0	19000	3400	8000	
	29-Apr-86		2540	129.0	20.0	690000	17400	>15000	
	08-May-86	2440.0		382.0	321.0	5300000	26000	22000	