

ESSEX-WINDSOR SOLID WASTE
AUTHORITY



Essex Landfill Site No. 2
2008 - 2009
BIENNIAL OPERATIONS
REPORT

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APPENDIX A

Post Closure Maintenance and Inspection Reports 2008-2009

APPENDIX B

1992–1998 Leachate Quality (MH7)

Historical Leachate Quality at Manhole 6 (1999 – 2007)

Historical Leachate Quality at Manhole 8 (1999 – 2007)

Figure: Leachate Analysis for Manhole 7 (MH7)

Figure: Leachate Analysis for Manhole 6 (MH6)

Figure: Leachate Analysis for Manhole 8 (MH8)

APPENDIX C

Annual Monitoring Reports for 2008 & 2009, prepared by Genivar Consultants L.P.
(Under separate cover)

APPENDIX D

Landfill Site No. 2 Site Plan
(provided by Genivar Consultants L.P.)

1 INTRODUCTION

Essex County Sanitary Landfill Site No. 2 is located in parts of Lots 12 and 13, Eastern Division, Concession 2, in the Town of Kingsville (formerly the Township of Gosfield South). The site fronts on Essex County Road 31, known as the Albuna Townline Road. Landfill 2 closed to the receipt of waste in October 1993. In August 1993 a Transfer Station was built on a portion of the licensed landfill site. Waste from the service area of the landfill site is now processed through the Transfer Station and then hauled to the Essex-Windsor Regional Landfill for disposal.

1.1 CERTIFICATE OF APPROVAL

The site is licensed under Provisional Certificate of Approval No. A 011401, dated December 2, 1985 which was subsequently amended on August 8, 2007. It encompasses an area of 38.5 ha of which 30.17 ha, in Areas 1 through 5, were approved for waste disposal (see Appendix D for area locations). No waste was disposed of in Area 5, and it is now the location of the Transfer Station.

1.2 PURPOSE

This report reflects the perpetual care of the landfill site, as set out in the End Use and Closure Plan dated February 1993 and approved August 8, 2007 and amended September 25, 2007, as well as the monitoring programs that were in effect for the years 2008 and 2009. The End Use and Closure Plan specifies that biennial operations reports will be submitted to the Ministry of the Environment effective 1998.

1.3 COMPLIANCE

Landfill Site No. 2 had a historical off-site chemical plume that previously resulted in non-compliance issues with regards to Guideline B-7 criteria for the reasonable use of groundwater for some analytes. In November 2004, the Essex-Windsor Solid Waste Authority applied and received approval to establish a Contamination Attenuation Zone on a number of the properties located to the south of the landfill. The monitoring results for 2008 and 2009 indicate that the operation of the leachate collection system and the

establishment of the Contaminant Attenuation Zone are improving ground water quality at the property boundary and that the Landfill was in compliance with Guideline B-7 criteria.

2 INSPECTIONS AND COMPLAINTS

2.1 SITE INSPECTIONS

Quarterly inspections of the site were carried out in accordance with the Closure and End Use Plan. The only deficiencies observed were landfill settlement in select areas of the landfill cap and some erosion resulting from precipitation runoff. This has resulted in negative surface water drainage in some areas. Supplemental capping material was placed in the areas to mitigate this deficiency; however additional work is required on an ongoing basis.

2.2 COMPLAINTS

A formal complaint reporting procedure for the site was implemented in May 1987 at the request of the District Office of the Ministry of the Environment. A complaint registry was established which records the time and date of the complaint and the action taken.

No complaints were received during 2008 or 2009.

3 SITE DEVELOPMENT AND MAINTENANCE

As noted in Section 1, the landfill site closed to the receipt of waste in October 1993. A number of activities have been undertaken since then to maintain the integrity of the infrastructure and environmental controls at the site, and to develop the site as a passive park in accordance with the Closure and End Use Plan submitted in February 1993 and approved in August 2007.

3.1 VEGETATION AND COVER

In 2008 and 2009 additional clay cover soils were placed in select areas of the Landfill to mitigate landfill settlement. Compost was spread over the clay as a topsoil amendment and the area was seeded. Weeds and grass were cut and trimmed as required.

In 2001 & 2002 the Essex-Windsor Solid Waste Authority collaborated with the Essex County Field Naturalists and planted approximately 3,670 indigenous trees and shrubs in Buffer Areas 6 & 9. These plantings complement plantings carried out in previous years, and are consistent with the End Use Plan as a passive park. The trees and shrubs planted at the site were pruned, weeds and grass were removed from around their trunks and wood chips were placed at the base of the trees as mulch. In summary a total of 12,368 trees and shrubs have been planted to date at Landfill Site No. 2.

In both 2008 and 2009, Dominion Tree Service were contracted to remove or trim trees that were growing over the hydro line running to pump station 1. In 2009 Rivard Excavating was contracted to remove brush along the west property line of the site so that access to the west leg of the leachate collection system could be maintained.

In order to promote a thicker and healthier growth of grass on top of the waste cells, a number of major grass cuts were completed in 2008 and 2009. By cutting the grass more often weed patches do not get a chance to germinate and the grass is allowed to reestablish itself in poor growth areas. A healthy, thick grass growth reduces erosion, surface water infiltration and cell cap desiccation. Preliminary inspection results suggest that the regular cutting of the grass has resulted in a much thicker healthier growth of grass.

3.2 DRAINAGE

Minor repairs to promote surface water drainage were completed in 2008 and 2009. Eroded areas of the landfill cap were repaired as required. The surface water monitoring program continued to confirm that the repairs made to the dyke in 1999 to separate the site from the Fleming-Wigle Drain have been effective.

3.3 ROADS

Internal stone roads were top dressed with new stone on an annual basis. Cold patch was applied to paved road surfaces to eliminate potholes in the asphalt as required.

3.4 MAINTENANCE

Staff of the Essex-Windsor Solid Waste Authority carried out the day to day maintenance of the site. This included, but was not limited to, fence and gate repairs cut or damaged by individuals looking to gain access to the site, painting or replacing monitor casings and bentonite seals and landscaping.

4 LEACHATE MANAGEMENT

A leachate collection system is in place at Landfill Site No. 2. A perimeter collection system was installed along the western boundary of Area 3, the southern boundary of Areas 2A, 3 and 4, and eastern boundary of Area A2 in 1990. Two leachate underdrain pipes were installed through the centre of Area 4 in 1991 to control leachate levels in this area. In October 1992, the perimeter leachate collector system was extended northerly along the entire eastern boundary of Area 2. The catchment area of the collector system is approximately 11.1 hectares.

Leachate collected in the system drains to Maintenance Hole 7 (MH7), as shown on the Site Plan in Appendix D, where it is pumped into a forcemain that delivers the leachate to an upstream location in the Town of Leamington sewer system. In July of 2007, approximately 400 metres of the leachate forcemain east of County Rd. 31 was relocated to permit the land owner to mine out aggregate located under the forcemain.

4.1 LEACHATE QUANTITY

In 2008 an amount of 22,622.40 m³ of leachate was pumped into the forcemain for treatment. This volume was equivalent to a leachate capture rate of 4.3 L/min/ha.

In 2009 an amount of 16,824.90 m³ of leachate was pumped into the forcemain for treatment. This volume was equivalent to a leachate capture rate of 3.2 L/min/ha.

The quantity of leachate captured in 2008 and 2009 is consistent with recent historical rates, as shown in Figures 1 and 2.

FIGURE 1: HISTORICAL DATA OF LEACHATE QUANTITIES 1990-2009

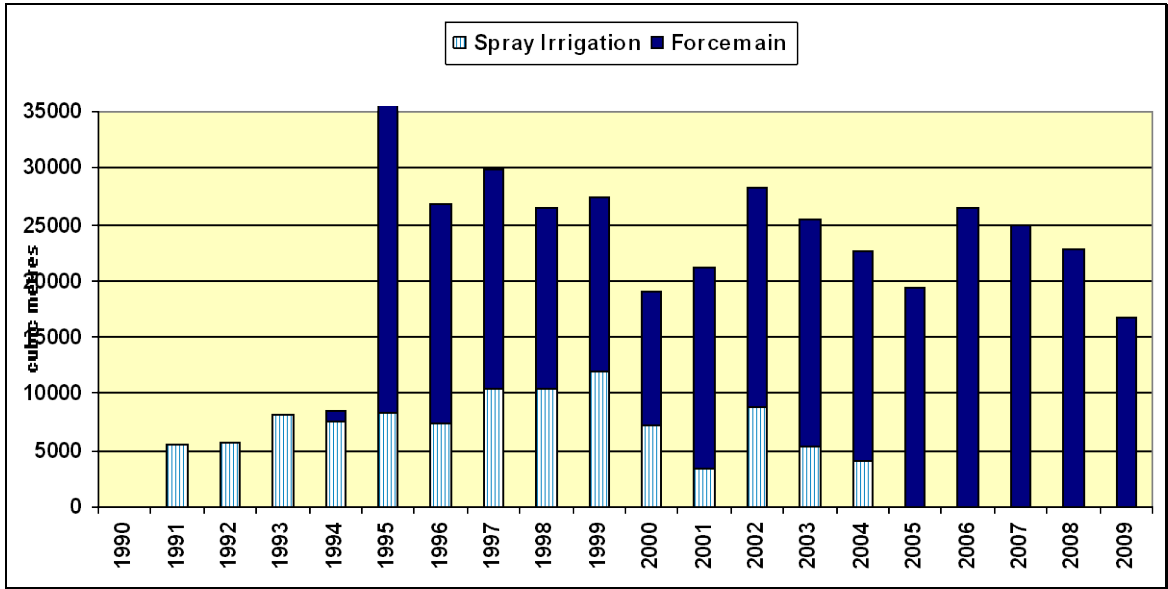
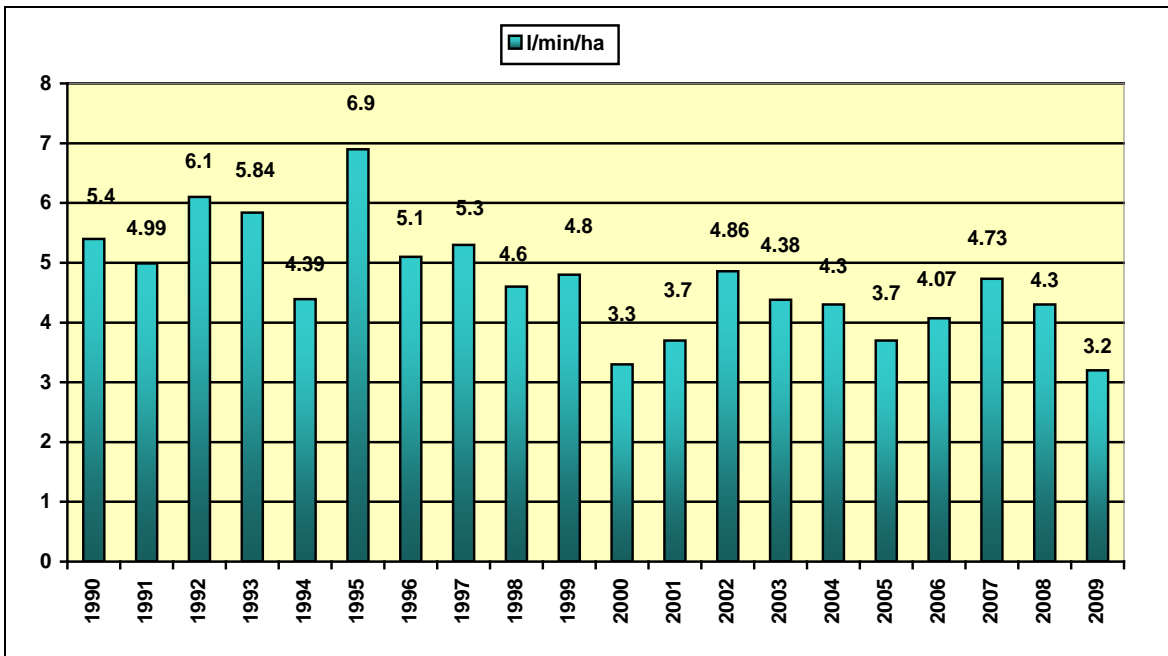


FIGURE 2: LEACHATE CAPTURE RATES 1990-2009



4.2 LEACHATE QUALITY

Analysis of the leachate for general chemistry is carried out two times per year as part of the Landfill Leachate Monitoring Program. Samples are collected for analysis from two locations within the leachate collection system, MH6 and MH8. The leachate is analyzed for pH, chloride, boron, conductivity and vinyl chloride. Leachate characteristics for the landfill were historically based on leachate collected from MH7 of the leachate collector system. MH7 collects leachate from both the western portion and the eastern portion of the leachate collector system. However, samples were collected from MH8 (western portion, west of MH7) and MH6 (eastern portion, north of MH7) since 2000, to better represent the leachate concentrations within the different portions of the collector system.

The analytical results for 2008 and 2009 are shown in Table 1, and Appendix B. In summary, the chemical concentrations are typical of old leachate from municipal solid waste landfills in southern Ontario. Similar to the historic chemical results, in 2009 the leachate collected in the eastern portion of the collector system (MH6) is diluted by ground water and/or infiltration of precipitation, but contains elevated concentrations of vinyl chloride. Samples could not be obtained from MH8 for April and October 2009 due to insufficient volume recovery.

TABLE 1: LEACHATE QUALITY RESULTS FOR MH6 AND MH8

PARAMETER	MH6				MH8			
	Apr 2-08	Oct 30-08	Apr 3-09	Oct 13-09	Apr 2-08	Oct 30-08	Apr 3-09	Oct 13-09
pH (pH units)	7.83	7.53	6.91	7.38	7.77	7.20	DRY	DRY
Conductivity	1,549	1,310	2,380	1,510	2,491	8,530	DRY	DRY
Chloride (mg/L)	166	121	191	107	198	957	DRY	DRY
Boron (mg/L)	0.60	0.58	0.85	0.48	0.50	0.30	DRY	DRY
Vinyl chloride (ug/L)	32.4	25.3	34.4	14.6	<0.2	<0.2	DRY	DRY

Parameters tested were amended per September 25, 2007 C of A No. A011401

The historical analytical results are shown in Appendix B.

4.3 LEACHATE SPRINGS

There were no leachate stains or springs detected during 2008 and 2009.

4.4 LEACHATE SYSTEM OPERATIONS

The current operating elevations of the pumps in MH7, which pump leachate into the forcemain, are 211.60 metres above sea level (m.a.s.l (off)) and 212.25 m.a.s.l. (on) to maintain gravity flow within the leachate collector system and to attempt to prevent the off-site movement of leachate. The leachate forcemain remained operational for most of 2008 and 2009 with minor exceptions.

4.5 LEACHATE SYSTEM MAINTENANCE

The Closure and End Use Plan specifies that the entire leachate management system is to be flushed and cleaned every two years. The work was carried out in 2008 by Benko Sewer Systems Ltd. and is scheduled to be flushed again in 2010.

On a number of occasions during 2008 and 2009 minor repairs and maintenance were carried out on the system as required. This included but was not limited to, flow meter calibrations, valve adjustments and pump station repairs.

In April 2009, MH6 was raised in order to reduce surface water infiltration through the manhole lid.

In 1996, the development of a greenhouse operation on the adjacent property west of the Landfill resulted in the excavation of the upper 3 to 4 metres of soil. Observations during subsequent monitoring events and groundwater elevations determined for 1998 through to 2002 that the ground water flow system around Monitor 6 was changed from historic conditions by the development of the greenhouse complex and further, resulted in an unacceptable landfill effect on ground water quality at the landfill property boundary near Monitor 6.

In February of 2003, Rivard Contracting was awarded a contract to construct a low permeability barrier near the northwestern corner of the Landfill. The objective of the

low permeability barrier was to reduce the westerly movement of ground water near Monitor 6. As a result, ground water near Monitor 6 would be induced to move toward the landfill perimeter collector system, similar to subsurface conditions prior to the development west of the Landfill. Subsequent monitoring results compiled since the repairs were carried out suggests that the cut off wall is working successfully and thus an off site landfill effect at this location is not anticipated.

5 MONITORING PROGRAMS

The Closure and End Use Plan for Landfill No. 2 sets out a detailed annual monitoring program for the site. The program includes: monitoring of the ground water, sampling of surface water following 30 mm precipitation events, and the measurement of precipitation, methane gas and leachate levels. Genivar Consultants L.P. carried out all of the monitoring programs at the site during 2008 and 2009.

5.1 GROUND WATER MONITORING

The annual ground water monitoring program consists of the following components:

- Measurement of groundwater levels at 20 monitoring locations
- Collection of ground water samples from 14 monitors in April and October.
- Analysis of samples collected for organic and inorganic parameters.
- Preparation of interim reports and the annual report.

5.2 PRECIPITATION EVENT SURFACE WATER SAMPLING

The Precipitation Event Monitoring Program includes the collection of samples from one surface water monitoring location, SW12, following a 30 mm precipitation event at least once in each quarter. Three precipitation events occurred in 2008. On July 2, 2008 there was 46.0 mm of precipitation, on September 13, 2008 there was 64.0 mm, and on December 9, 2008 the site received 36.8 mm of precipitation. Surface water samples were not collected since Station SW12A remained dry after the events.

There were five precipitation events in 2009. On February 12, 2009 there was 50.6 mm, March 9, 2009 38.8 mm, March 10, 2009 50 mm, June 19, 2009 44.7 mm and on June 25, 2009 the site received 32.4 mm of precipitation. On all occasions, surface water station SW12A was dry and as a result, samples could not be taken.

Consistent with historic results since the spring of 1998, surface water runoff from the site was not detected west of the soil dyke in the Fleming-Wigle Drain. Therefore no samples were submitted for laboratory analysis.

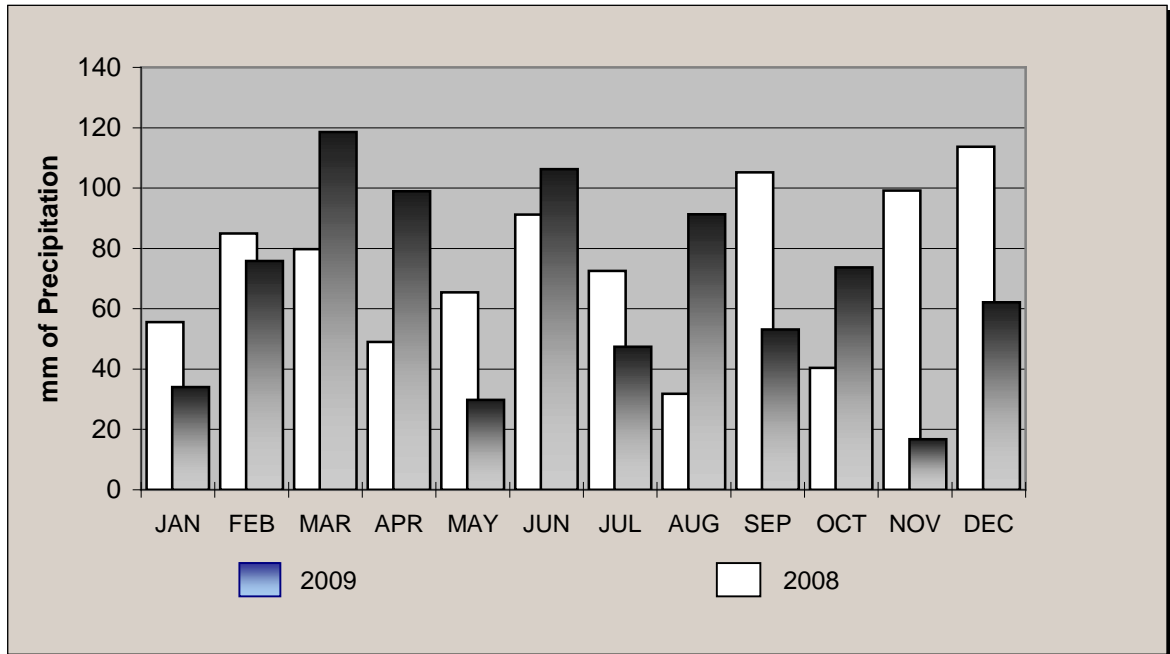
5.3 PRECIPITATION MEASUREMENTS

The measurement of precipitation is carried out at the site to assist in calculating leachate capture rates, and to trigger the precipitation event surface water monitoring program. The amount of precipitation received, by month, for the past 7 years is shown in Table 2. The results are presented graphically in Figure 3. A total of 888.8 mm of precipitation was recorded in 2008, and 808.0 mm was recorded during 2009.

TABLE 2: PRECIPITATION COMPARISON

MONTH	2009	2008	2007	2006	2005	2004	2003
January	34.0	55.6	102.7	66.1	71.6	19.2	16.0
February	75.8	85.0	8.5	49.8	58.6	24.4	25.2
March	118.6	79.8	61.0	50.0	11.6	67.6	51.0
April	99.0	49.0	103.0	58.2	71.0	25.8	69.0
May	29.8	65.4	35.1	119.5	27.4	176.8	121.3
June	106.3	91.2	28.8	99.1	14.6	45.4	89.8
July	47.4	72.5	45.4	109.0	74.2	75.2	80.1
August	91.3	31.8	178.8	89.0	64.4	77.7	115.7
September	53.1	105.2	47.7	85.4	17.6	19.0	120.2
October	73.7	40.4	57.4	109.8	14.0	33.7	66.8
November	16.8	99.2	49.8	78.4	82.6	84.4	80.8
December	62.2	113.7	81.0	30.2	86.2	47.2	48.4
Total	808.0	888.8	799.2	944.5	593.8	696.4	884.3

FIGURE 3: PRECIPITATION COMPARISON 2008-2009



5.4 LEACHATE LEVEL MEASUREMENTS

Leachate levels are measured monthly within the collector system to determine the effectiveness of the system. When leachate elevations within the collector system are greater than the forcemain “on” elevation of 212.25 m.a.s.l. leachate could move beyond the collector system into the upper aquifer south of the landfill.

The leachate level monitoring results confirm that the operational changes made to the collector system after September 27th, 2000 have generally resulted in leachate elevations being lower than the forcemain “on” elevations and is having a positive effect in improving ground water quality at the landfill property boundary.

5.5 METHANE GAS MEASUREMENTS

Measurements for methane gas were taken in January, February, March, November and December of 2008 and 2009 at Monitors 37, 38 and 39.

The detected concentrations were notably below the lower explosive limit (LEL), thus there is no potential combustible gas hazard for residences in the area. The methane measurement results for 2008 and 2009 are as shown in Table 3.

TABLE 3: 2008-2009 GAS MONITORING FOR LANDFILL NO. 2

DATE	MONITOR 37		MONITOR 38		MONITOR 39	
	% LEL	Organic Vapours (PPM)	% LEL	Organic Vapours (PPM)	% LEL	Organic Vapours (PPM)
Jan 21-08	0.0	<1.0	0.0	<1.0	0.0	<1.0
Feb 20-08	0.0	<1.0	0.0	<1.0	0.0	<1.0
Mar 20-08	0.0	<1.0	0.0	<1.0	0.0	<1.0
Nov 17-08	0.0	<1.0	0.0	<1.0	0.0	<1.0
Dec 12-08	0.0	<1.0	0.0	<1.0	0.0	<1.0
Jan 6-09	0.0	<1.0	0.0	<1.0	0.0	<1.0
Feb 3-09	0.0	<1.0	0.0	<1.0	0.0	<1.0
Mar 17-09	0.0	<1.0	0.0	<1.0	0.0	<1.0
Nov 5-09	0.0	<1.0	0.0	<1.0	0.0	<1.0
Dec 4-09	0.0	<1.0	0.0	<1.0	0.0	<1.0

LEL = lower explosive limit; PPM = parts per million

5.6 CONTAMINANT ATTENUATION ZONE ASSESSMENT

The Contaminant Attenuation Zone (CAZ) established south of the site provides an opportunity to maintain a small CAZ for the upper aquifer, with ground water flow in the lower aquifer moving back below Landfill No.2. South of the Landfill, shallow ground water within the upper aquifer mixes with deeper ground water in the lower aquifer as a result of aggregate extraction activities that removed the intervening aquitard. As a result, the ground water that moves in a southerly direction from the Landfill's south site boundary enters the lower aquifer and mixes with the deep ground water, then subsequently moves below the landfill site in a northerly direction.

Based on the 2008 and 2009 ground water quality results, it is apparent that the operation of the perimeter collector system and utilization of the CAZ are effective at maintaining acceptable ground water quality and prevent unacceptable off site impacts for chloride, boron, and vinyl chloride as a result of landfill leachate. Continued monitoring will be completed to evaluate the ongoing performance of the leachate collector system and the CAZ.

5.7 MONITORING CONCLUSIONS & RECOMMENDATIONS FOR 2008-2009

The conclusions and recommendations based on the results of the 2008 and 2009 monitoring program carried out by Genivar Consultants L.P. were as follows:

2008 MONITORING PROGRAM CONCLUSIONS

- The 2008 groundwater flow patterns associated with (a) the upper sand unit and weathered glacial till, and (b) the lower sand unit are consistent with historic patterns.
- Leachate quality within the collector system is typical for closed municipal solid waste landfill sites in southern Ontario. Similar to historic chemical results, the 2008 chemical concentrations are typically greater within the collector system

west of MH7 (MH8), relative to the eastern portion (MH6). One exception continues to be greater vinyl chloride concentrations at MH6.

- There are elevated chloride concentrations in the upper aquifer to the northeast, northwest, and south of the landfill waste. However, Guideline B-7 criteria were satisfied at the compliance points during 2008 for chloride and boron concentrations, except for chloride in April and June at Monitor 3-III. Elevated concentrations east of the landfill continue to be affected by road salting.
- Vinyl chloride concentrations were not detected within the monitoring wells at the downgradient limits of the contaminant attenuation zone, except at Monitor 32. However, groundwater near Monitor 32 moves into the lower aquifer through the pits to the south that are within the contaminant attenuation zone. Within the lower aquifer the groundwater moves back below the landfill site.
- Operations at the property west of the landfill modified groundwater flow conditions around the northwest corner of the landfill (Monitor 6). Construction of a low permeable clayey barrier was completed in February 2002 to redirect groundwater to the leachate collector system. Thus, an off-site landfill effect at this location is not anticipated.
- Operation of the leachate collector system is improving groundwater quality at the landfill site boundary. The system should continue to be operated in 2009. The contaminant attenuation zone south of the landfill provides sufficient attenuation capacity for groundwater compliance with Guideline B-7 criteria for chloride, boron, and vinyl chloride concentrations in the upper aquifer.
- The landfill affects groundwater quality within the lower aquifer below the landfill. Road salting and adjacent land uses also affect groundwater quality south of the landfill. At the landfill compliance point the lower aquifer groundwater quality was acceptable and complied with ODWQS and Guideline B-7 criteria. Vinyl chloride was not detected within the groundwater of the lower aquifer.

- Surface water flow within the Fleming-Wigle Drain continued to not be detected downstream of the soil dyke during 2008.
- Landfill gas migration from the landfill was not a concern for residences in 2008.

2009 MONITORING PROGRAM CONCLUSIONS

- The 2009 groundwater flow patterns associated with (a) the upper sand unit and weathered glacial till, and (b) the lower sand unit are consistent with historic patterns.
- Leachate quality within the collector system is typical for closed municipal solid waste landfill sites in southern Ontario.
- There are elevated chloride concentrations in the upper aquifer to the northeast, northwest, and south of the landfill waste. However, Guideline B-7 criteria were satisfied at the compliance points during 2009 for chloride and boron concentrations, except for chloride in April at Monitor 3-III. Groundwater at Monitor 3-III is induced to move toward the CAZ to the south. Elevated concentrations east of the landfill continue to be affected by road salting.
- Vinyl chloride concentrations were not detected within the monitoring wells at the downgradient limits of the CAZ, except at Monitor 32. However, groundwater near Monitor 32 moves into the lower aquifer through the pits to the south that are within the CAZ. Within the lower aquifer the groundwater moves back below the landfill site and vinyl chloride was not detected at the lower aquifer compliance points.
- Operations at the property west of the landfill modified groundwater flow conditions around the northwest corner of the landfill (Monitor 6). Construction of a low permeable clayey barrier was completed in February 2002 to redirect groundwater to the leachate collector system. Thus, an off-site landfill effect at this location is not anticipated.

- Operation of the leachate collector system is improving groundwater quality at the landfill site boundary. The system should continue to be operated in 2010. The contaminant attenuation zone south of the landfill provides sufficient attenuation capacity for groundwater compliance with Guideline B-7 criteria for chloride, boron, and vinyl chloride concentrations.
- Surface water flow within the Fleming-Wigle Drain continued to not be detected downstream of the soil dyke during 2009.
- Landfill gas migration from the landfill was not a concern for residences in 2009.

5.8 RECOMMENDED CHANGES TO THE MONITORING AND MEASUREMENT PROGRAMS FOR 2008 AND 2009

RECOMMENDED MODIFICATIONS TO THE 2008 MONITORING PROGRAM

The following modifications to the 2008 monitoring program were recommended:

- The operation of the west portion of the collector system should be continued in 2009.
- The contaminant attenuation zone south of the landfill should continue to be used in 2009.
- To assist with re-evaluation of elevated chloride concentrations detected at Monitor 3-III, the use of salt as a de-icer on the site should be reviewed by the Waste Authority. If chloride concentrations at Monitor 3-III continue to increase in 2009 an investigation into potential chloride sources should be completed.
- Remove water quality testing at Monitor 25-I as there is no longer a direct hydraulic connection within the lower aquifer from this location to the site. Continue the water level monitoring to confirm the lower aquifer groundwater flow direction below the landfill site.

- As the site is no longer hydraulically connected to the Fleming-Wigle Drain since the installation of the soil dyke, the continuation of surface water monitoring after precipitation events is not warranted.
- Decommission monitoring wells no longer required for the approved monitoring program. These monitoring wells should be decommissioned in accordance with regulations to prevent well damage and impacts to the aquifers.
- As methane has not been detected for a number of years, the gas monitoring at the site should be discontinued.

RECOMMENDED MODIFICATIONS TO THE 2009 MONITORING PROGRAM

The following modifications to the 2009 monitoring program were recommended:

- The operation of the west portion of the collector system should be continued in 2010.
- The contaminant attenuation zone south of the landfill should continue to be used in 2010.
- To assist with re-evaluation of elevated chloride concentrations detected at Monitor 3-III, the use of salt as a de-icer on the site should be reviewed by the Authority. Monitor 3-III will be assessed in 2010 to determine if chloride concentrations should be investigated further.
- Remove water quality testing at Monitor 25-I as there is no longer a direct hydraulic connection within the lower aquifer from this location to the site. Continue the water level monitoring to confirm the lower aquifer groundwater flow direction below the landfill site.
- As the site is no longer hydraulically connected to the Fleming-Wigle Drain since the installation of the soil dyke, the continuation of surface water monitoring after precipitation events is not warranted.

- Decommission monitoring wells no longer required for the approved monitoring program. These monitoring wells should be decommissioned in accordance with regulations to prevent well damage and impacts to the aquifers.
- As methane has not been detected for a number of years, the gas monitoring at the site should be discontinued.

MR. ELI MAODUS
General Manager

MR. RALPH REISER
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Appendix A

- ☒ Post Closure Maintenance and Inspection Reports for the years 2008 and 2009

Appendix B

- ❖ 1992–1998 Leachate Quality (MH7)
- ❖ Historical Leachate Quality At Manhole 6 (1999 – 2007)
- ❖ Historical Leachate Quality At Manhole 8 (1999-2007)
- ❖ Figure: Leachate Analysis for MH7
- ❖ Figure: Leachate Analysis for MH6
- ❖ Figure: Leachate Analysis for MH8

LANDFILL SITE NO. 2 BIENNIAL REPORT 2008-2009

TABLE: 1992–1998 LEACHATE QUALITY (MH7)

Group	Parameter	Apr-92	Aug-92	Oct-92	Apr-93	Aug-93	Oct-93	Apr-94	Aug-94	Oct-94	Apr-95	Aug-95	Oct-95	Apr-96	Oct-96	Mar-97	Oct-97	Apr-98	Oct-98
16	Vinyl Chloride (ug/l)	-	-	506.00	30.20	28.40	ND	14.00	ND	55.00	ND	72.50	99.60	ND	61.60	8.30	5.40	3.00	<2.50
17	Benzene (ug/l)	2.05	ND	ND	ND	ND	ND	TR	ND	ND	10.60	ND	ND	ND	ND	1.20	1.00	0.50	0.50
	Toluene (ug/l)	12.10	33.60	1.60	5.20	ND	ND	ND	ND	ND	0.66	0.30	ND	ND	ND	ND	4.10	<0.20	5.60
	O-Xylene/Styrene (ug/l)	3.11	ND	ND	ND	ND	ND	1.00	3.10	ND	0.83	ND	ND	ND	ND	ND	1.80	0.70	5.70
	M & P Xylenes (ug/l)	7.34	ND	ND	2.50	ND	ND	1.60	1.30	ND	1.60	0.30	ND	ND	ND	ND	4.10	0.50	14.30
	Ethylbenzene (ug/l)	-	-	-	2.70	ND	ND	ND	ND	ND	4.41	ND	ND	ND	ND	ND	1.80	<0.20	4.70

ND = Below Detection Limits

NA = Not Analyzed

- = Not detected

mg/l = Parts Per Million

ug/l = Parts Per Billion

ng/l = Parts Per Trillion

LANDFILL SITE NO. 2 BIENNIAL REPORT 2008-2009

HISTORICAL LEACHATE QUALITY AT MANHOLE 6 (1999 – 2007)

Parameter	MH 6																
	APR 21/99	APR 7/00	OCT 19/00	APR 09/01	OCT 12/01	APR 2/02	OCT 17/02	APR 4/03	OCT 31/03	APR 5/04	OCT 10/04	APR 7/05	OCT 7/05	APR 27/06	OCT 10/06	APR 4/07	OCT 25/07
Benzene	0.3	0.4	<0.8	<0.1	<2.0	0.5	1.4	<0.4	<0.2	<0.8	1.2	0.6	<0.1	0.5	<0.5	0.6	NR
Ethyl benzene	0.4	<0.4	<1.6	<0.2	<4.0	<0.4	<0.1	<0.4	<0.2	<0.8	<0.2	<0.5	<0.1	<0.5	<0.5	<0.5	NR
Toluene	0.4	<0.4	<1.6	<0.2	<4.0	<0.4	<0.2	<0.8	<0.4	<1.6	<0.4	<1	<0.2	<0.5	1.2	<0.5	NR
O-xylene	0.4	<0.4	<1.6	<0.2	<4.0	<0.4	<0.1	<0.4	<0.2	<0.8	<0.2	<0.5	<0.2	<0.5	<0.5	<0.5	NR
M,P-xylene	1.1	<0.4	<1.6	<0.2	<4.0	<0.4	<0.1	<0.4	<0.2	<0.8	<0.2	<0.5	<0.2	<1.0	<1.0	<1.0	NR
Vinyl Chloride (ug/L)	12.0	76.3	77.5	10.9	141.0	31.8	19.4	35.2	16.3	48.9	78.1	34.9	149.0	12.5	5.8	43.6	59.6
pH (pH units)	7.24	6.97	7.04	7.53	7.15	7.05	7.21	7.43	7.97	7.53	7.48	7.26	7.89	INS	7.97	7.84	NR
Chloride	170	196	252	120	234	181	307	272	199	173	233	232	177	248	135	164	112.0
Ammonia	NA	51.8	30.2	33.5	43.4	71.9	134.0	59.1	29.7	52.9	73.1	111.0	60.0	109.0	31.3	75.9	NR
TKN	47.9	50.0	29.9	30.3	56.8	68.6	140.0	67.0	31.0	49.6	95.0	109.0	58.1	99.0	32.9	79.0	NR
Boron	0.41	0.49	0.39	0.28	0.47	0.48	1.00	0.51	0.46	0.51	1.11	0.65	0.63	0.80	0.42	0.66	0.48
Phenols	0.001	0.001	—	BDL	BDL	BDL	BDL	BDL	BDL	0.001	BDL	0.001	BDL	<0.001	<0.001	<0.001	NR
Potassium	63.2	63.0	50.0	35.0	45.0	57.0	94.0	69.0	43.0	53.0	161.0	70.0	54.0	86.0	54.0	62.0	NR
DOC	14.5	11.8	6.9	8.9	15.9	12.3	27.5	14.1	8.0	11.1	16.9	16.6	12.3	39.1	11.3	14.9	NR

Note: * indicates trace level is less than Estimated Quantitation Limit and greater than the Method Detection Limit.

NR – denotes not required per September 25, 2007 C of A No. A011401

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HISTORICAL LEACHATE QUALITY RESULTS AT MANHOLE 8 (1999 – 2007)

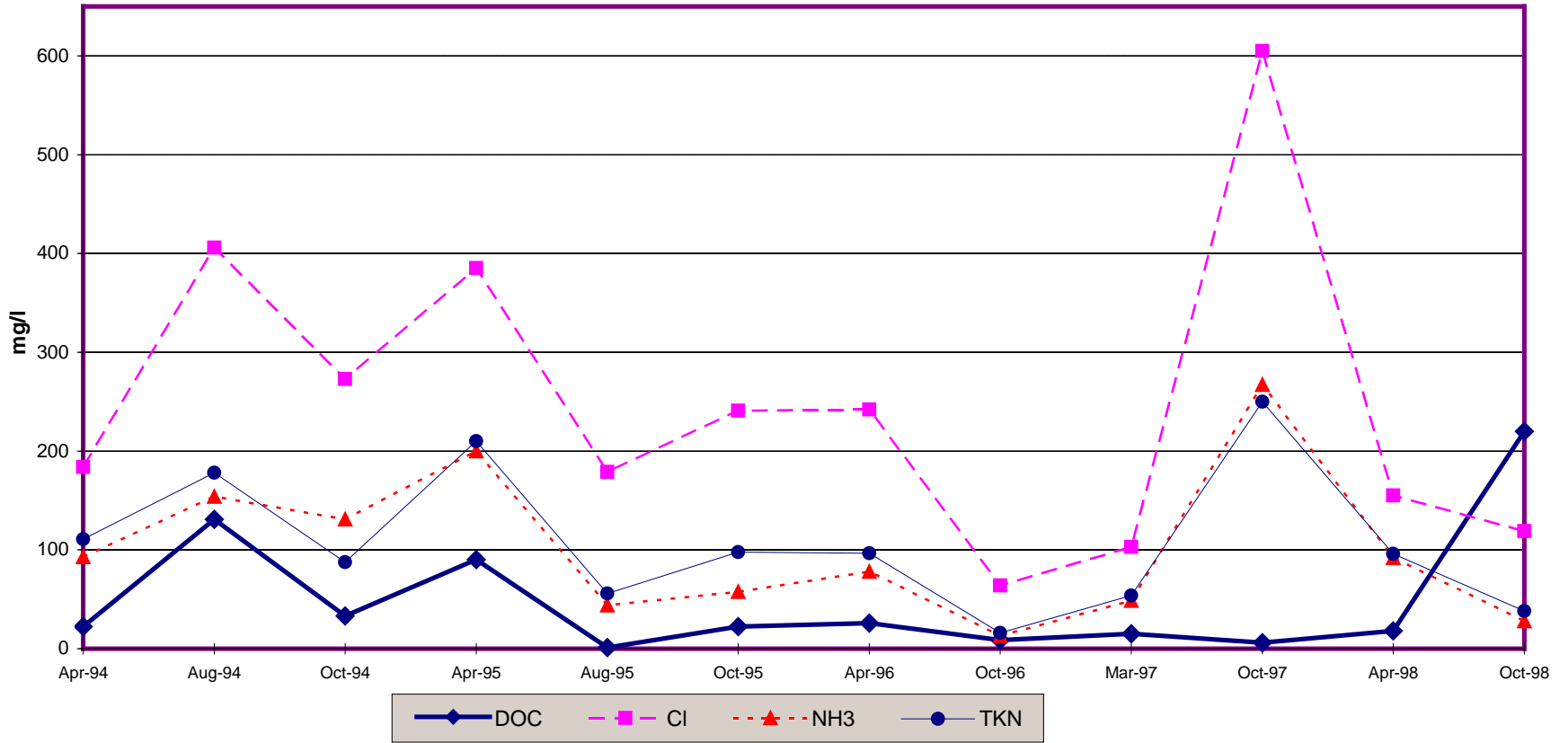
PARAMETER (MG/L)	MH8																
	APR 21/99	APR 5/00	OCT 19/00	APR 09/01	OCT 12/01	APR 2/02	OCT 17/02	APR 4/03	OCT 31/03	APR 5/04	OCT 10/04	APR 7/05	OCT 7/05	APR 27/06	OCT 10/06	APR 4/07	OCT 25/07
Benzene	0.3	0.5	0.4*	0.5	<0.1	0.5	1.3	0.6	<0.2	0.6	0.8	0.1	1.5	0.6	0.9	<0.5	NR
Ethyl benzene	<0.2	0.2	<1.0	<0.8	<0.2	<0.1	<0.1	0.7	<0.2	0.1	0.2	<0.1	2.5	<0.5	0.7	<0.5	NR
Toluene	<0.2	<0.2	<1.0	<0.8	<0.2	<0.1	<0.2	1.1	<0.4	<0.2	<0.2	<0.2	0.7	<0.5	2.9	<0.5	NR
O-xylene	1.4	0.4	<1.0	<0.8	<0.2	<0.1	<0.1	0.8	<0.2	0.1	1.3	<0.1	2.2	<0.5	0.7	<0.5	NR
M,P-xylene	0.2	0.8	<1.0	<0.8	<0.2	0.4	0.1	1.4	<0.2	0.4	0.8	<0.1	3.4	<1.0	<1.0	<1.0	NR
Vinyl Chloride (ug/L)	1.5	<0.5	<2.5	<0.8	<0.2	<0.2	18.0	<0.5	<0.4	<0.2	<0.2	<0.2	<0.4	<0.2	<0.2	<0.2	<0.2
pH (pH units)	7.35	7.11	7.10	7.45	7.57	7.20	7.21	7.43	7.82	7.31	7.85	7.52	7.71	INS	7.87	7.95	NR
Chloride	4,580	261	518	312	121	180	358	352	186	150	608	210	980	518	900	310	241
Ammonia	322.0	92.0	201.0	139.0	19.5	59.0	170.0	129.0	50.0	64.6	257.0	95.3	382.0	250.0	397.0	159.0	NR
TKN	63.0	85.5	225.0	131.0	29.5	58.9	162.0	142.0	54.2	60.0	213.0	104.0	392.0	240.0	412.0	162.0	NR
Boron	1.08	0.42	0.94	0.58	0.16	0.30	1.08	0.52	0.41	0.32	0.72	0.35	1.39	1.00	1.60	0.90	0.41
Phenols	0.004	0.001	—	0.002	BDL	0.001	BDL	0.002	BDL	0.001	0.002	0.002	BDL	<0.001	<0.001	<0.001	NR
Potassium	174	92	150	98	27	62	112	99	66	59	63	67	207	147	211	91	NR
DOC	79.0	21.6	8.3	96.0	15.9	17.2	30.4	29.8	20.1	20.3	61.3	19.9	58.1	58.4	98.6	41.7	NR

INS – indicates insufficient sample provided for analyses

NR – denotes not required per September 25, 2007 C of A No. A011401

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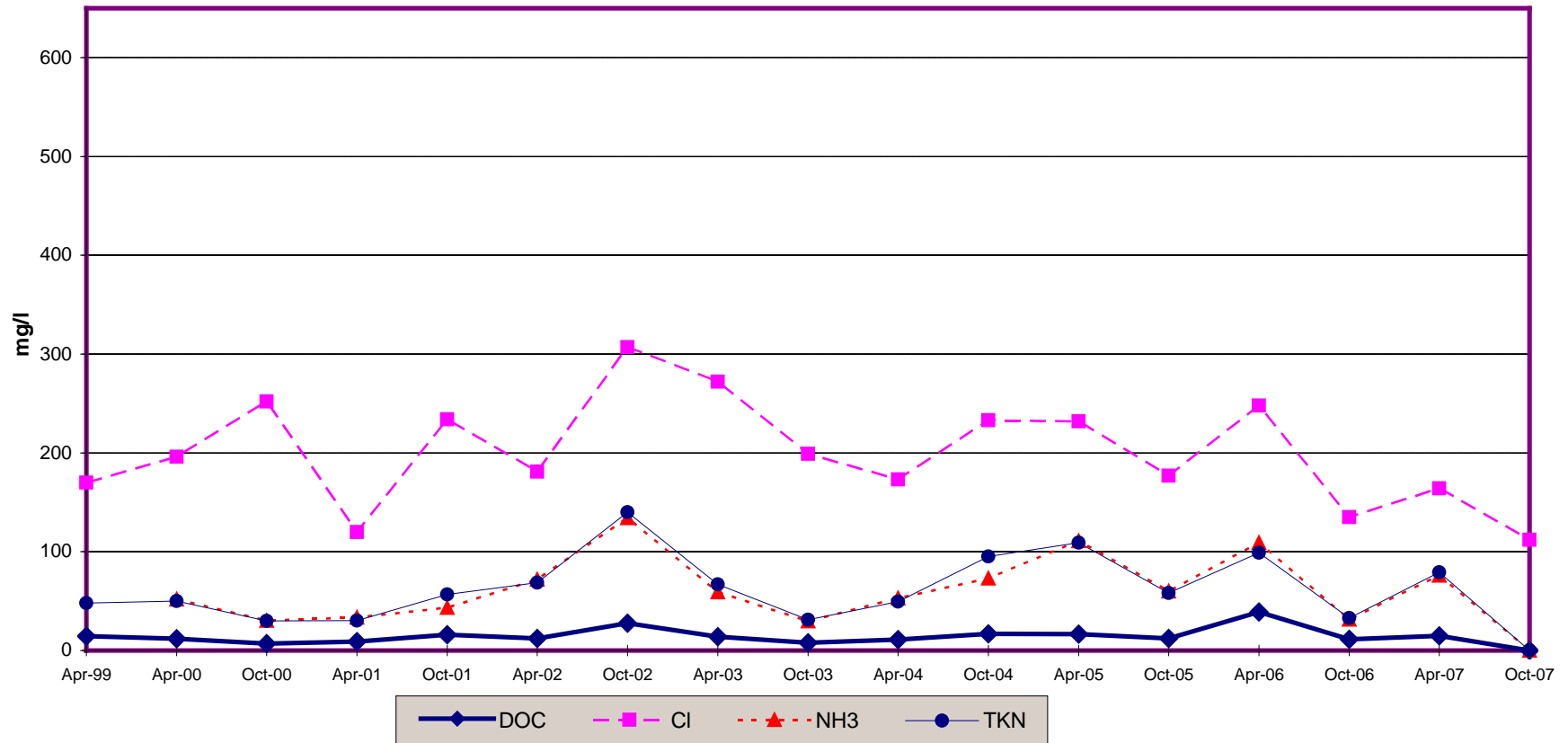
Leachate Analysis for Manhole 7 (MH7)



Refer to narrative in Section 4.2

LANDFILL SITE NO. 2 BIENNIAL REPORT 2008-2009

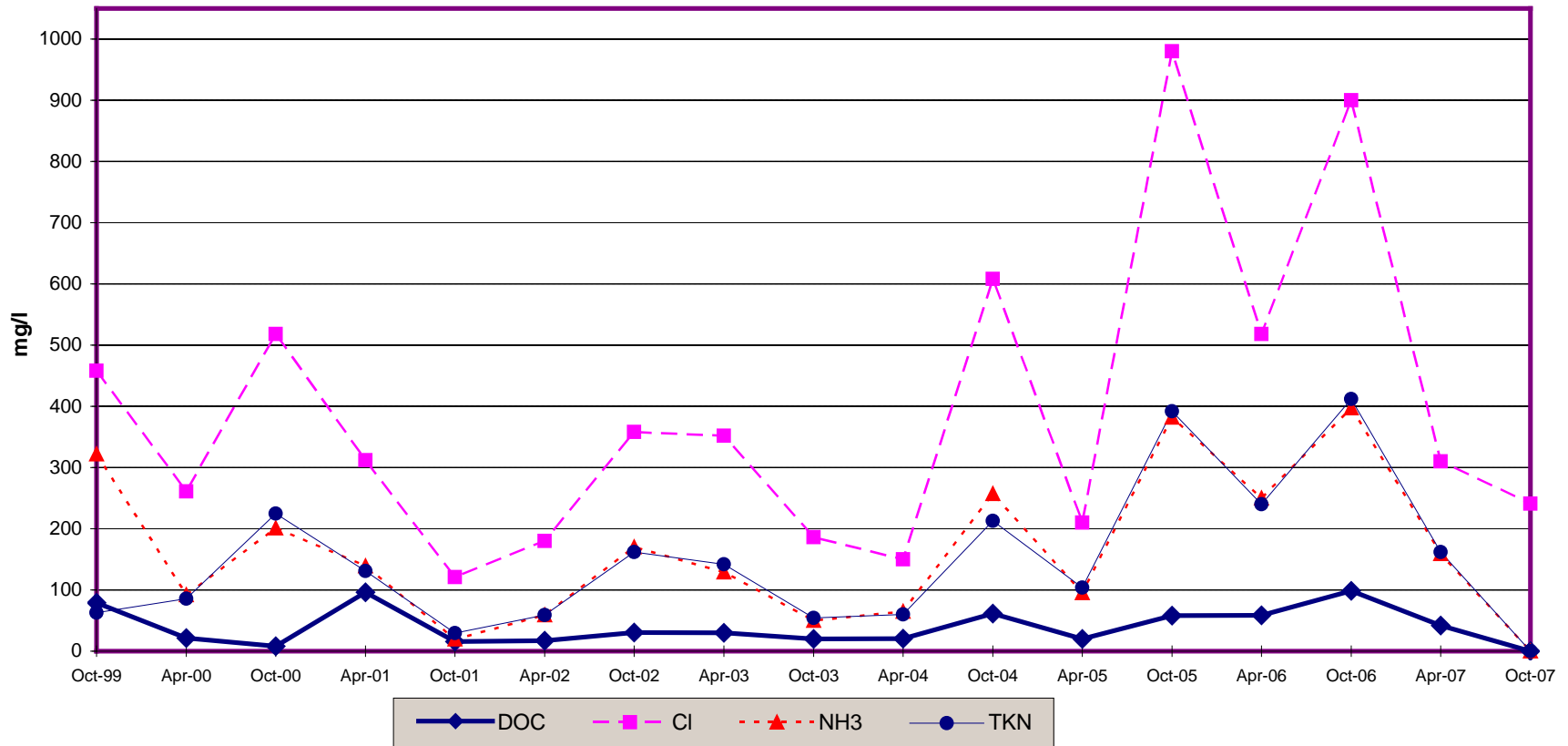
Leachate Analysis for Manhole 6 (MH6)



Refer to narrative in Section 4.2

LANDFILL SITE NO. 2 BIENNIAL REPORT 2008-2009

Leachate Analysis for Manhole 8 (MH8)



Refer to narrative in Section 4.2

Appendix C

- ✘ Annual Monitoring Reports for 2008 and 2009 prepared by Genivar Consultants L.P. are available under separate cover.

Appendix D

 Landfill Site No. 2 Site Plan