2005 Annual Report

Shepley's Hill Landfill
Long Term Monitoring & Maintenance
Devens, Massachusetts

Prepared for:

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LONG TERM MONITORING & MAINTENANCE
DEVENS, MASSACHUSETTS

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EXECUTIVE SUMMARY

This annual report documents the results of long term monitoring and maintenance activities conducted in the summer (June 2005) and winter of 2005 (monitoring event January, 2006), the ninth year of monitoring, at Shepley's Hill Landfill in Devens, Massachusetts. CH2M HILL prepared this report in accordance with the Record of Decision (ROD) for Areas of Contamination 4, 5, and 18 (ABB-ES, Oct 1995), and the approved Long Term Monitoring and Maintenance Plan (LTMMP), SWEC, May 1996. In addition, this report summarized activities associated with the construction and start-up of the Contingency Remedy, involving an arsenic groundwater extraction, treatment, and discharge system. The *Explanation of Significant Differences* (CH2M HILL, June, 2005) states:

> *Among other alternatives, the ROD describes two remedial alternatives: Alternative SHL-2, Limited Action, and Alternative SHL-9, Groundwater Pump and Discharge to the Ayer Publicly-Owned Treatment Works (POTW). These alternatives became the primary and contingency elements of the elected remedy for the Shepley's Hill Landfill remedial action, respectively. Alternative SHL-2 generally involves landfill closure with capping and monitoring. Alternative SHL-9, involving active extraction of groundwater, was selected as a contingency element of the selected remedy in order to supplement SHL-2, should SHL-2 not prove to be effective at controlling site risk.*

Alternative SHL-2, required completion of landfill closure and on-going, post-closure monitoring of the effectiveness of the landfill cover. Monitoring activities are described in the LTMMP and consist of an annual inspection of the landfill cover, annual landfill gas vent monitoring, and semi-annual groundwater chemistry monitoring. The Contingency Remedy, a modification of Alternative SHL-9 (Pump and Discharge to Ayer POTW) has been implemented according to the *Remedial Design and Remedial Action Workplan, Final Hundred Percent (100%) Submittal, Groundwater Extraction, Treatment, and Discharge Contingency Remedy for Shepley's Hill Landfill* (CH2M HILL, May 2005). Performance monitoring for start-up and initial operation of the Contingency Remedy is being conducted in accordance with the design document and the *Shepley's Hill Landfill, Performance Monitoring Plan, Groundwater Extraction, Treatment, and Discharge Contingency Remedy* (CH2M HILL, August, 2005). The LTMMP and the Performance Monitoring Plan will be merged into a single monitoring program in 2006. The results of these activities conducted in 2005 are described below.

An annual landfill inspection was conducted in the Fall of 2005 and observations made regarding the vegetative cover, vegetation types, erosion, settlement, and general condition of the various features. Presently, the landfill is in fair to good condition. The cover surface contains areas of sparse vegetation, intrusive vegetation, and settlement. Intermittent standing water, erosion, overgrowth of vegetation, and encroachment of wetland plants within drainage swales were observed. Maintenance activities are scheduled to be performed including repairs to fencing and gates, maintenance to remove wetland vegetation from drainage swales, and drainage improvements for the landfill cap involving filling of low spots resulting from subsidence.

As part of the annual landfill gas vent monitoring program, readings were collected from eighteen gas vents on the landfill plus four perimeter probes just north of the landfill. Readings collected from the four perimeter probes were similar to levels measured during last year's annual inspection. Readings collected from the 18 gas vents on the landfill indicated levels of carbon monoxide, and carbon dioxide production decreased since last year, while measurements of LEL, methane, oxygen, and hydrogen sulfide remained about the same. As observed in the 2004 monitoring, VOC concentrations were not detected.

LEL readings from the landfill gas vents near the southern end of the landfill have consistently registered higher than other areas in the past. These increased LEL readings, coupled with increased carbon monoxide, carbon dioxide, and methane readings in the landfill gas vents and the proximity of commercial development warranted installation of additional perimeter gas monitoring probes along the property line where the landfill is adjacent to structures. Nine gas monitoring probes were installed in November 2005 at the southern perimeter of the site along the commercial properties. Readings were collected from these monitoring probes in February 2006. Methane and hydrogen sulfide were not detected. Concentrations of VOCs, LEL, carbon monoxide, and carbon dioxide were detected in two or more of the probes.

Group 1 and Group 2 wells were monitored in the summer (June 2005) and winter (January 2006) of 2005 to evaluate the effectiveness of the landfill at reducing risk and achieving cleanup levels for contaminants of concern (COCs) in groundwater. The COCs are arsenic, chromium, 1,2-dichlorobenzene, 1,4-dichlorobenzene, 1,2-dichloroethane, lead, manganese, nickel, sodium, aluminum, and iron. Of the network of 14 monitoring wells, nine were sampled during the June 2005 event. However, the five wells that were not monitored during the June, 2005 event were monitored independently under the Performance Monitoring Plan for the Contingency Remedy in February/April 2005 and August 2005. The data from the Performance Monitoring Plan work are reported elsewhere. Fourteen monitoring wells were scheduled to be monitored as part of the January 2006 monitoring, however, one well, SHL-3, could not be sampled because the well was pumped dry prior to stabilization. Poor recharge in monitoring well SHL-3 has been documented in previous sampling rounds.

The goal of Alternative SHL-2 alone had been to maintain groundwater quality below cleanup levels at Group 1 wells, and to attain cleanup levels at Group 2 wells. Annual reports since capping of the landfill compare the concentrations of COCs to the cleanup levels, supporting five-year site reviews in which the effectiveness of remedial actions are evaluated. Evaluating effectiveness at Group 2 wells is based on reduction of risk rather than reduction of concentration as a measure of progress toward attainment of cleanup levels, because this approach focuses on the cleanup of arsenic, which is the primary contributor to risk in the Group 2 wells. According to the LTMMP, only chemicals that present carcinogenic risk are considered trigger chemicals in the monitoring program. The trigger chemicals are arsenic, 1,2 dichlorobenzene, 1,4 dichlorobenzene and 1,2-dichloroethane. Reduction of carcinogenic risk, rather than simply reduction of contamination, is the measure of progress toward attainment of cleanup. This risk-based approach keeps the focus on mitigation of the most significant contributors to risk.

Originally, all existing wells were designated as Group 2 wells per the LTMMP, including the three newer wells installed in 1996 (SHM-96-5B, SHM-96-5C, and SHM-96-22B) based on their first round of sampling. Risk reduction was evaluated during the first five-year review (FYR) in August 1998 (Stone & Webster 1998). During the August 1998 review, six monitoring wells (SHL-3, SHL-5, SHL-9, SHM-93-10C, SHL-22, and SHM-93-22C) achieved cleanup levels for all chemicals of concern and were reclassified as Group 1 wells. The remaining eight wells continue to be classified as Group 2 wells. Since the August 1998 review, three of the Group 1 wells (SHL-9, SHL-22 and SHM-93-22C) have exceeded the cleanup level for arsenic at least once during the semi-annual monitoring. A basewide five year review for all sites at the former Fort Devens undergoing investigation and remediation, was completed in September, 2000 (HLA, 2000). This comprehensive FYR was triggered by the initiation of soil remediation activities of AOC 44 and 52 on August 11, 1995.

Data evaluated during these two five year reviews relating to Shepley's Hill Landfill triggered the implementation of the Contingency Remedy because risk reduction goals were not being met by the selected remedy, SHL-2. The Army and the regulatory agencies decided to implement the contingency element of the selected remedy, alternative remedy SHL-9, Groundwater Extraction and Discharge. Construction of the groundwater extraction and treatment system for the landfill was undertaken primarily in Fall 2004 through Spring 2005, after a design process that had been initiated in Fall 2003. The completed system is located at the north end of the landfill, near down-gradient monitoring wells SHL-5, SHM-96-5B, SHM-96-5C, SHL-9, SHL-22, SHM-96-22B and SHM-93-22C. This system includes a wellfield with two extraction wells, a treatment plant, and utility berm across the cap connecting with the Devens POTW system and electrical power near Cooke Street. The treatment system became operational in Fall 2005.

A second basewide FYR report was completed by the United States Army Corps of Engineers, New England District (USACE) in September 2005 (Nobis, 2005). The review concluded that a protectiveness statement or determination could not be made at the time until follow-up actions were competed including start-up and performance monitoring of the extraction and treatment system, landfill cap maintenance, and completion of the Comprehensive Site Assessment/Corrective Actions Alternative Analysis (CSA/CAAA). It was anticipated that within 2 years, time enough for completion of the CSA/CAAA a protectiveness determination could be made.

Groundwater sampling was performed at nine LTMMP monitoring wells in June 2005. Two of these monitoring wells are located on the down-gradient edge of the landfill to the north, while the remaining seven are located on the east side of the landfill near Plow Shop Pond. These wells and five others, with the exception of SHL-3, were sampled as part of the January 2006 sampling. SHL-3 could not be sampled because the well was pumped dry prior to stabilization. Samples were collected in accordance with the *EPA's Low Stress (low flow) Purging and Sampling Procedure for the Collection of Groundwater Samples from Monitoring Wells* (July 1996). Samples were analyzed for volatile organic compounds (VOCs), inorganics, and general water quality parameters. Laboratory reports were reviewed for adherence to acceptable laboratory practices. Based on the data evaluation elements reviewed, all data was determined to be of acceptable quality for use, with some qualifications due to low matrix spike duplicate recovery, holding time exceedances, and associated field and method blank contamination in the June 2005 sampling.

Arsenic was the only trigger chemical detected above the cleanup level during the 2005 sampling program (see Table ES-1 on following page). Most results indicated no significant change from previous arsenic levels. However, the highest concentration of arsenic, 3,320ug/L, was recorded at SHM-96-22B during the January 2006 sampling. The previous greatest concentration of 2,500 ug/L was detected during the November 2003 sampling. Northern well SHM-96-5B was the monitoring well location with the highest concentration of arsenic of the wells sampled as part of the 2005 monitoring program. The highest arsenic concentration has been recorded at SHM-96-5B for all of the sampling rounds except fall 2004, in which the highest concentration was observed in well SHM-96-22B. Wells SHM-96-5B and SHM-96-22B are located relatively close to each other and are screened at a similar depth in sand/till. Monitoring wells SHM-96-5B and SHM-96-22B show a trend of generally increasing arsenic concentrations. Both these wells have continuously exhibited the highest arsenic levels measured at the site, one to two orders of magnitude above levels measured at the other compliance wells. Seven of the thirteen monitoring wells sampled in January, 2006 were below the arsenic cleanup level. Northern well SHL-22 was the only Group 1 well having arsenic concentrations exceeding the cleanup level, which has occurred continuously since May 2002. Concentrations measured at Group 2 wells SHL-4, SHL-10 and SHM-96-5C also met the cleanup level for arsenic, a trend that has been occurring over the past years, particularly at SHL-10.

Cleanup levels for the other three trigger chemicals were not exceeded. However, cleanup levels for the COCs iron, manganese and sodium were exceeded in the 2005 sampling events. In general, with the exception of iron, manganese, and sodium concentrations at wells SHL-5, SHM-96-5C and SHM-93-10C, concentrations of iron, manganese, and sodium have remained stable or declined since 2002.

TABLE ES-1 Compliance Point Wells Exceeding Arsenic Cleanup Level of 50 µg/L in 2005

Well	Orientation to Landfill	Geological Designation	Group #	Concentration June 2005	Concentration January 2006
SHL-22	North	Till	1	Not Sampled	154 µg/L
SHM-96-22B	North	Sand/Till	2	Not Sampled	3,320 µg/L
SHM-96-5B	North	Sand/Till	2	Not Sampled	4,130 µg/L
SHL-11	East	Water Table	2	524 µg/L	567 µg/L
SHL-19	East	Water Table	2	26.7 µg/L	156 µg/L
SHL-20	East	Till	2	159 µg/L	189 µg/L

Corrective action recommendations relating to the cap system and associated drainage are included in the Geotechnical Engineering Fall 2005 Annual Inspection Report (USACE, March 2006), provided in Appendix A. These recommendations include the following: (1) repair and replace the security fence and gates as required to control access to the site and (2) place topsoil and seed over the sandy area lacking vegetation on the east side along the perimeter of the cap. Along with the corrective actions listed above, it was recommended: (1) Install additional landfill gas monitoring probes along the commercial property at the south side of the landfill and (2) Repair and re-grade around the catch basins on the south side of the landfill.

Gas monitoring probes were installed along the south side of the landfill in December 2005 and were monitored in February 2006. Although monitoring was conducted in February, 2006 it is reported in this 2005 annual report. These wells will be monitored again in 2006 as part of annual gas monitoring. In addition, in December, 2005 repairs were made to security fences and no-trespassing signs were installed. Regrading activities are anticipated to occur upon completion of the CSA/CAAA. With the exception of the repairs mentioned above, and the other repairs recommended in the report, the landfill is in fair condition and appears to be functioning adequately. All of the above is discussed in more detail in Section 3.0 of this report.

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1.0 INTRODUCTION

This annual report has been prepared to document the monitoring and maintenance procedures conducted in 2005 at the Shepley's Hill Landfill in Devens, Massachusetts. These procedures were conducted in accordance with the *Record of Decision, Shepley's Hill Operable Unit, Areas of Contamination 4, 5, and 18* (ROD) (ABB-ES Oct 1995) for Shepley's Hill Landfill Areas of Contamination 4, 5, and 18, and the *Long Term Monitoring and Maintenance Plan, Shepley's Hill Landfill* (LTMMP) (SWEC, May 1996). This annual report was prepared by CH2M HILL.

The ROD selected remedy, Alternative SHL-2, which is a source control action that addresses long-term residential exposure to contaminated groundwater, the principal known threat at the Shepley's Hill Landfill Operable Unit. Alternative SHL-2 consisted of completing closure of Shepley's Hill Landfill in accordance with applicable Massachusetts requirements of 310 CMR 19.000, and monitoring and evaluating the effectiveness of the landfill cover system (completed in 1993) to control groundwater contamination and site risk.

The LTMMP for Shepley's Hill Landfill, completed in May 1996, outlines the landfill closure monitoring and maintenance procedures required by the ROD. These procedures include an annual visual inspection and gas emission monitoring of the landfill cap, and a semi-annual groundwater sampling program to monitor contaminants of concern (COCs) and evaluate the effectiveness of the landfill cover system to control groundwater contamination and site risk. The COCs and their cleanup levels for Shepley's Hill Operable Unit are listed in Table 1-1.

1.1 Evaluating Effectiveness of Remedial Objectives

Fourteen compliance point wells are monitored to evaluate the effectiveness of the landfill at reducing risk and achieving cleanup levels in monitoring wells. They are designated as Group 1 or Group 2 wells. The ultimate goal of Alternative SHL-2 is to maintain groundwater quality below cleanup levels at Group 1 wells, and to attain cleanup levels at Group 2 wells.

Five-year site reviews evaluate the effectiveness of Alternative SHL-2 at reducing the potential human health risk from exposure to groundwater and at preventing groundwater from contributing to Plow Shop Pond sediment contamination in excess of human health and ecological risk-based values. Evaluating effectiveness at Group 2 wells is based on reduction of risk rather than reduction of concentration as a measure of progress toward attainment of cleanup levels, because this approach focuses on the cleanup of arsenic, which is the primary contributor to risk in the Group 2 wells.

According to the LTMMP, only chemicals that present carcinogenic risk are considered trigger chemicals in the monitoring program. The trigger chemicals are arsenic, 1,2 dichlorobenzene, 1,4 dichlorobenzene and 1,2-dichloroethane. Reduction of carcinogenic risk, rather than simply reduction of contamination, is the measure of progress toward attainment of cleanup. This risk-based approach keeps the focus on mitigation of the most significant contributors to risk.

The LTMMP states Alternative SHL-2 will be considered effective with regard to Group 2 wells if five-year reviews show an ongoing reduction of potential human health risk (based on trigger chemicals) at Group 2 wells and the ultimate attainment of cleanup levels for all COCs by January 2008. Alternative SHL-2 will be considered effective with regard to Group 1 wells if five-year site reviews show that groundwater quality remains at or below cleanup levels for all COCs.

Chemical concentrations in Group 1 wells have historically attained cleanup goals, while those in Group 2 have not. Originally, all existing wells were designated as Group 2 wells per the LTMMP (Stone & Webster, 1996), including three newer wells installed in 1996 (SHM-96-5B, SHM-96-5C, and SHM-96-22B) based on initial sampling. During the first five-year site review (August 1998), six monitoring wells (SHL-3, SHL-5, SHL-9, SHM-93-10C, SHL-22, and SHM-93-22C) achieved cleanup levels for all chemicals of concern and were reclassified as Group 1 wells. The remaining eight wells continue to be classified as Group 2 wells. The second basewide FYR (HLA, 2000), did not reclassify any of the monitoring wells. However, the review concluded that based on the data collected to date, the required incremental reduction in risk was not achieved and the Army and regulatory agencies decided to implement Alternative SHL-9, Groundwater Extraction and Discharge.

Construction of a groundwater extraction and treatment system for the landfill was undertaken during 2004 and became fully operational following start-up testing in March 2006. The system is located just north of the landfill cap, near the set of compliance point wells that monitor the groundwater down-gradient of the landfill (SHL-5, SHM-96-5B, SHM-96-5C, SHL-9, SHL-22, SHM-96-22B and SHM-93-22C). This construction included a utility dike across the northern half of the cap. The treatment system was not operational at the time of monitoring activities in January 2006. The data collected during 2004, 2005, and January 2006 may therefore serve as baseline data to compare pre-treatment to post-treatment conditions in the future.

1.2 Five-Year Site Reviews

Stone & Webster Environmental Technology & Services (SWEC) conducted the first two years of monitoring in 1996 and 1997. These first two years of monitoring were included in the first *Five Year Review, Shepley's Hill Landfill, Long Term Monitoring* (SWEC, August 1998) required by the ROD, and marking five years since the final capping of the landfill in 1993. Since 1998, monitoring has been conducted by USACE, New England District. In 2000, a review of all Devens sites was performed and included in the *First Five Year Review Report for Devens Reserve Forces Training Area, Devens, MA* (HLA, 2000) which included monitoring conducted for Shepley's Hill Landfill Operable Unit in 1996 through 1999. The second five year review, *2005 Five Year Review* Report, was prepared for monitoring conducted from 2000 through 2004.

1.3 2005 Annual Report Objectives

This annual report covers long term monitoring and maintenance activities conducted in 2005 including the following:

- Landfill cap inspection to identify areas requiring maintenance.
- Installation of nine landfill perimeter gas monitoring probes along the south side of the landfill.
- Landfill gas measurements at 18 gas vents and 13 landfill perimeter gas monitoring probes to establish long-term trends with regard to gas production and venting.
- Monitoring of fourteen compliance point wells for groundwater elevations and COC concentrations to compare to cleanup levels as a measure of determining the effectiveness of the selected remedy.
- Monitoring of an expanded hydraulic network as part of the baseline study established under the Groundwater Extraction, Treatment, and Discharge Remedy.

The findings documented in this annual report support the third five-year site review for monitoring to be conducted from 2005 through 2009 in which the effectiveness of the remedy is formally evaluated with regard to risk reduction and attainment of cleanup levels. Interim recommendations are identified at the end of this report.

2.0 LANDFILL CAP MAINTENANCE ACTIVITIES

The ROD for the Shepley's Hill Landfill requires monitoring and maintenance of the landfill cap based on observations made during the annual inspections. Normally scheduled maintenance activities performed during 2005 included mowing of the landfill vegetative cover and cutting of vegetative growth. An upcoming Comprehensive Site Assessment (CSA), expected to be completed by the fall of 2007, will assess the adequacy of the landfill. Following the CSA, a Corrective Action Alternatives Analysis (CAAA) will be conducted to identify any remedial repairs required. Implementation of the selected options (if required based on the outcome of the CAAA) should improve drainage and function of the landfill cap. The following items should be addressed before the next inspection or as provided for in the final recommendations in the report cited above: (1) repair and replace the security fence and gates as required to control access to the site; (2) Place topsoil and seed over the sandy area lacking vegetation on the east side along the perimeter of the cap. Along with the corrective actions listed above, it is recommended to repair and regrade around the catch basins on the south side of the landfill. With the exception of the repairs mentioned above, and the other repairs recommended in the report, the landfill cap is in fair to good condition and appears to be functioning adequately.

These activities, and all maintenance items monitored during the 2005 cap inspection, are summarized in Section 3.0 of this report. A more detailed report of the monitoring and maintenance activities completed as part of the annual inspection is provided in the Geotechnical Engineering Fall 2005 Annual Inspection Report (USACE, March 2006), which has been included as Appendix A.

3.0 LANDFILL CAP MONITORING ACTIVITIES

The Shepley's Hill Landfill at Devens, Massachusetts was inspected to identify areas requiring maintenance on November 8 and 9 2005 by personnel from the U.S. Army Corps of Engineers, New England District (USACE). Features of the landfill inspected included the cap, drainage system, gas vent system, access roads, and security fence. Observations were made regarding the vegetative cover, vegetation types, erosion, settlement, and general condition of the various features. A narrative of the findings and recommendations of this inspection are included below.

- Catch Basin #3 near the Cooke Street entrance to the site is not set at grade. Soil excavation in this area has left the rim of the grate about six to eight inches higher than the surrounding ground. The rim of this catch basin should be lowered to the surrounding grade.
- The concrete headwall drainage structure at the terminus of the catch basin and underground conduit system on the south side is overgrown with vegetation and is silting in. The grade of the channel bottom is uneven and standing water is present. Wetland species are becoming established as well. The structure and channel immediately downstream is should be cleared, accumulated sediment should be removed, and the channel should be regraded as required to properly drain. The channel will then be reseeded or riprap should be placed, depending on water velocities. This work is scheduled to be performed in 2006. Areas of standing water are present at numerous locations across the landfill surface.
- The northern reaches of the eastern drainage swale have some minor vegetation growth and sand accumulation. The swale should be cleared of vegetation and sand.
- In the vicinity of gas vents 8, 11 and 12, the perimeter of the cap has some areas of sparse/eroded vegetation. The soil in the bare areas is mostly sand and is eroded in some areas. The area should be graded to fill in the eroded areas and topsoil should be placed to a depth of 6 inches over the sand to allow grass to grow. The grass should extend at least twenty feet past the limits of the cap.
- The access roads on the site are in good condition. There are no problems on access roads that warrant repair at this time.
- Portions of the perimeter chain-link security fence are in poor condition. Fence sections and gates are missing and unrestricted access to the site is available at several locations. Some evidence of off-road vehicles (ATV's, dirt bikes, etc.) using the cap area was seen. On the east side near monitoring well SHL-11, the fence has been rolled back and is open. A gate and lock will be added here. There are also several other locations around Plow Shop Pond which provide unrestricted access. The security fence should be repaired, with all missing fence sections, including gates, replaced or repaired.

The recommendations will be addressed in a forthcoming Comprehensive Site Assessment that will be conducted to assess the overall effectiveness of the landfill cap with regard to infiltration. A summary of Corrective Action measures for the Landfill Cap are included in Section 9.0.

4.0 LANDFILL GAS MONITORING RESULTS

The purpose of the landfill gas monitoring program is to establish long-term trends with regard to gas production and venting. A combustible gas survey was performed on 18 passive gas vents on the landfill cover and 13 perimeter gas monitoring probes to determine whether methane, hydrogen

sulfide, or volatile organic compounds have accumulated in the subsurface of the landfill site or are migrating off-site, and if so, how these readings compare with the previous year.
Originally, 18 passive gas vents were installed in the landfill cover. In November 2001, four landfill perimeter gas monitoring probes were installed to monitor potential landfill gas migration from Shepley's Hill Landfill towards the north, in the direction of Sculley Road. Nine additional landfill gas monitoring probes were installed along the commercial property at the south side of the landfill in December 2005 after the initial 2005 landfill gas monitoring had been completed. These newly installed probes were sampled in February 2006 as part of a supplemental landfill gas survey.

The annual landfill gas sampling was conducted on November 8, 2005. The weather was clear, with temperatures in the 50's Fahrenheit (°F) and the barometric pressure was 29.9 inches of mercury and rising. The supplemental landfill gas sampling was conducted on February 16, 2006. Weather conditions on this day were recorded as clear, 55 °F and a barometer reading of 30.1 inches mercury and falling. Gas samples were field analyzed for the following parameters using the listed equipment:

Parameter	Gas Monitoring Equipment
Total Volatile Organic Compounds (VOC)	Thermo Environmental 580B (PID) with a 10.6 eV lamp
Percent Oxygen	Landtec GEM 500 landfill gas monitor (November 2005) and Landtec GA90 (February 2006)
Hydrogen Sulfide (ppm)	Industrial Scientific TMX 412 CGI (November 2005) and Industrial Scientific MG 140 (February 2006)
Percent Lower Explosive Limit (LEL)	Industrial Scientific TMX 412 CGI
Carbon Monoxide (ppm)	Industrial Scientific TMX 412 CGI (November 2005) and Industrial Scientific MG 140 (February 2006)
Percent Carbon Dioxide	Landtec GEM 500 landfill gas monitor (November 2005) and Landtec GA90 (February 2006)
Percent Methane	Landtec GEM 500 landfill gas monitor (November 2005) and Landtec GA90 (February 2006)

The equipment used to collect the landfill gas readings was calibrated in the shop by U.S. Environmental. Samples were collected by attaching a rubber Quik cap with a hose clamp to the gas vent pipe. A barbed fitting was placed in a drilled hole in the cap. Tubing was run from the barbed fitting to an Industrial Scientific SKC224-PCXRE air sampling pump in November 2005 and an Industrial Scientific Sampling Pump SP402 in February 2006. The pump was operated for approximately 7 to 10 minutes to purge 2 vent pipe volumes and to ensure that the gases collected were representative of the gas collection layer. The gas monitoring equipment was then attached to the pump and turned on.

The landfill gas monitoring results are provided in the *Geotechnical Engineering Fall 2005 Annual Inspection Report* (Appendix A). The following is a summary of the perimeter landfill gas monitoring results.

November 2005 Landfill Gas Vent Monitoring

VOCs and hydrogen sulfide were not detected in any of the gas vents. The oxygen levels ranged from 0% (V-16, and, V-17) to 21.0% (V-18). LEL readings ranged from 0% (V-15 and V-18) to over 100% LEL in eight of the 18 vents. Carbon monoxide was not measured in 16 of the 18 gas vents. The greatest carbon monoxide concentration, 3 PPM, was detected V-17. Carbon dioxide ranged from 0% (V-15 and V-18) to 27% at V-17. Methane ranged from 0% (V 15 and V-18) to 32.7 % at V-17. Levels of carbon monoxide and carbon dioxide production decreased since last year, while measurements of VOCs, LEL, methane, oxygen, and hydrogen sulfide remained about the stable. Increased levels of LEL, carbon monoxide, carbon dioxide and methane production were observed between the 2003 and 2004 monitoring.

November 2005 Landfill Gas Probe Monitoring

All four perimeter landfill gas monitoring probes (PGP-1, PPG-2, PGP-3, and PGP-4) tested negative for VOC's, LEL, hydrogen sulfide, carbon monoxide, and methane. Carbon Dioxide was detected in all four probes ranging in concentrations from 0.6% to 2.2%. Oxygen levels ranged from 19.2 % at PGP-2 to 20.3% at PGP-1 and PGP-4. Levels of all gases were similar to levels measured during 2004 annual inspection.

February 2006 Landfill Gas Probe Monitoring

VOCs were detected in seven of the nine gas probes installed along the southern border of the landfill. The VOC concentrations ranged from 0.9 ppm at LGP-14 to 0.2 ppm at LGP-7, LGP-8, and LGP-11. LEL concentrations of two percent were observed at LGP-8 and LGP-9 and one percent at LGP-7. Carbon monoxide was detected in two probes: LGP-9 at 1 ppm and LGP-14 at 2 ppm. Carbon Monoxide was detected in eight of the nine probes at concentrations ranging from 0.3 ppm (LGP-5) to 10.7 ppm (LGP-8). Methane and hydrogen sulfide were not detected.

The gas readings are within the parameters of a mature landfill. The major concern with landfill gas is off-site migration. If the gas vents are functioning properly and are adequately spaced there should be no significant off-site migration of landfill gases; however, due to the increased LEL, carbon monoxide, carbon dioxide, and methane readings, and the proximity of residential housing and commercial development, the gas monitoring probes installed along the northern and southern property lines where the landfill is adjacent to structures should continued to be monitored.

5.0 GROUNDWATER ELEVATIONS

Groundwater elevations were collected from the compliance point wells in order to observe any changes in elevation and the direction of groundwater flow. Groundwater elevations at compliance point wells were measured on the first day of each sampling event, June 6, 2005 and January 19, 2006, respectfully. The depth to water table was measured in the field, and then subtracted from the elevation of the reference point to determine the elevation of the water table at each location. Table 5-1 lists the water table elevations (for each sampling round), the geological unit(s) screened by the wells, and the elevation of the screened interval for each well. Groundwater elevations measured in January 2006 were consistently higher than those measured in June 2005.

In addition to these semi-annual groundwater measurements, groundwater measurements of all Shepley's Hill Landfill wells were conducted by CH2M HILL in conjunction with the Performance Monitoring Plan (PMP) implemented as part of the Groundwater Extraction, Treatment, and Discharge Alternative. Site-wide groundwater measurements were collected on February 16, August 1, August, 24, August 26, and August 29, 2006. Water level measurements collected on August 24 and 26 as part of an extraction test are provided as Table 5-2. Data collected on August 24, 2006 represent water level conditions prior to the extraction test and the data collected on August 26 represent water level conditions during the extraction test. The synoptic groundwater data collected prior to and during the extraction tests has been contoured to depict conditions prior to pumping (Figure 5-1) and immediately prior to termination of pumping at 25 gpm (Figure 5-2).

During the first 5-year review (SWEC, August 1998), groundwater elevations were re-evaluated to identify hydraulic gradients and to confirm changes due to the construction of the landfill cap. Groundwater modeling suggested that the landfill cap has reduced the volume of water beneath the cap, resulting in a more northerly groundwater flow (SWEC, 1998). Water level data collected on August 24, 2006, under baseline conditions suggests that the model analysis of a northerly groundwater flow is still valid. The water level data collected during the extraction test indicates that the operation of the groundwater extraction system will create an even greater northerly flow.

6.0 GROUNDWATER SAMPLING

Groundwater sampling is conducted at the landfill on a semi-annual basis in accordance with the LTMMP at assorted compliance point monitoring wells. Nine monitoring wells were sampled as part of the 2005 summer monitoring: SHL-3, SHL-4, SHL-5, SHL-10, SHM-93-10C, SHL-11, SHL-19, SHL-20, and SHM-93-22C in June 2005. The wells were sampled on June 6 and 7, 2005. Fourteen wells were scheduled to be sampled as part of the 2005 winter sampling, including the wells mentioned above as well as SHM-96-5B, SHM-96-5C, SHL-22, and SHM-96-22B. However, monitoring well SHL-3 could not be sampled because the well went dry during purging. Poor recharge in SHL-3 has been documented in previous sampling rounds. The 2005 winter sampling was conducted on January 19, 20, and 25, 2006. The 2005 summer sampling program was conducted by USACE personnel and the 2005 winter sampling was completed by CH2M HILL personnel.

Of these fourteen long term monitoring wells, the seven at the north end of the landfill (SHL-5, SHM-96-5B, SHM-96-5C, SHL-9, SHL-22, SHM-96-22B and SHM-93-22C) are located in the area predicted to experience the greatest intrusion of groundwater flow from the landfill, as suggested by previous modeling results (Harding ESE, A MACTEC Company, 2002). The remaining seven are located along the eastern edge of the landfill, between the landfill and Plow Shop Pond.

Four additional wells located near Molumco Road (SHM-99-31A, SHM-99-31B, SHM-99-31C, and SHM-99-32X) are frequently sampled at the same time as the compliance point wells, for comparison purposes only. However, these wells not sampled during the 2005 monitoring.

In accordance with the ROD and LTMMP, compliance point wells are designated as Group 1 or Group 2 wells. Chemical concentrations in Group 1 wells have historically attained cleanup goals, while those in Group 2 have not. Originally, all existing wells were designated as Group 2 wells per the LTMMP, including three newer wells installed in 1996 (SHM-96-5B, SHM-96-5C, and SHM-96-22B). During the first five-year site review (August 1998), six monitoring wells (SHL-3, SHL-5, SHL-9, SHM-93-10C, SHL-22, and SHM-93-22C) achieved cleanup levels for all chemicals of concern and were reclassified as Group 1 wells. The remaining eight wells continue to be classified as Group 2 wells. The *2005 Five Year Review Report* did not make any changes to the well group designations. If necessary, these group designations will be revised during the next five-year review (based on data collected in the years 2005 to 2009) depending on whether groundwater quality meets the criteria of section 1.2 of the ROD.

6.1 Preparation for Sampling

Sampling activities were coordinated with the Devens BRAC Environmental Office and the contract laboratory prior to commencement of sampling. Bottles were checked to insure they complied with the requirements of the sampling program. Sampling equipment, including YSI water quality meters, portable generators and tubing, was rented (or purchased in the case of supplies) from local vendors. USACE used their own Grundfos Rediflow II pumps, controllers, Heron water level indicators, and HF Scientific DRT-15CE turbidity meters for the sampling events (equipment is occasionally supplemented with identical or similar models rented from U.S. Environmental, as required – these instances are noted on the Groundwater Field Analysis Forms where appropriate). CH2M HILL rented all of the equipment used during the winter sampling from Pine Environmental. All equipment was inventoried and tested to ensure it was accounted for and functioning. The well logs of each of the wells to be sampled were reviewed by the field team prior to the scheduled event to determine tubing requirements, and brought to the landfill during the sampling event to confirm the screened intervals.

6.2 Sampling

Monitoring wells were purged and sampled in accordance with *EPA's Low Stress (low flow) Purging and Sampling Procedure for the Collection of Groundwater Samples from Monitoring Wells* (July 1996) using an adjustable rate, low flow pump.

Before sampling activities commenced, groundwater elevations were measured at each well location to be sampled. YSI water quality meters and turbidity meters were calibrated at the beginning of each day of use. A calibration check was also performed at the end of each day. During sampling, the generator used to power the pumps was located at a downwind area at least 30 feet away from the well being sampled, to minimize potential contamination from the exhaust. Upon initial opening of each well, initial water level measurements were collected. The pump intake was lowered to approximately the middle of the screen of each well to be sampled when possible. When the water level was below the top of the screen, the pump was positioned at a depth approximately midway between the top of the water level and the bottom of the screen.

Water quality parameters, including temperature, specific conductance, pH, oxidation-reduction potential (ORP), turbidity, and dissolved oxygen (DO) were collected every 3 to 5 minutes to ensure proper purging of the wells before each well was sampled. The results are listed on Groundwater Field Analysis Forms located in Appendix B. Most of the water quality parameters, were monitored using a flow-through cell and a Sonde-YSI water meter (YSI 600XL). Turbidity samples were not collected from the flow through cell due to the silt buildup that can occur in the cell. A T-connector with ball valve was set up before the flow-through cell to facilitate the collection of samples for turbidity readings. With the exception of the last day of the winter sampling (January 25, 2006) dissolved oxygen readings were measured in the flow cell. Dissolved oxygen readings on January 25, 2006 were collected with a YSI 85 in-situ probe after the YSI 600 XL began giving erroneous dissolved oxygen readings. Sampling was conducted when water quality parameters became stabilized for three consecutive readings. The tubing was disconnected from the flow-through cell and samples were collected directly from the discharge tubing. Observations made during the sampling activities include:

- To ensure precision of water level measurements, well casings that had faded marks or no marks were remarked.
- At several wells during each event, the water level was lower than the top of the screen, and the pumps were lowered to approximately midway between the water level and the bottom of the screen.
- Monitoring well SHL-3 could not be sampled during the 2006 winter monitoring because the well went dry while purging Previous sampling programs have noted problems with recharge at SHL-3 due to siltation problems

6.3 Equipment Decontamination

All non-disposable sampling and testing equipment that came in contact with the sampling medium was decontaminated to prevent cross contamination between sampling points. The submersible pump was decontaminated using the following procedure:

- Upon removal of the pump from the well following sample collection, the pump was submersed in potable water and detergent (Alconox) solution. At least 1 to 2 gallons of the detergent solution was pumped through (starting the pump at a low flow rate, as in sampling, and increased to a higher speed).
- The pump was removed and sprayed with potable water to minimize the transfer of soap to the riser.
- The pump was then submersed in potable water and at least 1 to 2 gallons were pumped through.
- The pump was then submersed in deionized water and at least 1 to 2 gallons were pumped through.

- The submersible pump was sprayed with isopropyl alcohol (reagent grade) using a hand held spray bottle, over a tub. The pump was then submersed in a final deionized water rinse and at least 1 to 2 gallons were pumped through.
- The pump was air dried and wrapped in clean aluminum foil.

7.0 LABORATORY TESTING

Groundwater samples collected during the summer sampling event were sent to Severn Trent Laboratories in Colchester, Vermont for analysis. Groundwater samples collected during the winter 2005 sampling were submitted to Alpha Analytical Labs of Westborough, Massachusetts. All samples were analyzed for volatile organic compounds, inorganics, and general water quality parameters.

7.1 Sample Handling

Samples were collected in containers compatible with the intended analysis and properly preserved prior to shipment to the laboratory. Each sealed container was placed in a leak proof plastic bag and placed in a strong thermal ice chest filled with bubble wrap packing material, or equivalent, to ensure sample integrity during shipment. Ice was added to cool samples to 4 degrees Celsius (°C) or just below. Chains of custody were used to identify and document the samples being shipped. Sample custody was initiated by the sampling team upon collection of samples and chain-of-custody forms were placed in waterproof plastic bags and taped to the inside lid of the cooler. The cooler was sealed with chain-of-custody seals. Samples collected during the spring sampling were shipped to the laboratory via overnight delivery while the samples collected in January 2006 were delivered by courier.

7.2 Analyses

Contaminants of concern (COCs) for compliance point wells include arsenic, chromium, 1,2-dichlorobenzene, 1,4-dichlorobenzene, 1,2-dichloroethane, lead, manganese, nickel, sodium, aluminum, and iron. Cleanup levels for these COCs are listed on Table 1-1. Water analyses were conducted according to SW846 methods 8260B for volatile organic compounds (VOCs), and 6010B for target analyte list (TAL) metals (7471A for mercury). The summer monitoring used the following methods for general chemistry: chemical oxygen demand (COD) by EPA method 410.1, biochemical oxygen demand (BOD) by EPA method 405.1, hardness by Standard Method 2340B, alkalinity by EPA method 310.1, cyanide by EPA method 335.4, anions (chloride, nitrate, and sulfate) by EPA method 300.0, total organic carbon (TOC) by SW846 method 9060, total dissolved solids (TDS) by EPA method 160.1, and total suspended solids (TSS) by EPA method 160.2. The winter monitoring utilized the following methods for the general chemistry analyses: COD by Standard Method 5220D, BOD by Standard Method 5210B, hardness by Standard Method 2340B, alkalinity by Standard Method2320B, cyanide by Standard Method 9014, TOC by SW846 9060, TDS by Standard Method 2540C, TSS by Standard Method 2540D, chloride by Standard Method 9251, nitrate by Standard Method 4500NO3-F, and sulfate by Standard Method 9033B.These analyses were conducted on samples collected from all compliance point wells. As reported in previous annual reports, starting with the fall event of 2001, the method used to determine hardness for use, with some qualifications due to low matrix spike duplicate recovery, holding time exceedances and associated field and method blank contamination in the June 2005 sampling.

9.0 IMPLEMENTATION OF CONTINGENCY REMEDY

9.1 Description

The rationale for implementing the contingency remedy for the Shepley's Hill groundwater along with detailed plans and specifications is presented in the document entitled, Remedial Design and Remedial Action Workplan, Final Hundred Percent (100%) Submittal, Groundwater Extraction, Treatment, and Discharge Contingency Remedy for Shepley's Hill Landfill. (CH2M HILL, May, 2005). Groundwater modeling work indicated that the system would effectively provide containment of the groundwater moving beneath Shepley's Hill Landfill and to the north if operated at 50 gallons per minute (gpm). The BRAC Cleanup Team (BCT) decided during the completion of the final design effort to conduct initial operation of the system at 25 gpm and initial operational data would be utilized to assess whether or not pumping rates could be increased in the future. The design document (CH2M HILL, May, 2005) provides the following statements about this plan:

> *Although the wellfield design extraction rate is 50 gallons per minute (gpm) total from the wellfield, the startup pumping rate will be a reduced rate of 25 gpm identified by the BCT while the BCT reviews initial extraction test and startup data (e.g., baseline geochemical monitoring, influent concentrations, etc.).*
>
> *The primary performance objective of the extraction system is to contain the arsenic plume in the vicinity of the base boundary near the north end of the landfill. Pump test work (SWET, 1998), a 60% design for an extraction/discharge system (USAEC, 1997), and groundwater modeling (Harding ESE, 2003) provide the basis for development of this design and remedial action work plan. In addition, as mentioned previously, the Army decided in October, 2003 to treat the extracted water stream with a goal for the treatment system of 10 µg/l for arsenic, ensuring 1) that the arsenic concentration and mass-related discharge limitation requirements of the MassDevelopment Industrial Discharge Permit would be easily met and 2) that treatment goals are consistent with the new arsenic drinking water standard of 10 µg/l, promulgated on January 22, 2001 and due to be implemented by public water systems by January 23, 2006. The decision of the BCT to operate the wellfield at lower pumping rate (25 gpm vs the 50 gpm modeled flow) will focus groundwater extraction in the deeper part of the glacial aquifer during initial operations. Higher flow rates will likely be needed in the future to achieve full containment of the groundwater plume.*

Construction of the wellfield, involving two 6-inch extraction wells, was completed in February 2005 and the remainder of system construction and connections with the treatment plant were completed in the Spring and Summer 2005. Concurrent with final design and construction work, CH2M HILL evaluated surface water and groundwater disposal options for treated water from the Arsenic Treatment Plant (CH2M HILL, 2005). This work involved hydraulic modeling to evaluate the impacts of surface water and groundwater discharge at a number of locations east and southeast of the wellfield. Appendix E provides a Technical Memorandum, dated December 22, 2005, providing details of this evaluation. In brief, the evaluation identified locations east of the treatment plant that could be viable for groundwater or surface water discharge. Further work evaluating potential process modifications that may be necessary to provide for dechlorination of effluent is being conducted in 2006.

Start-up wellfield extraction testing, plant process testing, and early system operation were conducted in late August and September 2005. Section 9.2 further describes activities conducted during system start-up.

9.2 Start-Up Activities

The extraction/recovery testing was conducted from August 24th through August 30th and involved two 24 hour drawdown tests and one recovery test of the EW-1 extraction well. A technical memorandum describing this testing is provided in Appendix F. Most importantly, hydraulic triggers established for start-up period operations (CH2M HILL, 2005c) were not exceeded during the tests at 25 gallons per minute.

During the start-up period, process testing and adjustments were made over a period of several days to evaluate the appropriate dosage of coagulant needed to achieve treatment to the operational goal of 10 ug/L. Influent and effluent sampling was conducted during this period to document arsenic, iron, and manganese concentrations throughout the testing period. This was necessary for evaluation of coagulant dosage, as well as to document influent/effluent characteristic under full operational pumping at 25 gpm. The testing demonstrated that the treatment process successfully treats a complex matrix (influent groundwater) and meets the goal of 10 ug/L arsenic. A brief summary memo (CH2M HILL, 2005d) provided in Appendix G discusses the process testing in greater detail.

In addition, to start-up process testing, geochemical and water-level monitoring were conducted during the start-up period and subsequently during routine operations in accordance with the Performance Monitoring Plan (CH2M HILL, 2005c). This data collection confirmed that the hydraulic triggers were not exceeded, in addition to demonstrating that groundwater arsenic levels and other geochemical parameters have remained relatively stable in the vicinity of the extraction wellfield and elsewhere during the early operation of the system.

During the first month of start-up operations 35% LEL was detected in the influent tank, 7% LEL in the effluent sump, and 2% LEL in the effluent manhole. Further monitoring indicated that methane was being generated from dissolved methane in influent groundwater as it is brought to the surface and equilibrates with atmospheric pressure. The methane/ethane levels in groundwater proved to be fairly typical for groundwaters having high TOC levels that are undergoing active methanogenesis. The plant was shutdown upgrade systems to ensure that hazardous atmospheres would not develop in headspaces the plant or process. Upgrades including LEL monitors on the clarifier and roll-off; an O_2 monitor on the microfilter (MF) skid; explosion-proof electrical in the effluent sump and extraction wells; and sealing/venting of the effluent sump and MF process tanks were made during the Fall and Winter and the system was brought back on line in early March, 2006.

10.0 CONCLUSIONS AND RECOMMENDATIONS

10.1 Conclusions

- The second five year review was completed by the USACE in September 2005. The five year concluded that the required incremental reduction in risk was not achieved and the Army and regulatory agencies decided to implement the Alternative SHL-9, Groundwater Extraction, Treatment, and Discharge. The groundwater extraction system began operation in March 2006.
- Site-wide groundwater measurements were collected on August 24 and 26, 2005. Water level data collected on August 24, 2006, representing baseline conditions suggests that the previous model analysis of a northerly groundwater flow is still valid. The water-level data collected on August 26 during an extraction test indicates that the operation of the groundwater extraction system will be expected create an even greater northerly flow.
- The locations of the wells in the LTMP remain appropriate, relative to source areas and the direction of groundwater flow.
- Shepley's Hill Landfill Cap appears to be in fair to good condition.
- The Geotechnical Engineering Annual Inspection in 2005 (refer to Appendix A) concluded: *An upcoming Comprehensive Site Assessment will assess the adequacy of the landfill. Following the CSA, a Corrective Action Alternatives Analysis will be conducted to identify any remedial repairs required. Implementation of the selected options (if required based on the outcome of the CAAA) should improve the drainage and function of the landfill cap. The following items should be addressed before the next inspection or as provided for in the final recommendations in the report cited above: (1) Repair and replace the security fence and gates as required to control access to the site; (2) Place topsoil and seed over the sandy area lacking vegetation on the east side along the perimeter of the cap. Along with the corrective actions listed above, it is recommended to (1) Install additional landfill gas monitoring probes along the commercial property at the south side of the landfill (the probes were installed in November 05, after this inspection) (2) Repair and regrade around the catch basins on the south side of the landfill. With the exception of the repairs mentioned above, and the other repairs recommended in the report, the landfill is in fair condition and appears to be functioning adequately.* As noted, gas probes were installed on the south end of the landfill monitored in February, 2006 (refer to Appendix A). Methane was not detected in any of the new or older perimeter gas probes. In addition, in December, 2005 the security fence was repaired and no-trespassing signs were installed.

10.2 Recommendations

- The list of parameters monitored as part of the long term sampling program should be reviewed as recommended in the 2005 Five Year Review Report (USACE, September 2005) with the intent of eliminating parameters that have no significant site history and do not contribute to site risks or to the understanding of the groundwater chemistry. These include copper, lead, nickel, selenium, silver, cyanide, BOD, and VOCs.

- Integrate LTM and PMP groundwater sampling programs.
- Other recommendations made in this annual report that are not currently scheduled but should be addressed in the future include, (1) Repair and regrade around the catch basins on the south side of the landfill; and (2) Repair the hasps on the casings of groundwater monitoring wells SHL-4 and SHL-9.

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Tables

Table 1-1 Contaminants of Concern (COC) - Cleanup Levels Shepley's Hill Landfill Devens, Massachusetts		
COC	**Cleanup Level ug/L**	**Selection Basis**
Arsenic	50	MCL
Chromium	100	MCL
1,2-Dichlorobenzene	600	MCL
1,4-Dichlorobenzene	5	MCL
1,2-Dichloroethane	5	MMCL
Lead	15	Action Level
Manganese	291	Background
Nickel	100	MCL
Sodium	20,000	Health Advisory
Aluminum	6,870	Background
Iron	9,100	Background

Based Upon Record of Decision

Table 5-1
Monitoring Well Specifications and Groundwater Elevations
Shepley's Hill Landfill
Devens, Massachusetts

Well ID	Description	Orientation to Landfill[1]	Ground Surface Elevation[2] (ft msl)	Reference Elevation[2] (ft msl)	Total Depth (feet)	Screen Length (feet)	June 2005		January 2006	
							Water Levels	Groundwater Elevation (ft msl)	Water Levels	Groundwater Elevation (ft msl)
SHL-3	Water Table	East	247.4	248.6	33.29	10	29.75	218.85	29.58	219.02
SHL-4	Water Table	East	226.4	228.1	14.65	10	10.05	218.05	9.69	218.41
SHL-5	Water Table	North	217.9	218.6	13.75	10	2.59	216.01	1.40	217.20
SHM-96-5B	Base of Sand/Till	North	218.5	220.0	92.47	10	4.36	215.64	3.89	216.11
SHM-96-5C	Water Table	North	218.7	219.4	79.62	10	3.88	215.52	5.98	213.42
SHL-9	Water Table	North	221.7	223.0	26.25	10	7.51	215.49	6.72	216.28
SHL-10	Water Table	East	249.1	248.8	29	15	30.35	218.41	30.64	218.47
SHM-93-10C	Bedrock	East	247.1	248.6	56.31	10	28.86	219.74	28.46	220.14
SHL-11	Water Table	East	235.0	236.5	30	15	18.28	218.22	17.99	218.51
SHL-19	Water Table	East	239.5	241.5	32.37	15	22.19	219.31	21.49	220.01
SHL-20	Base of Till	East	235.4	237.0	50.55	10	18.62	218.38	18.34	218.66
SHL-22	Base of Till	North	220.0	220.6	110.6	10	5.24	215.36	4.75	215.85
SHM-96-22B	Sand/Till Interface	North	220.0	221.7	92.42	30	5.10	216.60	4.56	217.14
SHM-93-22C	Bedrock	North	219.9	220.4	137.5	10	6.30	214.10	6.10	214.30

Notes:
1. North wells are located in the direction of groundwater flow away from the landfill.
   East wells are located between landfill and East Plow Pond.
2. Elevations based Meridian Associates survey (7&8/2005), referenced to be National Geodetic Vertical Datum of 1929 (NGVD29).

Table 5-2 Groundwater Elevations (Baseline and Extraction Test)
Site-Wide Groundwater Elevations
Shepley's Hill Landfill
Devens, Massachusetts

				Baseline: 8/24/05		*Maximum Drawdown: 8/26/06*	
Well ID	Ground Surface Elevation[1,3] (ft msl)	Outer Casing Elevation[1,3] (ft msl)	Reference Elevation[1,3] (ft msl)	DTW (TOC) (ft)	Elevation (ft msl)	DTW (TOC) (ft)	Elevation (ft msl)
SHM-05-39A	222.9	222.9	222.6	11.93	210.7	11.88	210.7
SHM-05-39B	222.9	222.9	222.6	12.70	209.9	12.66	209.9
SHM-05-40X	224.6	224.6	224.4	14.55	209.9	14.56	209.8
SHM-05-41A	223.8	223.8	223.5	10.71	212.8	10.82	212.7
SHM-05-41B	223.6	223.6	223.3	10.53	212.8	10.63	212.7
SHM-05-41C	224.0	224.0	223.6	10.75	212.9	10.86	212.7
SHM-05-42A	214.5	217.9	217.8	4.98	212.8	5.10	212.7
SHM-05-42B	214.5	217.9	217.8	4.93	212.9	5.07	212.7
SHM-99-31A	213.9	215.7	215.4	4.40	211.0	4.28	211.1
SHM-99-31B	213.7	215.5	215.4	4.32	211.1	4.35	211.1
SHM-99-31C	213.7	215.9	215.8	4.59	211.2	4.63	211.2
SHM-99-32X	220.2	222.5	222.3	10.17	212.1	10.24	212.1
SHP-05-47A	214.4	NA	218.5	5.97	212.5	Dry	Dry
SHP-05-47B	214.4	NA	216.3	3.93	212.4	3.81	212.5
SHP-05-48A	213.9	NA	217.0	Dry	Dry	Dry	Dry
SHP-05-48B	213.8	NA	218.4	Dry	Dry	Dry	Dry
SHP-05-49A	213.3	NA	217.8	5.93	211.9	Dry	Dry
SHP-05-49B	213.3	NA	216.2	4.28	211.9	4.65	211.6
SHP-99-33A	222.1	NA	224.1	13.17	210.9	13.19	210.9
SHP-99-33B	222.2	NA	223.7	12.42	211.3	12.55	211.2
SHP-99-34A	223.6	NA	225.7	13.65	212.1	13.56	212.1
SHP-99-34B	223.6	NA	225.6	13.33	212.3	13.25	212.4
WP-01	213.3	NA	213.4	Dry	Dry	Dry	Dry
EW-01	NA	228.2	228.0	14.22	213.8	24.18	203.8
EW-01 pilot	NA	228.2	228.0	14.22	213.8	14.84	213.2
EW-04	NA	228.5	228.1	14.53	213.6	--	--
EW-04 pilot	NA	228.5	228.1	14.62	213.5	14.82	213.3
SHL-13	220.1	222.3	221.8	7.59	214.2	7.52	214.3
SHL-21	258.7	261.2	260.0	45.81	214.2	45.75	214.3
SHL-22	220.0	221.4	220.6	7.36	213.2	7.57	213.0
SHL-23	240.5	242.6	242.3	28.16	214.1	28.17	214.1
SHL-5	217.9	218.9	218.6	5.32	213.3	5.38	213.2
SHL-8D	220.1	222.3	221.8	8.03	213.8	8.04	213.8
SHL-8S	220.1	222.3	222.0	8.22	213.8	8.27	213.7
SHL-9	221.7	223.5	223.0	9.83	213.2	9.95	213.1
SHM-05-45A	227.3	229.7	229.5	15.69	213.8	16.09	213.3
SHM-05-45B	227.7	230.3	230.1	16.29	213.8	16.61	213.0
SHM-05-46A	227.3	229.4	229.3	15.32	214.0	15.49	213.5
SHM-05-46B	227.1	228.8	228.7	14.60	214.1	14.76	213.7
SHM-93-22C	220.0	221.7	221.7	8.45	213.3	8.65	213.1
SHM-96-22B	219.9	221.6	220.4	7.23	213.2	7.42	213.0
SHM-96-5B	218.5	220.2	220.0	6.39	213.6	6.65	213.4
SHM-96-5C	218.7	219.6	219.4	5.98	213.4	6.12	213.3
SHP-05-43	259.4	262.4	261.7	45.45	216.3	45.36	216.3
SHP-05-44	256.4	259.5	259.1	42.46	216.6	42.40	216.7
N-1, P-1	228.8	231.5	231.0	14.93	216.1	14.86	216.1
N-1, P-2	228.8	231.5	231.0	14.80	216.2	14.77	216.2
N-1, P-3	228.8	231.5	231.2	14.46	216.7	14.40	216.8
N-2, P-1	221.6	223.8	223.1	5.92	217.2	5.85	217.3
N-2, P-2	221.6	223.8	223.0	6.14	216.9	6.08	216.9
PSP-01	NA	NA	216.1	0.94	217.0	0.97	217.1
SHL-11	235.0	237.0	236.5	18.98	217.5	18.91	217.6
SHL-20	235.4	237.0	237.0	19.33	217.7	19.30	217.7
SHL-4	226.4	228.4	228.1	10.77	217.3	11.07	217.0
SHP-01-36X	221.1	NA	225.1	7.16	217.9	8.11	217.0
SHP-01-37X	219.5	NA	223.7	6.91	216.8	6.53	217.2
SHP-01-38A	219.8	NA	221.8	4.39	217.4	4.36	217.4
SHP-01-38B	219.9	NA	222.0	4.49	217.5	4.34	217.7
N-3, P-1	219.8	222.5	221.8	4.76	217.0	4.71	217.1
N-3, P-2	219.8	222.5	221.5	4.78	216.7	4.76	216.7
N-4, P-1[4]	218.3	219.9	219.2	--	--	--	--
N-4, P-2[4]	218.3	219.9	219.2	2.10	217.1	2.09	217.1
N-4, P-3[4]	218.3	219.9	219.2	--	--	--	--
N-5, P-1	241.7	244.9	243.7	23.38	220.3	23.35	220.4
N-5, P-2	241.7	244.9	243.7	23.27	220.4	23.22	220.5
N-6, P-1	257.1	259.9	259.9	36.51	223.4	36.05	223.9
N-7, P-1	254.4	257.7	256.6	30.35	226.3	30.34	226.3
N-7, P-2	254.4	257.7	257.1	30.43	226.7	30.44	226.7
SHL-15	260.1	261.2	260.9	18.93	242.0	18.98	241.9
SHL-18	236.8	238.8	238.6	19.60	219.0	19.62	219.0
SHL-19	239.5	241.8	241.5	23.38	218.1	23.40	218.1
SHL-3	247.4	248.6	248.6	30.77	217.8	30.80	217.8
SHM-93-10C	247.1	249.1	248.6	29.92	218.7	23.93	224.7
SHM-93-10D	246.5	249.1	248.9	30.63	218.3	30.64	218.3
SHM-93-10E	246.6	248.8	248.5	29.73	218.8	29.64	218.9
SHM-93-18B	236.3	238.7	238.3	19.29	219.0	19.30	219.0
SHL-24	237.8	239.9	239.8	15.69	224.1	15.72	224.1
SHP-95-27X	236.3	238.7	238.5	33.02	205.5	16.14	222.4
SHP-99-35X	257.5	259.3	259.2	36.39	222.8	35.05	224.2

NA=Not Available (survey data not available)

Notes:

1. Field survey performed by Meridian Associates, Inc. between July and August 2005.
2. Northing and easting coordinates based upon project system, reported to be North American Datum of 1983 (NAD83).
3. Elevations referenced to National Geodetic Vertical Datum of 1929 (NGVD29).
4. N-4 ice damaged. P-2 measurement approx.
5. Reference elevation generally inner (PVC) casing or zero mark on stageboard. SHL-3 PVC (elev. 247.8) not used for reference due to depth in protective casing.

Table 7-1
Groundwater Sample Analysis and Procedures
Shepley's Hill Landfill
Devens, Massachusetts

Parameters	June 2005 Method	January 2006 Method
Volatile Organic Compounds	SW846 8260B	SW846 8260B
Inorganics		
Aluminum	SW846 6010B	SW846 6010B
Arsenic	SW846 6010B	SW846 6010B
Barium	SW846 6010B	SW846 6010B
Cadmium	SW846 6010B	SW846 6010B
Chromium	SW846 6010B	SW846 6010B
Copper	SW846 6010B	SW846 6010B
Cyanide	EPA Method 335.4	SM 9014
Iron	SW846 6010B	SW846 6010B
Lead	SW846 6010B	SW846 6010B
Manganese	SW846 6010B	SW846 6010B
Mercury	SW846 7470A	SW846 7470A
Nickel	SW846 6010B	SW846 6010B
Selenium	SW846 6010B	SW846 6010B
Sodium	SW846 6010B	SW846 6010B
Silver	SW846 6010B	SW846 6010B
Zinc	SW846 6010B	SW846 6010B
General Laboratory Parameters		
Hardness	SM 2340B	SM 2340B
Total Dissolved Solids	EPA 160.1	SM 2540C
Total Suspended Solids	EPA 160.2	SM 2540D
Chloride	EPA 300.0	SM 9251
Nitrate as N	EPA 300.0	SM 4500NO3-F
Sulfate	EPA 300.0	SM 9038B
Alkalinity	EPA 310.1	SM 2320B
Biological Oxygen Demand - 5 Day	EPA 405.1	SM 5210B
Chemical Oxygen Demand	EPA 410.1	SM 5220D
Total Organic Carbon	SW 846 9060	SW 846 9060
General Field Parameters		
pH	YSI 600 XL	YSI 600 XL
Temperature	YSI 600 XL	YSI 600 XL
Specific Conductivity	YSI 600 XL	YSI 600 XL
Dissolved Oxygen	YSI 600 XL	YSI 600 XL/ YSI 85
Oxygen Reduction Potential	YSI 600 XL	YSI 600 XL
Turbidity	HF Scientific DRT-15CE	LaMotte 202

Table 7-2
Groundwater Analytical Results (ug/L)
June 6-7, 2005
Shepley's Hill Landfill
Devens, Massachusetts

PARAMETERS	CLEANUP LEVEL (1)	Monitoring Well ID									
		SHL-3	SHL-4	SHL-5	SHL-10	SHM-93-10C	SHL-11	SHL-11 DUP	SHL-19	SHL-20	SHM-93-22C
VOLATILES (8260B)											
1,1-Dichloroethane	70 (4)	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
1,2-Dichlorobenzene	600	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
1,2-Dichloroethane	5	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
1,2-Dichloroethene (total)	70 (2)	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	1.4 J	1.4 J	5.0 U	5.0 U	5.0 U
1,3-Dichlorobenzene	600 (2)	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
1,4-Dichlorobenzene	5	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	1.8 J	5.0 U	2.1 J	5.0 U
2-Butanone	-	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 UJ	5.0 U	5.0 U
4-Methyl-2-Pentanone	-	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Acetone	3,000 (4)	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 UJ	5.0 U	5.0 U
Benzene	5 (2)	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	1.5 J	1.4 J	5.0 U	5.0 U	5.0 U
Methyl-t-Butyl Ether	70 (4)	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Xylenes	10,000 (2)	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 UJ	5.0 U	5.0 U
METALS (6010B or as noted)											
Aluminum	6,870	88 U	88 U	227	88 U	88 U	88 U	88 U	88U	88 U	88 U
Arsenic	50	4.5 U	10.1	7 B	4.5U	8.1 B	**524**	**518**	26.3	**159**	15.8
Barium	2,000 (2)	8.4 U	35 B	9.5 B	8.4 U	8.4 U	78.5 B	77.2 B	10.3 B	86.8 B	70.8 B
Cadmium	5 (2)	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
Chromium	100	2.9 B	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2U	2.4 B
Copper	1,300 (3)	4.2 U	4.2 U	4.2 U	4.2 U	4.2 U	6.6 B	4.2 U	4.2 U	4.2 U	4.2 U
Iron	9,100	37.9 U	1,220	2,930	37.9 U	37.9 U	**59,400**	**57,400**	6,680	5,980	572
Lead	15	2.7 U	2.7 U	2.7 U	2.7 U	2.7 U	4.8	2.9 U	2.7 U	2.7 U	2.7 U
Manganese	291 (5)	1.7 B	**361**	**476**	1.5 B	27.5	**2,380**	**2,300**	**1,090**	**6,270**	218
Mercury (7470A)	2 (2)	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Nickel	100	3 U	4.2 B	3 U	3 U	3 U	3 U	3 U	4 B	7.2 B	3 U
Selenium	50 (2)	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U
Silver	40 (4)	1.8 U	1.8 U	1.8 U	1.8 U	1.8 U	1.8 U	1.8 U	1.8 U	1.8 U	1.8 U
Sodium	20,000	696 B	7,190	3,240 B	841 B	7,840	**21,600**	**20,900**	1,470 B	**32,000**	9,910
Zinc	2,000 (4)	1.9 B	3.6 U	7 B	4.7 B	1.6 U	5 B	3.6 B	2.5 B	3.1 B	16.4 B
GENERAL CHEMISTRY											
Alkalinity as $CaCO_3$	-	7,600 UJ	58,100 UJ	41,100 UJ	17,600 UJ	191,000 J	201,000 J	207,000 J	32,700 UJ	277,000 J	147,000 J
Biochemical Oxygen Demand	-	1,100 U	1,100 U	1,300	1,100 U	1,100 U	1,400	1,100 U	1,100 U	1,100 U	1,300
Chemical Oxygen Demand	-	20,000 U	20,000 U	20,000 U	20,000 U	20,000 U	20,000 U	20,000 U	20,000 U	20,000 U	20,000 U
Chloride	-	690 U	8,800	6,400	1,100 U	24,300	23,900	22,900	1,100 U	31,700	15,000
Cyanide (Total)	200 (2)	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Hardness as $CaCO_3$	-	5,800	49,800	38,900	17,400	209,000	127,000	123,000	26,500	254,000	149,000
Nitrate as Nitrogen	10,000 (2)	370 U	440 U	200 U	430 U	330 U	420 U	410 U	480 U	550 U	520 U
Sulfate	500,000 (2)	3,900	7,300	910 U	3,000	23,600	880 U	1,200 U	8,900	11,700	8,700
Total Dissolved Solids	-	21,000	81,000	77,000	28,000	270,000	585,000 *	297,000	56,000	362,000	200,000
Total Organic Carbon	-	1,000 U	1,700	6,000	1,000 U	1,000 U	3,600	4,800	1,100	3,000	4,300
Total Suspended Solids	-	1,700	1,200	1,600	500 U	500 U	33,100	41,800	5,000	7,900	1,600
FIELD READINGS (units as noted below)											
Dissolved Oxygen (mg/L)	-	11.2	0.8	0.3	11.2	0.7	0.5	0.5	1.9	0.3	1.0
Oxidation Reduction Potential (mv)	-	176	122	153	211	249	-7	-7	69	-1	-23
pH	-	6.6	5.6	4.2	6.4	7.3	EF	EF	4.9	6.2	6.8
Specific Conductivity (µS/cm)	-	18	141	94	29	433	548	548	88	586	292

Notes:

Shaded areas with bold numbers indicate cleanup level exceedance -
B = (Inorganics) value below laboratory RL but above the IDL
J = estimated value
* = duplicate analysis Relative Percent Difference outside acceptance limits
U = below laboratory RL
NS = not sampled
NA = not analyzed

EF = equipment failure
(1) Cleanup values as developed in the ROD (unless otherwised noted).
(2) No cleanup value was developed so the Federal Maximum Contamination Level was used.
(3) No cleanup value was developed so the Massachusetts Maximum Contamination Level was used.
(4) No cleanup value was developed so the Massachusetts Contingency Plan GW-1 standard was used.
(5) The LTMMP listed a cleanup goal of 1,715 ug/L. This level has been in use by USACE in past years.
The ROD indicated a cleanup goal of 291 ug/L. As there was no ESD prepared,
the ROD value iscurrently reflected in this table.

Table 7-3
Groundwater Analytical Results (ug/L)
January 19, 20, and 25, 2006 Sampling Event
Shelpey's Hill Landfill Compliance Point Wells
Devens, Massachusetts

Parameters	Cleanup Level (1)	Monitoring Well ID													
		SHL-4	SHL-5	SHM-96-5B	SHM-96-5B DUP	SHM-96-5C	SHL-9	SHL-10	SHM96-10C	SHL-11	SHL-19	SHL-20	SHL-22	SHM-96-22B	SHM-93-22C
Volatile Organics (8260B)															
1,1-Dichloroethane	70 (4)	0.75 U	0.75 U	1.0	1.0	1.0	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	1.4	1.3	0.75 U
1,2-Dichlorobenzene	600	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
1,2-Dichloroethane	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,3-Dichlorobenzene	600 (2)	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
1,4-Dichlorobenzene	5	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
2-Butanone	-	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	32
4-Methyl-2-pentanone	-	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Acetone	3,000 (4)	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Benzene	5 (2)	0.5 U	0.5 U	0.94	0.94	1.6	0.5 U	0.5 U	0.5 U	1.4	0.5 U	1.1	0.5 U	1.1	0.5 U
Chlorobenzene		0.5 U	0.5 U	0.84	0.88	2.6	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.72	0.5 U
Chloroform		0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U
Ethyl ether		2.5 U	2.5 U	17	17	18	2.5 U	2.5 U	6.7	15	2.5 U	11	19	17	8.2
Methyl tert butyl ether	70 (4)	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Methylene chloride (6)		5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Tetrahydrofuran		10 U	10 U	10 U	10 U	88	10 U	10 U	10 U	10 U	10 U	10 U	140	10 U	33
Vinyl chloride		1.0 U	1.0 U	1.0 U	1.0 U	1.1	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Xylenes (total)	10,000 (2)	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloroethene (Total)	70 (2)	0.75 U	0.75 U	2.1	2.1	2.2	0.75 U	0.75 U	0.75 U	1.2	0.75 U	0.6	1.9	2.5	0.75 U
Total Metals (6010B or as noted)															
Aluminum, Total	6,870	100 U	170	100 U	100 U	100 U	110	100 U	470	100 U	100 U	100 U	100 U	100 U	100 U
Arsenic, Total	50	5 U	5.0 U	**4,130**	**4,190**	43	18	5.0 U	11	**567**	**156**	**189**	**154**	**3,320**	23
Barium, Total	2,000 (2)	10	10	50	50	70	10 U	10 U	10 U	70	10	90	10	70	90
Cadmium, Total	5 (2)	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Chromium, Total	100	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Copper, Total	1,300 (2)	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Iron, Total	9,100	280	2,600	**39,000**	**40,000**	**100,000**	4,400	50 U	490	**57,000**	**13,000**	5,500	650	**70,000**	740
Lead, Total	15	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Manganese, Total	291 (5)	200	**500**	**7,500**	**7,600**	**4,600**	**310**	10 U	60	**2,400**	**980**	**5,500**	**2,600**	**1,700**	250
Mercury, Total (7470A)	2 (2)	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel, Total	100	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U
Selenium	50 (2)	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Silver, Total	40 (4)	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U
Sodium, Total	20,000	2,000 U	2,500	**28,000**	**28,000**	**40,000**	2,000	2,000 U	9,500	**24,000**	2,000 U	**29,000**	**40,000**	**31,000**	13,000
Zinc, Total	2,000 (4)	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U
Genearl Chemistry															
Alkalinity, Total	-	17	29	320	330	440	54	14	180	260	35	250	380	320	160
Solids, Total Dissolved	-	25,000	70,000	320,000	340,000	440,000	130,000	25,000	240,000	210,000	73,000	270,000	450,000	300,000	230,000
Solids, Total Suspended	-	5,000 U	5,000 U	59,000	62,000	110,000	5,000 U	6,400	6,700	28,000	33,000	8,500	5,000 U	87,000	9,800
Cyanide, Total	200 (2)	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chloride	-	1,000	2,200	21,000	21,000	51,000	6,200	1,200	21,000	22,000	1,000 U	24,000	32,000	23,000	18,000
Nitrogen, Nitrate	10,000 (2)	700	620	220	190	240	100 U	200	100 U	190	100 U	100 U	4,200	210	110
Sulfate	500,000 (2)	10,000 U	24,000	10,000 U	10,000 U	10,000 U	10,000 U	10,000 U	22,000	10,000 U	10,000 U	10,000 U	10,000 U	10,000 U	10,000 U
Chemical Oxygen Demand	(5)	20,000 U	33,000	26,000	29,000	45,000	20,000 U	20,000 U	20,000 U	24,000	20000 U	20,000	20,000 U	26,000	20,000 U
BOD, 5 day	-	2,000 U	2,000 U	2,900	2,000 U	5,000 U	2,000 U	2,000 U	2,000 U	8,200	2,000 U	2,000 U	2,000 U	4,800	2,000 U
Total Organic Carbon	-	850	4,800	4,500	4,400	8,900	6,000	500 U	760	3,800	1,000	3,000	4,000	5,300	4,500
Hardness	-	16,000	43,000	220,000	220,000	270,000	57,000	13,000	200,000	130,000	35,000	180,000	320,000	190,000	160,000
Field Readings (units as noted)															
Dissolved Oxygen (mg/L)	-	5.28	0.65	0.22		0.15	0.45	6.71	0.01	0.63	2.42	0.2	0.16	0.17	0.73
Oxidation Reduction Potential (mv)	-	412	425.2	-82.1		-85.9	-23.4	330.4	228.2	3.7	282.9	-0.2	208.2	-114.0	-235.1
pH	-	5.81	5.2	6.53		6.49	5.92	6.04	7.4	6.2	5.78	6.45	5.17	5.54	8.49
Specific Conductivity (uS/cm)	-	48	113	666		1035	141	39	450	689	120	634	744	730	375

NOTES:
Shaded areas with bold numbers indicate cleanup level exceedance
U = Analyte or compound was analyzed but not detected at a concentration above the reporting limit.
(1) Cleanup values as developed in the ROD (unless otherwise noted)
(2) No cleanup value was developed so the Federal Maximum Contamination Level was used.
(4) No cleanup value was developed so the Massachusetts Contingency Plan GW-1 standard was used.
(5) The LTMMP listed a cleanup goal of 1,715 ug/L. This level has been in use by the USACE in past years. The ROD indicated a cleanup goal of 291 ug/L. As there was no ESD prepared, the ROD value is currently reflected in this table.
(6) Methylene Chloride was detected in the equipment blank a concentration of 8.5 ug/L but not detected in any of the groundwater samples
(7) YSI 600 XLM failed, collected In-situ readings with a YSI 85 probe.

Table 7-4
Comparison of Historic Arsenic Concentrations (ug/L)
Shepley's Hill Landfill Compliance Point Wells
Devens, Massachusetts

Sample Date	Monitoring Well ID (group designation)						
	SHL-3 (1)	SHL-4 (2)	SHL-5 (1)	SHM-96-5B (2)	SHM-96-5C (2)	SHL-9 (1)	SHL-10 (2)
Aug-91	35.0	**260**	23.0	NS	NS	37.0	**67.0**
Dec-91	**120**	**140**	38.0	NS	NS	**67.0**	**120**
Mar-93	6.5	2.54	11.4	NS	NS	42.4	**280**
Jun-93	NS	NS	NS	NS	NS	NS	NS
Nov-96	NS	48.8	12.0	**1,440**	**71**	46.9	3.4 B
May-97	<10	**73.6** J	<10	**3,300** J	43.2	16.1 J	<10
Oct-97	<10	**180**	<10	**2,040**	43.1	25.2	**209**
May-98	<5	37.4	<5	**4,300**	49.5	15.0	<5
Nov-98	<5.4	**89.1**	11.5	**3,080**	46.8	27.2	<5.4
May-99	2.7 B	**78.2**	5.0 B	**3,490**	**57**	**71.3**	2.7 B
Nov-99	<1.9	**61.3**	6.5	**2,700**	44.8	28.5	<1.9
May-00	<2.5	**116**	<2.5	**5,110**	**52.2**	15.0	<2.5
Nov-00	17.4	**91.5**	13.8	**2,500**	40.3	31.4	<4.2
May-01	<4.1	**50.8**	13.8	**3,800**	**80.5**	15.1	<4.1
Oct-01	<1.5	**66.0**	14.8	**1,850**	41.1	28.1	<1.5
May-02	2.8 B	47.8 B	11.9 B	**3,800**	**50.4** B	**144**	4.0 B
Oct-02	<3.2	**66.1**	<3.2	**1,970**	41.3	29	<3.2
May-03	<4.7	26.6	7.3	**3,920**	**55.1**	13.4	<4.7
Nov-03	<4.1	13.4	4.7 B	**3,380**	48.3	30.6	<4.1
May-04	<2.6	27.2	7.4 B	**3,950**	47.1	19.8	<2.6
Nov-04	<5.8	19.5	6.8 B	**2,110**	49.5	32.2	<5.8
Jun-05	<4.5	10.1	7.0 B	NS	NS	NS	<4.5
Jan-06	NS	<5	<5	**4,130**	43.0	18.0	<5

Sample Date	Monitoring Well ID (group designation)						
	SHM-93-10C (1)	SHL-11 (2)	SHL-19 (2)	SHL-20 (2)	SHL-22 (1)	SHM-93-22B (2)	SHM-93-22C (1)
Aug-91	NS	**320**	**340**	**98**	27	NS	\
Dec-91	NS	**320**	**710**	**89**	25	NS	NS
Mar-93	21.3	**340**	**390**	**330**	32.9	NS	**68.9**
Jun-93	18.1	NS	NS	NS	NS	NS	49.8
Nov-96	12.4	**332**	**138**	**244**	24.8	**324**	44.6
May-97	<10	**252** J	<10	<10	<10	**318** J	40.4
Oct-97	10.5	**366**	**298**	**227**	34.8	**352**	<10
May-98	7.5	**346**	**77.5**	**238**	10.6	**365**	31.6
Nov-98	10.2	**376**	**145**	**218**	<5.4	**406**	**51.1**
May-99	10.8 B	**431**	**156**	**216**	12.2 B	**707**	42.8
Nov-99	8.7	**492**	**176**	**215**	7.3	**1,440**	33.2
May-00	5.9 J	**404**	**41.4**	**216**	14.6	**1,360**	34.4
Nov-00	8.8	**523**	**154**	**172**	45	**1,180**	47.8
May-01	6.9	**487**	**129**	**186**	47.6	**1,540**	19.7
Oct-01	10.1	**573**	**183**	**165**	44.2	**1,670**	31.6
May-02	11.0 B	**469**	**66.9**	**154**	**55.9** B	**2,040**	30.5 B
Oct-02	7.1	**648**	**164**	**175**	**77.1**	**159**	30.1
May-03	9.8	**498**	36.1	**197**	**101**	**2,070**	21.0
Nov-03	<5.2	**639**	**83.6**	**194**	**76.4**	**2,500**	29.8
May-04	7.2 B	**502**	**75**	**136**	**88.1**	**1,690**	27.8
Nov-04	10.6 B	**617**	**121**	**156**	**65.4**	**2,360**	34.9
Jun-05	8.1 B	**524**	26.3	**159**	NS	NS	15.8
Jan-06	11.0	**567**	**156**	**189**	**154**	**3,320**	23.0

Notes:
Bold Number indicates cleanup level exceedances (MCL cleanup level is 50 ug/L)
B = Value within five times of the greater amount detected in the equipment or preparation blank
J = Estimated value <5 = Concentration less than the indicated method detection limit
NS = Not Sampled

Table 7-5

Comparison of Historic Iron, Manganese, and Sodium Concentrations (ug/L)

Shelpey's Hill Landfill Compliance Point Wells

Devens, Massachusetts

Historical Concentrations for Iron (MCL is 9,100)

Sample Date	SHL-3 (1)	SHL-4 (2)	SHL-5 (1)	SHM-96-5B (2)	SHM-96-5C (2)	SHL-9 (1)	SHL-10 (2)	SHM-93-10C (1)	SHL-11 (2)	SHL-19 (2)	SHL-20 (2)	SHL-22 (1)	SHM-93-22B (2)	SHM-93-22C (1)
	Monitoring Well ID (group designation)													
May-02	30	1,520	1,110	**40,100**	**49,200**	**19,300**	<17.0	71	**55,400**	**13,900**	7,010	606	**92,000**	916
Oct-02	<22.6	4,380	1,120	**18,700**	44,800	8,430	<22.6	53	**64,500**	**27,600**	**9,100**	707	446	778
May-03	56	2,790	1,140	**37,400**	**78,900**	3,280	47	41	**62,200**	6,740	7,720	626	**88,600**	885
Nov-03	540	1,840	1,720	**32,000**	**63,200**	7,820	<45.0	<45.5	**68,700**	**15,400**	8,190	444	**87,000**	904
May-04	30 B	4,330	1,900	**29,000**	**71,100**	5,680	<19.2	32 B	**60,500**	**13,400**	5,640	541	**59,500**	1,010
Nov-04	<35.5	6,690	2,740	**21,600**	**55,400**	8,580	39 B	48 B	**63,000**	**20,000**	6,630	469	**82,900**	1,340
Jun-05	<37.9	1,220	2,930	NS	NS	NS	<37.9	<37.9	**59,400**	6,680	5,980	NS	NS	572
Jan-06	NS	280	2,600	**39,000**	**100,000**	4,400	<50	490	**57,000**	**13,000**	5,500	650	**70,000**	740

Historical Concentrations for Manganese (MCL is 291)

Sample Date	SHL-3 (1)	SHL-4 (2)	SHL-5 (1)	SHM-96-5B (2)	SHM-96-5C (2)	SHL-9 (1)	SHL-10 (2)	SHM-93-10C (1)	SHL-11 (2)	SHL-19 (2)	SHL-20 (2)	SHL-22 (1)	SHM-93-22B (2)	SHM-93-22C (1)
	Monitoring Well ID (group designation)													
May-02	14 B	**573**	289	**11,000**	**4,110**	**446**	1 B	45 B	**2,010**	**2,280**	**5,950**	**1,370**	**1,680**	**425**
Oct-02	<2.5	**436**	259	**13,000**	**4,110**	**484**	<2.5	47	**1,990**	**3,400**	**7,200**	**1,760**	12	**407**
May-03	2	**843**	273	**9,500**	**4,230**	**364**	1	37	**2,180**	**1,200**	**7,260**	**1,860**	**1,340**	**324**
Nov-03	20	**324**	340	**10,600**	**4,260**	**412**	<1.6	46	**3,030**	**2,100**	**7,760**	**2,110**	**1,950**	**425**
May-04	<1.9	**856**	332	**8,910**	**3,960**	**336**	<1.9	30	**2,340**	**1,510**	**6,560**	**1,960**	**798**	**368**
Nov-04	1 B	**1,240**	**439**	**10,800**	**3,970**	**373**	1 B	48	**2,570**	**2,950**	**5,630**	**2,460**	**1,590**	**385**
Jun-05	2 B	**361**	**476**	NS	NS	NS	2 B	28	**2,380**	**1,090**	**6,270**	NS	NS	218
Jan-06	NS	200	**500**	**7,500**	**4,600**	**310**	<10	60	**2,400**	**980**	**5,500**	**2,600**	**1,700**	250

Historical Concentrations for Sodium (MCL is 20,000)

Sample Date	SHL-3 (1)	SHL-4 (2)	SHL-5 (1)	SHM-96-5B (2)	SHM-96-5C (2)	SHL-9 (1)	SHL-10 (2)	SHM-93-10C (1)	SHL-11 (2)	SHL-19 (2)	SHL-20 (2)	SHL-22 (1)	SHM-93-22B (2)	SHM-93-22C (1)
	Monitoring Well ID (group designation)													
May-02	1,340 B	6,370	2,340 B	**38,600**	**34,000**	2,380 B	1,380 B	8,620	**27,600**	2,570 B	**34,000**	**43,700**	**35,900**	18,800
Oct-02	1,570	2,840	2,180	**36,200**	**35,400**	2,560	1,520	8,180	**29,800**	4,240	**35,600**	**45,500**	**114,000**	19,500
May-03	1,220	2,380	2,340	**32,600**	**32,000**	2,080	950	8,990	**31,100**	1,600	**36,800**	**43,400**	**37,300**	14,200
Nov-03	1,360 B	13,400	2,030 B	**33,500**	**34,800**	2,310 B	1,280 B	8,370	**27,000**	2,670	**35,800**	**42,700**	**36,300**	17,400
May-04	1,060 B	5,390	2,040 B	**31,000**	**30,000**	1,620 B	1,020 B	8,650	**22,500**	2,300 B	**33,300**	**40,900**	**56,900**	15,100
Nov-04	684 B	4,060	1,870 B	**32,200**	**32,200**	1,550 B	845 B	8,190	**22,800**	2,280 B	**31,900**	**41,900**	**34,300**	16,100
Jun-05	696	7,190	3,240 B	NS	NS	NS	841 B	7,840	**21,600**	1,470 B	**32,000**	NS	NS	9,910
Jan-06	NS	<2,000	2,500	**28,000**	**40,000**	2,000	<2,000	9,500	**24,000**	<2,000	**29,000**	**40,000**	**31,000**	13,000

Notes:

Bold Number indicates cleanup level exceedances (MCL cleanup level is 50 ug/L)

B = Value within five times of the greater amount detected in the equipment or preparation blank

<5 = Concentration less than the indicated method detection limit

NS = Not Sampled

Table 7-6
Monitoring Well Chemical Cleanup Level Exceedances At Monitoring Wells Previously Attaining Cleanup Goals (Group 1)
Shepley's Hill Landfill
Devens, Massachusetts

Monitoing Well Identification	**Well Designation** (Based on First Five-Year Review, SWEC, 8/98)	**Exceedances of Cleanup Levels for Triggering Chemicals, Since Achieving Group 1 Status**
SHL-3	Group 1	None
SHL-4	Group 2	Not Applicable
SHL-5	Group 1	None
SHL-9	Group 1	71.3 ug/L As (Spring 1999) 144 ug/L As (Spring 2002)
SHL-10	Group 2	Not Applicable
SHL-11	Group 2	Not Applicable
SHL-19	Group 2	Not Applicable
SHL-20	Group 2	Not Applicable
SHL-22	Group 1	55.9 B ug/L As (Spring 2002) 77.1 ug/L As (Fall 2002) 101 ug/L As (Spring 2003) 76.4 ug/L As (Fall 2003) 88.1 ug/L As (Spring 2004) 65.4 ug/L As (Fall 2004) 154 ug/L As (Winter 2005)
SHM-93-10C	Group 1	None
SHM-93-22C	Group 1	51.1 ug/L (Fall 1998)
SHM-96-5B	Group 2	Not Applicable
SHM-96-5C	Group 2	Not Applicable
SHM-96-22B	Group 2	Not Applicable

Notes:
As = Arsenic
B = Value was withing five times of the greater amount detected in the equipment or preparation blank samples

Table 8-1
Sample Preparation and Analysis Methods, Containers, Holding Times, and Preservatives
Shepley's Hill Landfill
Devens, Massachusetts

Parameters	Analysis Method Jun-05	Analysis Method Jan-06	Sample Container	Minimum Volume	Preservative	Holding Time
Volatile Organic Compounds	SW846 8260B	SW846 8260B	3 x 40 mL Vials with Teflon septa screw caps	40 mL	HCl to pH <2 No Headspace 4^{o} +/- 2^{o} C	14 Days
Metals, except Cyanide Mercury Hardness	SW846 6010B EPA Method 335.4 SW846 7470A SM 2340B	SW846 6010B SM 9014 SW846 7470A SM 2340B	1 Liter HDPE	300 mL	HNO3 to pH <2	180 Days (except Hg) 28 Days Hg
Cyanide	EPA Method 335.4	SM 9014	500 ml HDPE	500 mL	NaOH to pH >12 4^{o} +/- 2o C	14 Days
Anions Chloride Nitrate as N Sulfate Alkalinity Total Dissolved Solids	EPA 160.1 EPA 300.0 EPA 300.0 EPA 300.0 EPA 160.2 EPA 160.1	SM 2540C SM 9251 SM 4500NO3-F SM 9038B SM 2540D SM 2540C	500 mL HDPE	100 mL	4^{o} +/- 2^{o} C	 28 Days 48 Hours 28 Days 14 Days 48 Hours
Chemical Oxicdation Demand	EPA 410.1	SM 5220D	250 mL HDPE	250 mL	H2SO4 to pH <2 4^{o} +/- 2o C	28 Days
Biochemical Oxidation Demand - 5 Day	EPA 405.1	SM 5210B	1 Liter HDPE	1 Liter	4^{o} +/- 2^{o} C	48 Hours
Total Suspended Solids	EPA 160.2	SM 2540D	1 Liter HDPE	1 Liter	4^{o} +/- 2^{o} C	7 Days
Total Organic Carbon	SW 846 9060	SW 846 9060	3 x 40 mL Vials with Teflon septa screw caps	40 mL	H2SO4 to pH <2 4^{o} +/- 2o C	28 Days

Figures

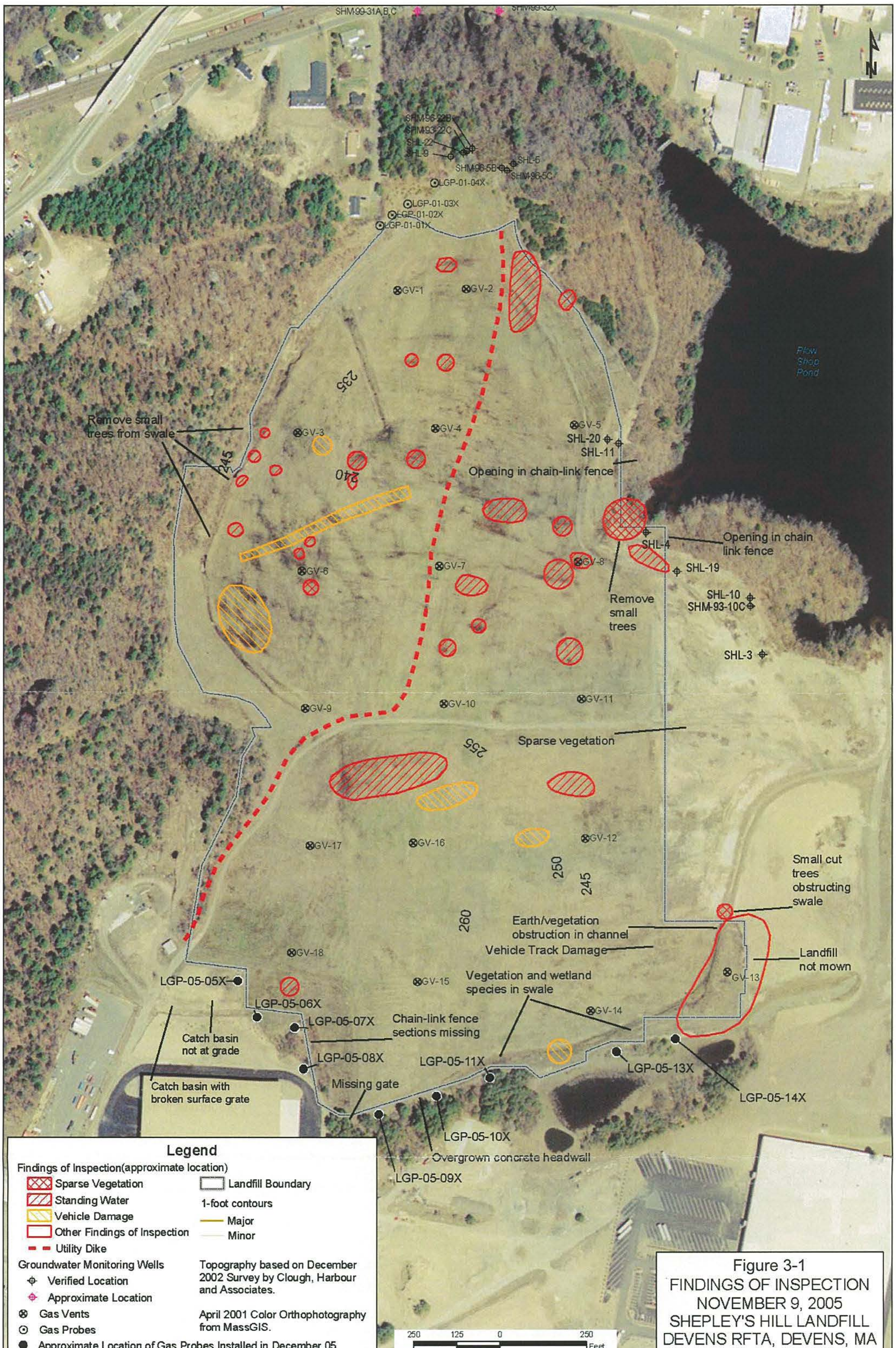
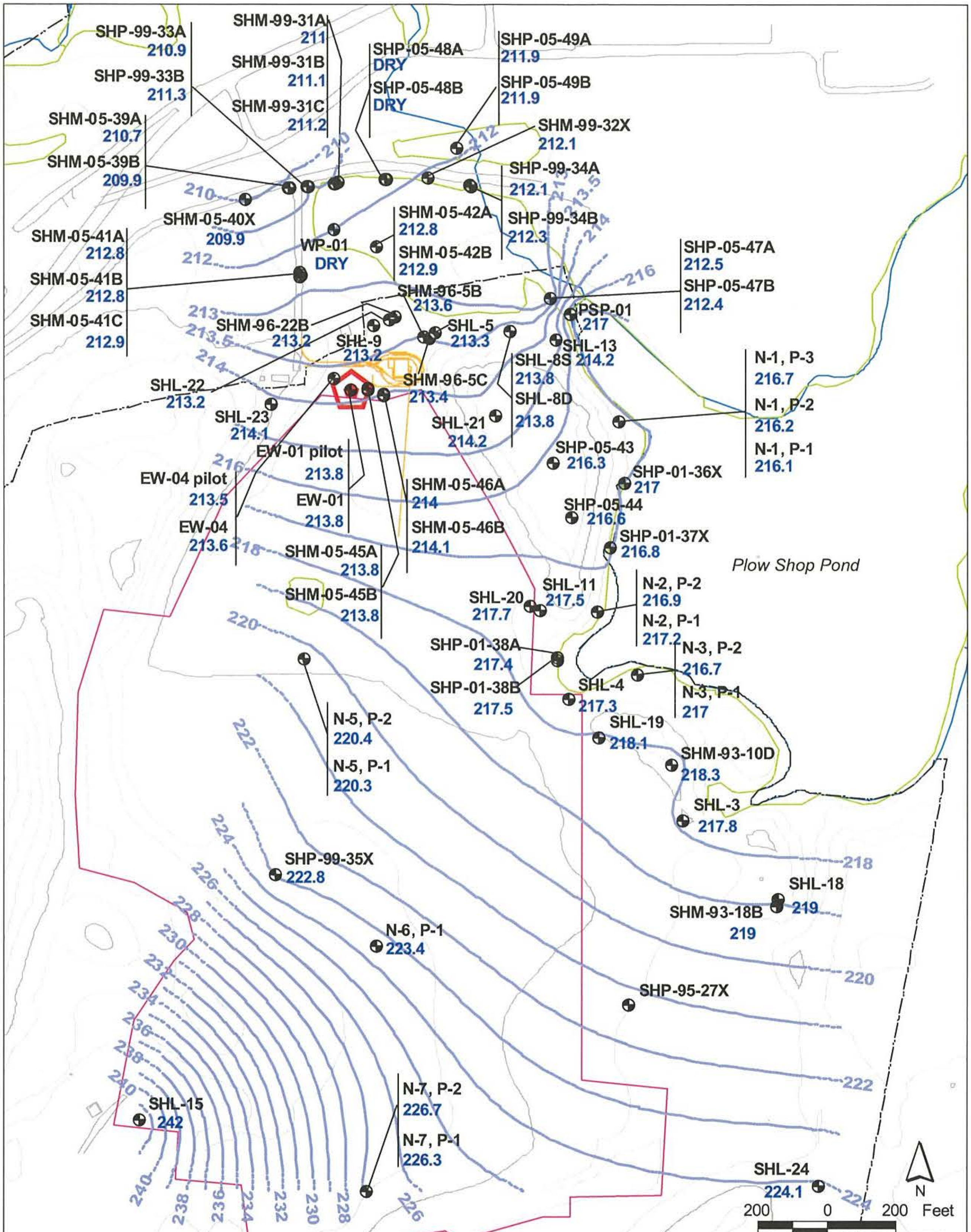


Figure 3-1
FINDINGS OF INSPECTION
NOVEMBER 9, 2005
SHEPLEY'S HILL LANDFILL
DEVENS RFTA, DEVENS, MA



LEGEND

Estimated Groundwater Elevation Contour
(dashed where inferred; in feet above mean sea level)

SHL-15 ← Location ID
242 ← Groundwater Elevation
Well, Piezometer, or Stage Board

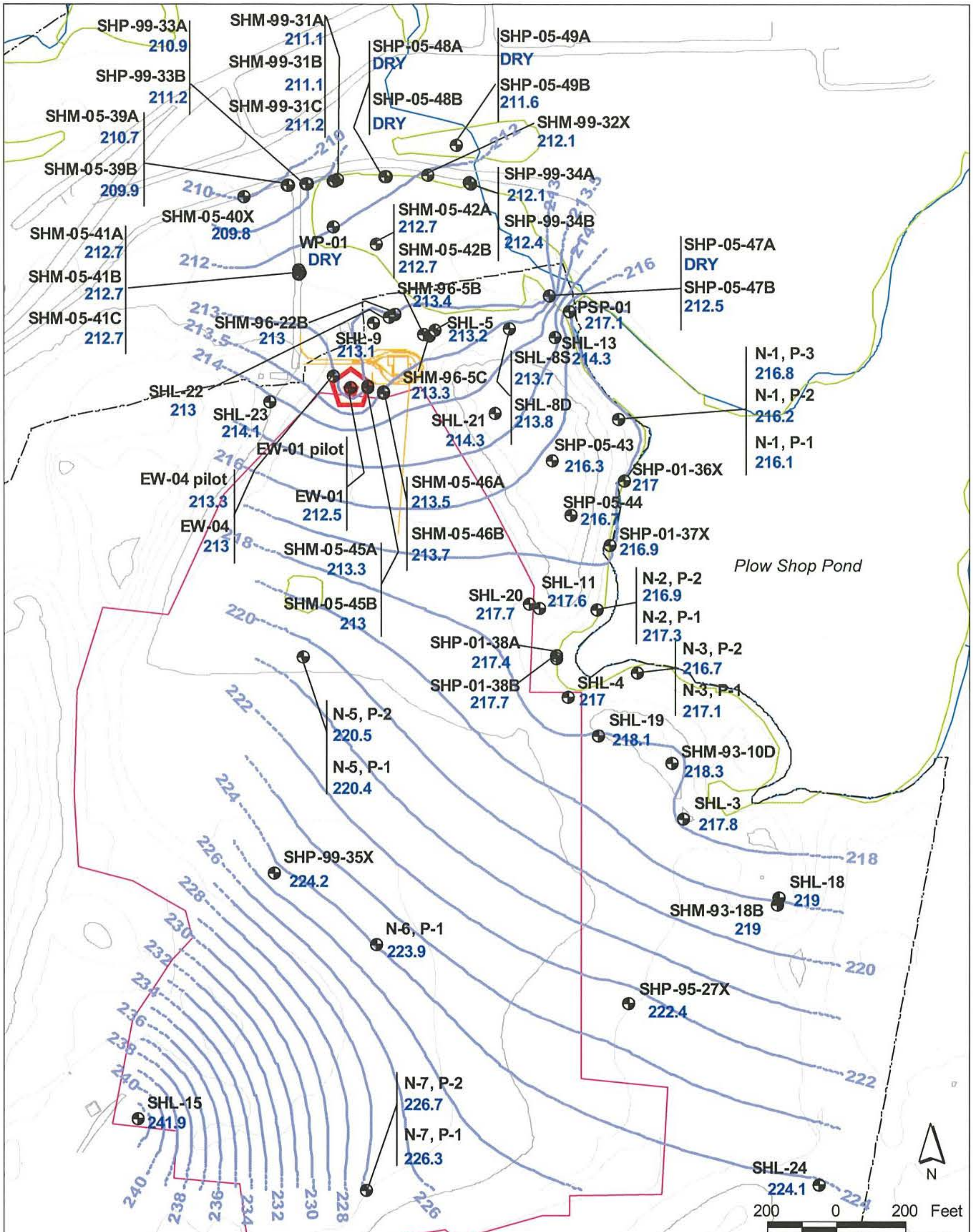
Test Well EW-01

Figure 5-1
Contour Map of Baseline (Pre-Test) Groundwater Elevations
Measured on August 24, 2005

Shepley's Hill Landfill, Fort Devens, MA

Contour Interval = 1 foot (except where noted)

CH2MHILL



LEGEND

Estimated Groundwater Elevation Contour
(dashed where inferred; in feet above mean sea level)

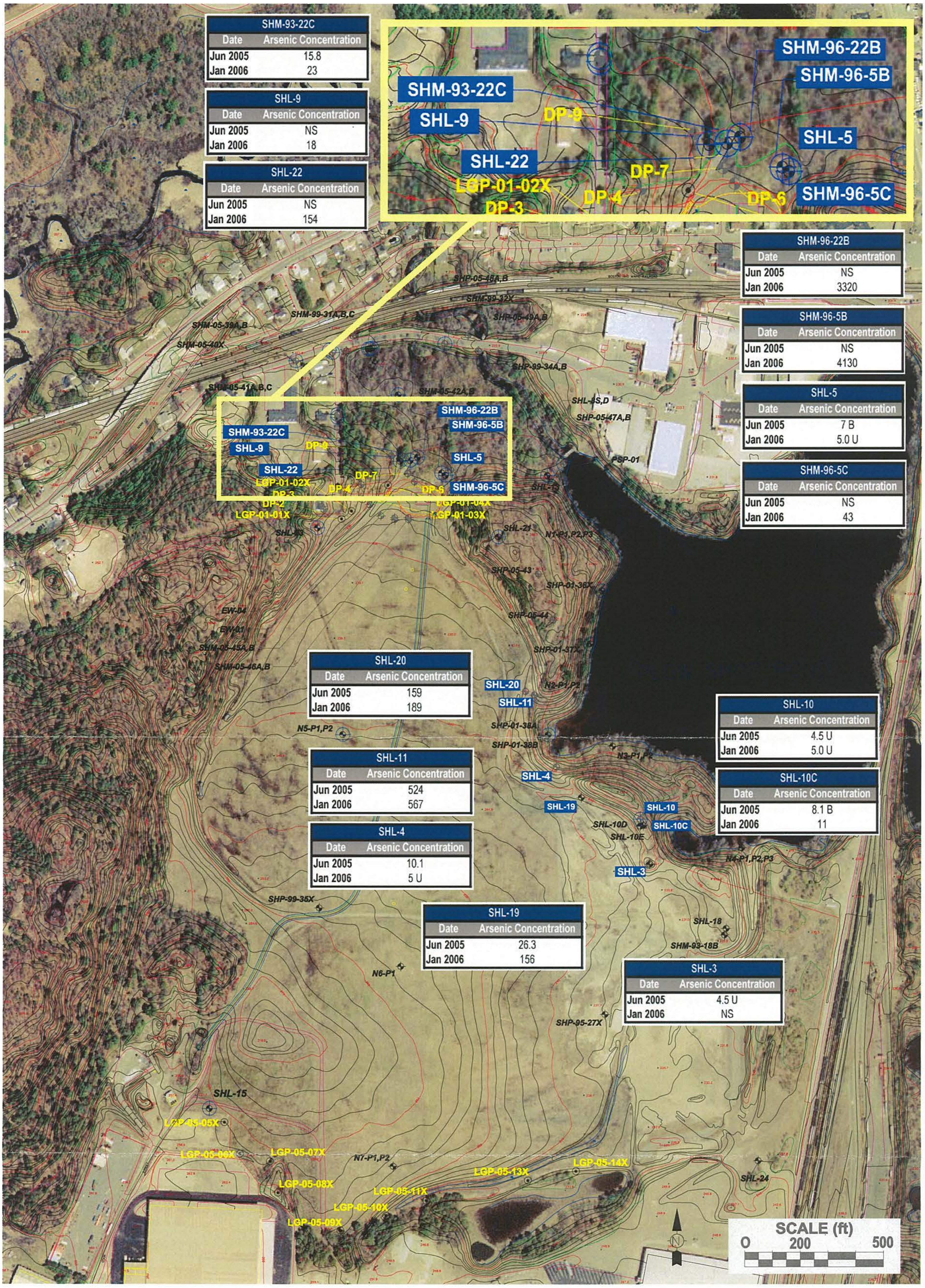
SHL-15 ← Location ID
242 ← Groundwater Elevation
← Well, Piezometer, or Stage Board

Test Well EW-01

Figure 5-2
Contour Map of Groundwater Elevations at Maximum Drawdown
Measured on August 26, 2005
August 25, 2005 Aquifer Pumping Test
Shepley's Hill Landfill, Fort Devens, MA

Contour Interval = 1 foot (except where noted)

CH2MHILL



LEGEND

- Long Term Monitoring Network (SHL-9)
- Permanent Gas Monitoring Probes (LGP-05-05X)

Note: Contingency Remedy performance monitoring network included for reference. Includes Hydraulic and Geochemistry monitoring.

FIGURE 7-1
Long Term Monitoring Network

CH2MHILL

Appendix A

Geotechnical Engineering Fall 2005 Annual Inspection Report

US Army Corps
of Engineers®
New England District

GEOTECHNICAL ENGINEERING
FALL 2005 ANNUAL
INSPECTION REPORT

SHEPLEY'S HILL LANDFILL
FORMER FORT DEVENS
DEVENS, MASSACHUSETTS

March 2006

1.0 BACKGROUND

Shepley's Hill Landfill encompasses approximately 84 acres in the northeast corner of the main post of the former Fort Devens, Massachusetts (Figure 1). The landfill is bordered to the northeast by Plow Shop Pond, to the north by Nonacoicus Brook (which drains the pond), to the west by Shepley's Hill, to the south by recent commercial development, and to the east by the site of a former railroad roundhouse.

The landfill was reportedly operating by the early 1940s, and evidence from test pits within the landfill suggests earlier usage, possibly as early as the mid-nineteenth century. The landfill contains a variety of waste materials, including incinerator ash, demolition debris, asbestos, sanitary wastes, spent shell casings, glass, and other wastes. The maximum depth of the refuse occurs in the central portion of the landfill and is estimated to be about 40 feet. The volume of waste in the landfill has been estimated at over 1.3×10^6 cubic yards (cy), of which approximately 25 percent is below the water table.

The landfill was closed in five phases between 1987 and 1992-93 in accordance with Massachusetts regulations 310 CMR 19.000 (1985). The Massachusetts Department of Environmental Protection (MADEP) approved the closure plan in 1985. Closure consisted of installing a 30/40-mil polyvinyl chloride (PVC) membrane cap, covered with soil and vegetation and incorporating gas vents. Closure also included installation of wells to monitor groundwater quality around the landfill, and construction of a storm drainage system to control surface water runoff. MADEP issued a Landfill Capping Compliance Letter approving the closure in February 1996.

The ROD outlined the remediation objectives for the site (USEPA, 1995). It requires the Army to monitor groundwater, inspect and maintain the landfill, and prepare annual reports. It also requires that the Army review the effectiveness of the remedy every five years.

2.0 LANDFILL CAP MONITORING ACTIVITIES

The Shepley's Hill Landfill at Devens, Massachusetts was inspected on 8 and 9 November 2005 by personnel from the U.S. Army Corps of Engineers, New England District (NAE). Features of the landfill inspected included the cap, the drainage system, the gas vent system, access roads, and the security fence. Observations were made regarding the vegetative cover, vegetation types, erosion, settlement, and general condition of the various features. A comprehensive site assessment is currently being conducted to assess the effectiveness of the landfill cap. Appendix A of this report contains the Landfill Maintenance Checklist that summarizes the findings of this inspection. All observations are also presented on Figure 1. A narrative of the findings of this inspection follows.

- Catch Basin #3 near the Cooke Street entrance to the site is not set at grade. Soil excavation in this area has left the rim of the grate about six to eight inches higher than the surrounding ground. The rim of this catch basin should be lowered to the surrounding grade.

- The concrete headwall drainage structure at the terminus of the catch basin and underground conduit system on the south side is overgrown with vegetation and is silting in (Photo 1). The grade of the channel bottom is uneven and standing water is present. Wetland species are becoming established as well. The entire southern swale should be cleared, accumulated sediment should be removed, and the channel should be regraded as required to properly drain. The channel should then be revegetated.

- Ponded areas of standing water are present at numerous locations across the landfill surface. See Figure 1 and Photos 2, 3 and 5.

- The northern reaches of the eastern drainage swale have some minor vegetation growth and sand accumulation. The swale should be cleared of vegetation and sand.

- East of gas vents 8, 11 and 12, the perimeter of the cap has some areas of erosion and sparse vegetation. The soil in these areas is comprised predominantly of sand. The areas should be graded to fill in the eroded areas and topsoil should be placed to a depth of 6 inches over the sand to allow grass to grow. The grass should extend at least twenty feet past the limits of the cap.

- The access roads on the site are in good condition. There are no problems on access roads that warrant repair at this time.

- Portions of the perimeter chain-link security fence are in poor condition. Fence sections and gates are missing and unrestricted access to the site is available at several locations. Some evidence of off-road vehicles (trucks, ATV's, dirt bikes, etc. see photo 3) using the cap area was seen. On the east side near monitoring well SHL-11, the fence has been rolled back and is open. A gate and lock should be added here if permanent access is required. There are also several other locations around Plow Shop Pond (see Photo 4) which provide unrestricted access. The security fence should be repaired, with all missing fence sections, including gates, replaced or repaired.

- The gas monitoring probes at the northwest edge of the landfill are in excellent condition, with locked, steel caps. The gas vents are in good condition. All screens and pipes are in functional condition. The older gas vents, painted yellow, are showing signs of age, with rusting/corrosion evident (See Photo 7). They should be scraped, cleaned, and repainted.

- A summary of Corrective Action measures for the Landfill Cap are included in Section 4.0.

3.0 LANDFILL GAS MONITORING RESULTS

The purpose of the landfill gas monitoring program is to establish long-term trends with regard to gas production and venting. A combustible gas survey was performed to determine whether methane, hydrogen sulfide, or volatile organic compounds have accumulated in the subsurface of the landfill site or are migrating off-site. Four landfill perimeter gas monitoring probes were installed on 7 November 2001 on the northern side of the landfill. The purpose of the probes is to monitor potential landfill gas migration from Shepley's Hill Landfill towards Sculley Road. Following this inspection, ten more probes were installed on the the southern perimeter of the landfill and will be available for the next annual report

The annual landfill gas sampling was conducted on 8 and 9 November 2005. The weather was sunny, with temperatures in the 50's (F) and the barometric pressure was 29.9 inches of mercury and rising. Gas samples were field analyzed for the following parameters using the listed equipment:

Parameter	Equipment
Total Volatile Organic Compounds (VOC)	Thermo Environmental 580B (PID) with a 10.6 eV lamp
Percent Oxygen	Landtec GEM 500 landfill gas monitor
Hydrogen Sulfide (ppm)	Industrial Scientific TMX 412 CGI
Percent Lower Explosive Limit (LEL)	Industrial Scientific TMX 412 CGI
Carbon Monoxide (ppm)	Industrial Scientific TMX 412 CGI
Percent Carbon Dioxide	Landtec GEM 500 landfill gas monitor
Percent Methane	Landtec GEM 500 landfill gas monitor

The TMX 412, PID and the GEM 500 were all calibrated in the shop by U.S. Environmental. Samples were collected by attaching a rubber Quik cap with a hose clamp to the gas vent pipe. A barbed fitting was placed in a drilled hole in the cap. Tubing was run from the barbed fitting to a SKC224-PCXRE air pump. The pump was operated for approximately 7 to 10 minutes to purge 2 vent pipe volumes and to ensure that the gases collected were representative of the gas collection layer. The gas monitoring equipment was then attached to the pump and turned on. The readings were recorded on the Landfill Gas Monitoring form (Appendix B) after they had stabilized. The locations of the gas vents are shown in Figure 1.

The results from the monitoring event can be found on Table 1 in Appendix B. The following is a brief summary of the results. The perimeter landfill gas monitoring probes (LGP-01, LGP-02, LGP-03, LGP-04) tested negative for VOC's, hydrogen sulfide, carbon monoxide, and methane. Minimal levels of carbon dioxide were detected, ranging from 0.6 % at LGP-04 to 2.2 % at LGP-02. Oxygen levels ranged from 19.2 % at LGP-02 to 20.3% at LGP-01 and LGP-04.

The following summarizes the gas vent readings. VOCs were not detected in any of the gas vents. The oxygen levels ranged from 0% (Vent # 9, 16,17) to 21.0% (Vent # 15) using the GEM 500. No hydrogen sulfide was detected in any of the gas vents. Methane LEL readings ranged from 0% at V-15 and V-18 to over 100% LEL in many of the vents. No carbon monoxide was detected in any of the gas vents except for V-16 and V-17, which had readings of 2 and 3 ppm, respectively. Carbon dioxide ranged from 0 % (Vent # 15, 18) to 27.0 % at Vent #17. Methane ranged from 0 % (Vent # 15,18) to 32.7 % at Vent #17.

The gas readings are within the parameters of a mature landfill. The vents are functioning properly. The scenario of high atmospheric pressure to low atmospheric pressure results in a venting of landfill gas into the atmosphere. The scenario of low atmospheric pressure to high atmospheric pressure results in air intrusion into the upper portion of the landfill. The scenario during this inspection was most likely the latter, as barometric pressure was rising during the inspection. The major concern with landfill gas is off-site migration. If the gas vents are functioning properly and are adequately spaced there should not be off-site migration of landfill gases; however, due to the high LEL readings and the proximity of residential housing and commercial development, gas monitoring probes should be installed along the property line where the landfill is adjacent to structures (note that this has been done at the northern end near Sculley Road). Gas monitoring probes should also be installed at the southern perimeter of the site along the commercial properties. The LEL readings along the southern perimeter have consistently registered high LEL readings in the past, and were sometimes above 100%. As of the date of this inspection, 10 landfill gas probes were planned to be installed on the southern perimeter of the landfill and will be available for analysis for the next annual inspection.

4.0 CORRECTIVE ACTION

An upcoming Comprehensive Site Assessment will assess the adequacy of the landfill. Following the CSA, a Corrective Action Alternatives Analysis will be conducted to identify any remedial repairs required. Implementation of the selected options (if required based on the outcome of the CAAA) should improve the drainage and function of the landfill cap. The following items should be addressed before the next inspection or as provided for in the final recommendations in the report cited above: (1) Repair and replace the security fence and gates as required to control access to the site; (2) Place topsoil and seed over the sandy area lacking vegetation on the east side along the perimeter of the cap. Along with the corrective actions listed above, it is recommended to (1) Install additional landfill gas monitoring probes along the commercial property at the south side of the landfill (the probes were installed in November 05, after this inspection) (2) Repair and regrade around the catch basins on the south side of the landfill. With the exception of the repairs mentioned above, and the other repairs recommended in the report, the landfill is in fair condition and appears to be functioning adequately.

FIGURE

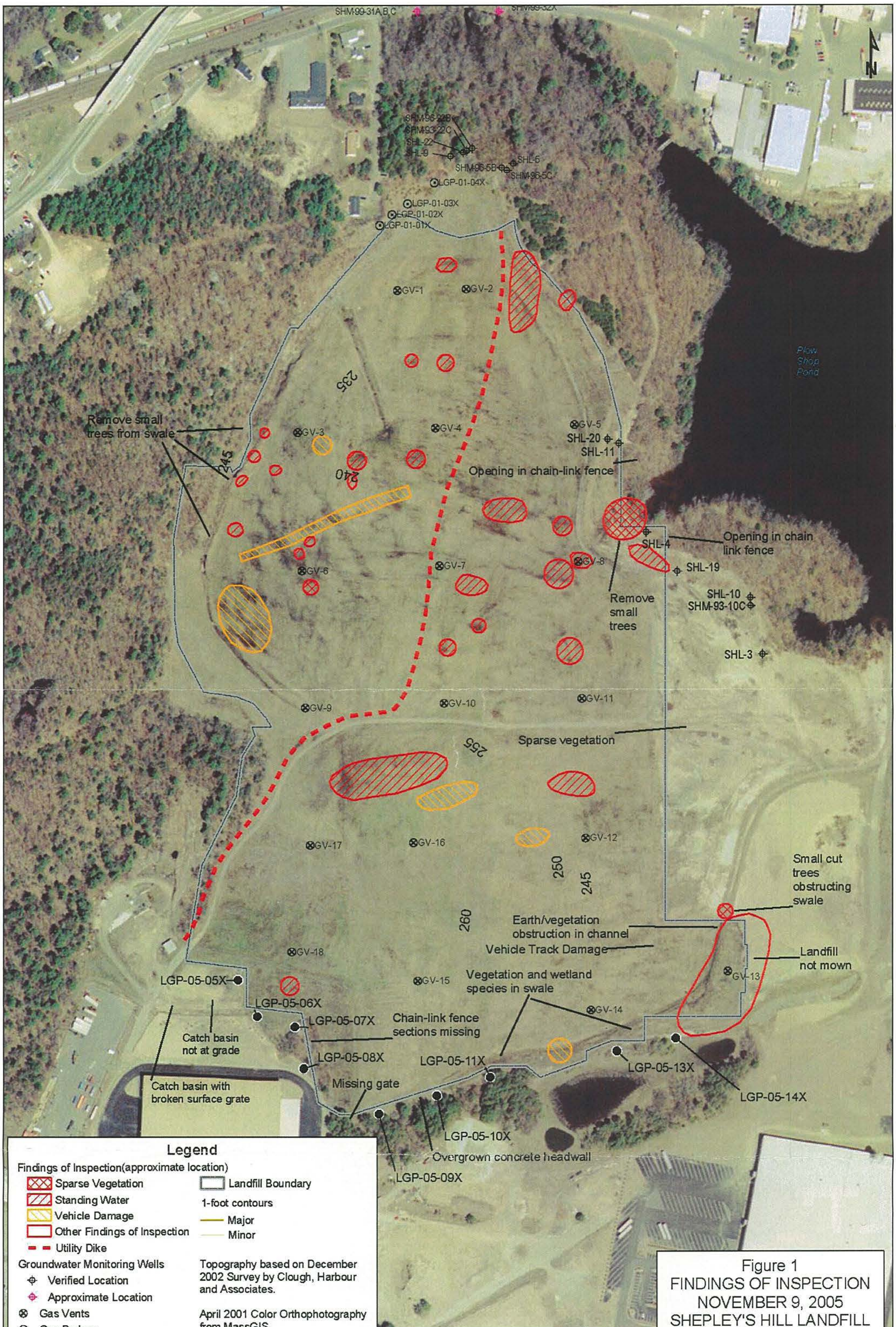


Figure 1
FINDINGS OF INSPECTION
NOVEMBER 9, 2005
SHEPLEY'S HILL LANDFILL
DEVENS RFTA, DEVENS, MA

PHOTOGRAPH LOG

Index of Photographs

Photo 1

Photo 2

Photo 3

Photo 4

Photo 5

Photo 6

Photo 7

APPENDIX A

Inspection & Maintenance Check List

Geotechnical Engineering
Shepley's Hill Landfill
Fall 2005 Annual Inspection Report

DATE: 8 November 2005
INSPECTOR: Kullberg/Michalak

LANDFILL ATTRIBUTE	OBSERVATIONS	RECOMMENDATIONS	SAT/ UNSAT
Cover Surface	1. Vegetative cover is generally satisfactory except as noted in the comments that follow. Various species growing; mowed to about 8 inches height (see Photo 6).	1. See specific comments under the sections that follow.	SAT
	2. There are several areas where settlement has occurred.	2. A Comprehensive Site Assessment (CSA) is being conducted to address this condition.	SAT
	3. Trees were removed in the fall of 2002 & 2004 in the vicinity of GV-13, the southern perimeter, and the eastern perimeter, and have not reestablished.	3. Monitor for tree growth in future	SAT
	4. A utility berm was constructed through the middle of the landfill in 2004. It provides utility service to a newly constructed pumping station at the northeastern corner of the landfill.	4.Observe effect on drainage patterns in the vicinity of the utility berm during future inspections. This may be investigated as part of the ongoing CSA.	NA
	5. Several areas on the landfill have sustained damage by trespassing vehicles, and in some cases damage by lawn mowing equipment (Photo 3).	5. Damaged areas should be repaired as soon as possible.	UNSAT
Vegetative Growth	1. In the vicinity of gas vents 8, 11 and 12, the perimeter of the cap has some areas of sparse/eroded vegetation. The soil in the bare areas is mostly sand and is eroded in some areas. The area should be graded to fill in the eroded areas and topsoil should be placed to a depth of 6 inches over the sand to allow grass to grow. The grass cover should extend at least twenty feet beyond the limits of the cap.	1. This area should be reseeded, with hay or straw placed on the surface, to prevent further erosion. This area to be considered as part of the CSA.	UNSAT
Landfill Gas Vent Wells	1. The gas vents are in good condition. All screens and pipes are in functional condition. All of the non-galvanized vents are showing signs of rusting and corrosion. These include all gas vents except for V-12 through V-15.	1. All of the nongalvanized vents should be scraped, cleaned and painted.	SAT

LANDFILL ATTRIBUTE	OBSERVATIONS	RECOMMENDATIONS	SAT/ UNSAT
Drainage Swales	1. Most of the drainage swale on the south side is being invaded by vegetation/wetland species. There are also intermittent zones of standing water indicating a lack of proper channel slope and drainage. 2. In the south east side drainage swale, in the vicinity of gas vent #13 and continuing downstream to the rip rap - lined channel, the drainage swale is overgrown with vegetation and wetland species. It appears to be heavily silted in and has a large area of standing water. There is an earth and vegetation obstruction just upstream of the new rock section preventing the drainage of water and turning the channel into a pond.	1. The swale should be cleared of vegetation, accumulated sediment, and debris. The swale should then be regraded to promote adequate drainage. 2. The swale should be cleared of vegetation, accumulated sediment, and debris. The swale should then be regraded to promote adequate drainage.	UNSAT UNSAT
Culverts	1. The concrete drainage structure at the terminus of the catch basin and underground conduit system on the southwest side is overgrown with vegetation and is silting in. Standing water is present and wetland species are becoming established as well.	1. The structure and channel immediately downstream should be cleaned out and the channel regraded as required to properly drain.	UNSAT
Catch Basins	1. Catch Basin #2 near the entrance to the site has a broken surface grate. 2. Catch Basin #3 near the entrance to the site is not set at grade. The rim of the basin is about six to eight inches higher than the surrounding ground.	1. The surface grate should be replaced. 2. The rim of this catch basin should be lowered to meet the surrounding grade.	UNSAT UNSAT

Settlement	1. It appears that many areas of the landfill may be settling. The extent and its effect on the function of the landfill is unknown	1 A Comprehensive Site Assessment is underway to address this condition.	SAT
Erosion	1. No substantial erosion observed.		SAT
Access Roads	1. The access roads on the site are in good condition.	1. There are no problems on access roads which warrant repair at this time.	SAT
Security Fencing	1. The perimeter chain-link security fence is in poor condition. Fence sections and gates are missing and unrestricted access to the site is available at many locations. Some damage to the cap by off-road vehicles (trucks, ATV's, dirt bikes, etc.) using the turfed cap areas was observed.	1. The security fence should be repaired/replaced and extended. This work is currently planned under the maintenance work underway at the landfill.	UNSAT
Wetland Encroachment	1. Wetland encroachment is taking place at several locations, but is not happening on a wide scale. Overall, the areas of encroachment are small. These locations have been noted in above comments.	1. Wetland encroachment should be eliminated by simple mowing in some areas, and by regrading channels in other areas. The above comments address the actions to take at specific locations. A CSA is underway to address this concern at the landfill.	UNSAT

Immediate Action Required: The following problem areas, from among those mentioned in the comments above, are the most critical and should be addressed before the next inspection;

(1) Repair and replace the security fence and gates as required to control access to the site;
(2) Repair damage to cap caused by trespassers and lawn mowing equipment.

SAT – Satisfactory
UNSAT- Unsatisfactory
NA – Not Applicable

APPENDIX B

Landfill Gas Monitoring

APPENDIX B
Landfill Gas Monitoring
Table 1

INSPECTOR: Kullberg/ Michalak TITLE: Civil Engineer DATE: 11/08/05

ORGANIZATION: CENAE-EP WEATHER: Sunny, 55 d F BAROMETER: 29.9 in Hg and rising.

Vent No.	VOC ppm PID	O_2 % GEM 500	H_2S ppm ISTMX	LEL % ISTMX	CO ppm ISTMX	CO_2 % GEM 500	CH4 % GEM 500	Remarks
V-1	0	5.6	0	32	0	10.8	1.7	CGI O2 – 6.9
V-2	0	5.2	0	>100	0	12.8	8.6	CGI O2 – 13.4
V-3	0	2.8	0	>100	0	15.1	9.0	CGI O2 – 3.6
V-4	0	6.4	0	50	0	10.6	4.3	CGI O2 – 12.7
V-5	0	10.4	0	11	0	7.7	1.4	CGI O2 – 17.1
V-6	0	0.4	0	>100	0	18.9	12.5	CGI O2 – 12.9
V-7	0	2.1	0	14	0	12.2	4.4	CGI O2 – 17.6
V-8	0	8.3	0	25	0	8.9	4.2	CGI O2 – 15.8
V-9	0	0	0	>100	0	21.8	26.4	CGI O2 – 9.0
V-10	0	0.6	0	>100	0	14.8	10.3	CGI O2 – 9.3
V-11	0	10.1	0	12	0	6.4	2.2	CGI O2 – 18.4
V-12	0	2.8	0	>100	0	9.4	6.4	CGI O2 – 4.7
V-13	0	20.2	0	25	0	0.5	0.5	CGI O2 – 19.1
V-14	0	20.7	0	6	0	0.2	0.3	CGI O2 – 20.9
V-15	0	20.9	0	0	0	0	0	CGI O2 – 21.0
V-16	0	0	0	>100	2	23.7	20.7	CGI O2 – 0.3
V-17	0	0	0	>100	3	27	32.7	CGI O2 – 0.2
V-18	0	21.0	0	0	0	0	0	CGI O2 – 20.9
LGP-1	0	20.3	0	0	0	0.7	0	CGI O2 – 20.7
LGP-2	0	19.2	0	0	0	2.2	0	CGI O2 – 19.6
LGP-3	0	19.5	0	0	0	1.7	0	CGI O2 – 20.1
LGP-4	0	20.3	0	0	0	0.6	0	CGI O2 – 20.5

CALIBRATION INFORMATION:
Instrument: Thermo Environmental 580B PID 10.6 SN#: 182
Calibrated by: US Environmental Rental Co. 7 November 2005
Calibrated With: 100 ppm isobutylene (R.F. = 1.0)

Instrument: Industrial Scientific TMX412 SN#: 98090009-447
Sampling Pump: Industrial Scientific Sampling Pump SP402 SN#: 9911050-292
Calibrated by: US Environmental Rental Co. 8 November 2005
Calibrated With: 50 ppm CO, 25 H_2S, 50% LEL Methane, 20.9% O_2

Instrument: Landtec GEM 500 Serial#: E-0904
Calibrated by: US Environmental Rental Co. 7 November 2005
Calibrated With: 15% CH_4, 15% CO_2, 20.9% O_2

* Note: Barometric Pressures were obtained from NOAA National weather Service Forecast Office Boston, MA at http://www.erh.noaa.gov/box/stationobs.shtml for the nearest available reporting station at the airport in Fitchburg, MA for the sample date 8 November 2005.

APPENDIX C
Landfill & Gas Probe Supplemental Inspection

1.0 PURPOSE

Perimeter gas probes were installed (Photo 2) on the southern border of the landfill in December 2005 and were sampled for gas levels on February 16, 2006. This supplemental inspection appendix presents the gas level readings recorded, documents the installation of new perimeter fencing at Shepley's Hill Landfill, and documents some damage to the access roads at SHL which occurred during the recent maintenance contract work.

2.0 FENCING AND ACCESS ROADS

New chain link fencing was installed during recent maintenance work at the landfill. On the south side near the former Web Van warehouse, a section of fencing was constructed at a location of unrestricted access (Photo 3). Two other sections of fencing and gates were added on the south and west sides of Plow Shop Pond where the fence had been rolled back for access (Photos 4 & 5). The fencing appeared to be in excellent condition and will help minimize unauthorized access to the landfill by pedestrians and vehicles.

During the recent maintenance work, the access roads were slightly damaged by rutting and erosion (Photos 1 & 6). The access roads should be regraded, gravel added if necessary, and revegetated on the perimeter.

3.0 GAS PROBE READINGS

INSPECTOR: Kullberg/ Michalak TITLE: Civil Engineer DATE: 02/16/06

ORGANIZATION: CENAE-EP WEATHER: Sunny, 55 d F

BAROMETER: 30.1 in Hg @ 1030 BAROMETER: 30.0 in Hg @ 1200

Probe Number	VOC ppm PID	O_2 % GA90	H_2S ppm MG140	LEL % MG140	CO ppm MG140	CO_2 % GA90	CH4 % GA90	Remarks
LGP-5	0.2	20.6	0	0	0	0.3	0	CGI O2 – 20.7
LGP-6	0.7	20.6	0	0	0	0	0	CGI O2 – 21.0
LGP-7	0.2	11.6	0	1	0	3.8	0	CGI O2 –12.4
LGP-8	0.2	11.9	0	2	0	10.7	0	CGI O2 – 13.8
LGP-9	0	12.5	0	2	1	5.9	0	CGI O2 –13.2
LGP-10	0	15.5	0	0	0	7.6	0	CGI O2 – 19.5
LGP-11	0.2	17.8	0	0	0	3.9	0	CGI O2 –18.4
LGP-12	x	x	x	x	x	x	x	Not Installed
LGP-13	0.4	17.0	0	0	0	2.4	0	CGI O2 – 19.2
LGP-14	0.9	8.2	0	0	2	3.2	0	CGI O2 – 9.0

CALIBRATION INFORMATION:

Instrument: Thermo Environmental 580B PID 10.6 SN#: 237
Calibrated by: US Environmental Rental Co. 15 February 2006
Calibrated With: 100 ppm isobutylene (R.F. = 1.0)

Instrument: Industrial Scientific MG 140 SN#: 01044002-134
Sampling Pump: Industrial Scientific Sampling Pump SP402 SN#: 0004373-050
Calibrated by: US Environmental Rental Co. 15 February 2006
Calibrated With: 50 ppm CO, 25 H_2S, 50% LEL Methane, 20.9% O_2

Instrument: Landtec GA90 Serial#: G1457
Calibrated by: US Environmental Rental Co. 15 February 2006
Calibrated With: 15% CH_4, 15% CO_2, 20.9% O_2

4.0 Photographs

PHOTO 1

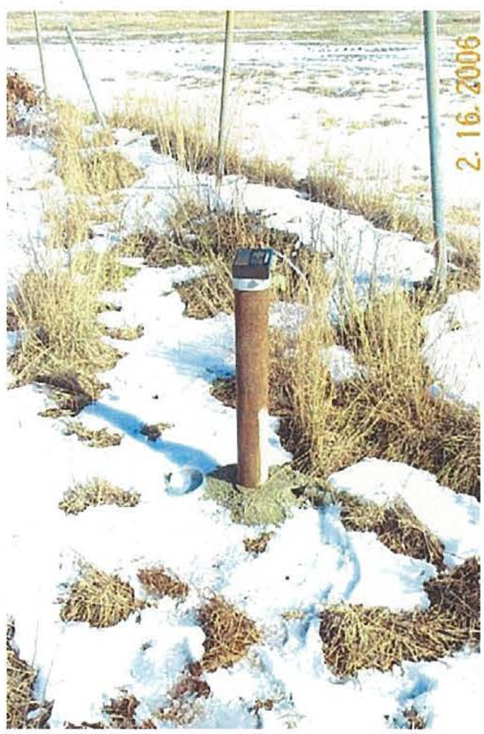


PHOTO 2

PHOTO 3

PHOTO 4

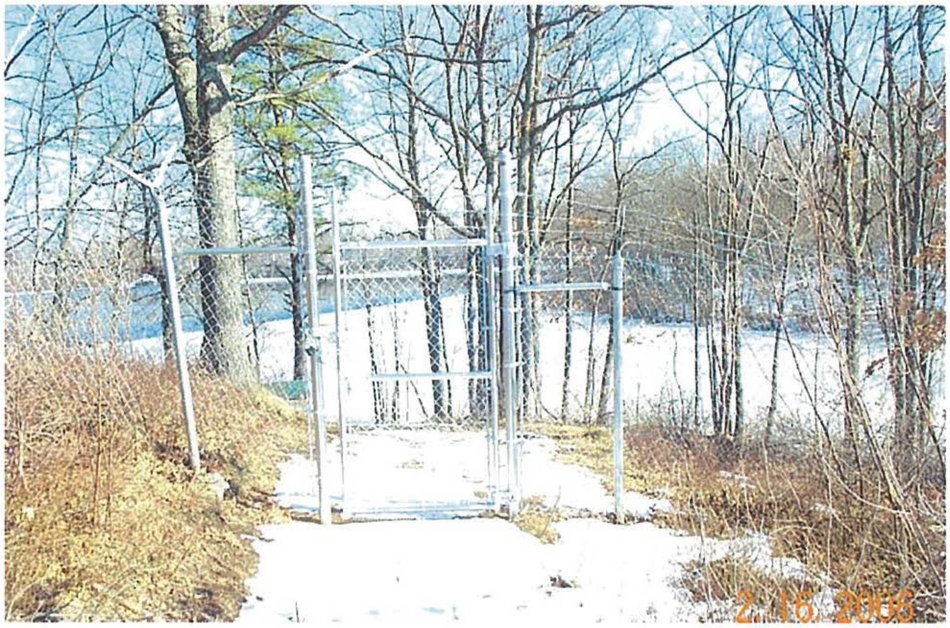


PHOTO 5

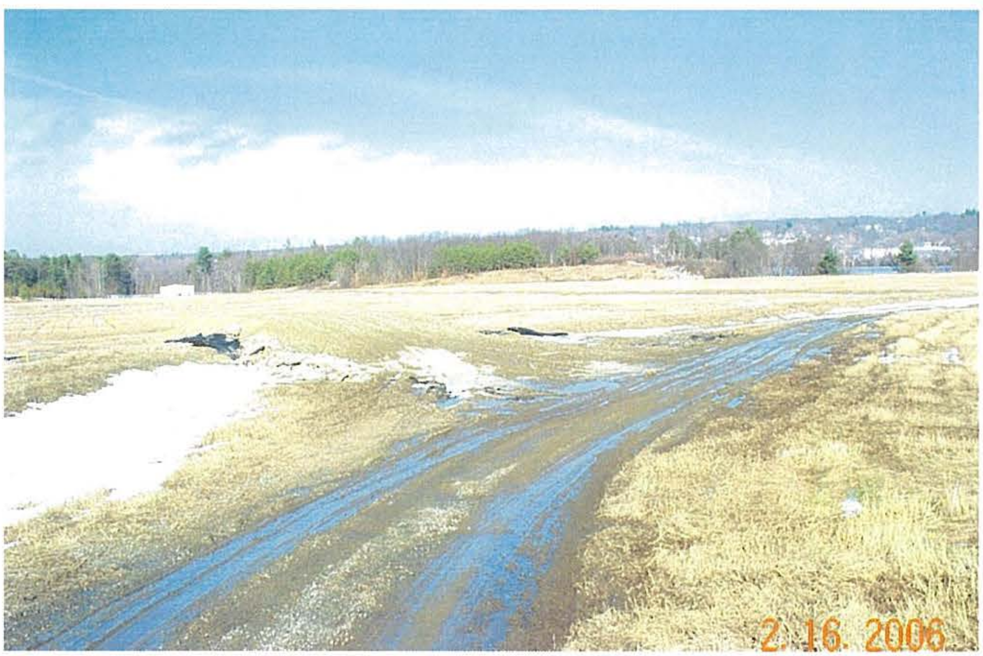


PHOTO 6

Appendix B

Groundwater Field Analysis Forms

June 2005 Monitoring

U. S. Army Corps of Engineers GROUNDWATER LEVEL MEASUREMENT SHEET

SITE INFORMATION

Site Name: Shepley's Hill Landfill
Location: Devens, MA
Date: 06 June 2005

Project Name: Long Term Monitoring &Maint
Personnel: Jack Keenan, Tom Markotte

WEATHER CONDITIONS AND EQUIPMENT

Temperature Range: 70's
Precipitation: drizzle early
Tidally-Influenced [ ] Yes [x] No

Equipment No.:
Barometric Pressure: 30.0"

Monitoring Well	Date/Time	Reference Point	Elevation of Reference Point (feet NGVD)	Water Level Indicator Reading (feet)	Groundwater Elevation (feet NGVD)
SHL-3	1135	top of casing	248.5 (top of cas.)	29.75	218.75
SHL-4	1220	top PVC	228.71	10.05	218.66
SHL-5	1520	top PVC	218.53	2.59	215.94
SHL-9	1532	top PVC	222.84	7.51	215.33
SHL-10	0845	top PVC	248.76	30.35	218.41
SHL-11	1513	top PVC	236.34	18.28	218.06
SHL-19	1320	top PVC	241.34	22.19	219.15
SHL-20	1510	top PVC	236.84	18.62	218.22
SHL-22	1537	top PVC	220.45	5.24	215.21
SHM-93-10C	0845	top PVC	248.42	28.86	219.56
SHM-93-22C	1536	top PVC	221.55	6.30	215.25
SHM-96-5B	1529	top PVC	219.81	4.36	215.45
SHM-96-5C	1527	top PVC	219.25	3.88	215.37
SHM-96-22B	1540	top PVC	220.27	5.10	215.17

GWM WELL # SHL-3	U.S. Army Corps of Engineers
SCREEN INTERVAL DEPTH: 25.1-35.1' (top of casing) WELL DIAMETER: 2 in	Groundwater Sampling Log Sheet
H2O LEVEL: DEPTH, PRE PUMP INSERTION 29.75	Project Name: Shepley's Hill Landfill, Devens, MA
DEPTH, POST PUMP INSERTION 29.70	SAMPLE METHOD: EPA LOW STRESS METHOD
DEPTH SAMPLED: 33.0 REFERENCE POINT: PVC OR CASING (DEPTHS RECORDED BENEATH)	Metals/Hardness 1 x 1L HDPE (HNO3) VOC'S 3 x 40ml glass vials (HCl)
DATE: 6 June 2005 TIME: 1135 NGVD	Cyanide 1 x 250ml HDPE (NaOH) BOD 1 x 1L HDPE
RECORDED BY: JK SS AG TM SIGNATURE: Thomas J. Marcotte	Anions,Alkalinity,TDS 1 x 500ml HDPE COD 1 x 250mL HDPE (H2SO4)
SAMPLED BY: JK SS AG TM SIGNATURE: Thomas J. Marcotte	TSS 1 x 1L HDPE TOC 3 x 40ml glass vials (H2SO4)

TIME (24hr)	WATER DPTH BELOW MP (feet)	PUMP SETTING	PURGE RATE (ml/min)	CUM. VOLUME PURGED (gal)	WATER TEMP (°C)	SPECIFIC COND. (µS/cm)	pH	ORP/Eh (mv)	D. O. (mg/L)	TURBIDITY (NTU's)	COMMENTS
1030	30.30	118.0	240		11.49	20	7.63	235.0	11.59	7.50	
1034	30.31	118.0	240		11.43	19	7.28	230.7	11.10	6.50	
1038	29.80	118.0	240	0.75 gal	13.29	19	7.06	221.1	10.97	5.95	
1042	29.70	122.8	80		13.96	19	7.05	216.8	10.97	4.85	
1046	29.71	159.2	240	1.00	14.27	19	6.90	219.1	10.91	7.50	
1050	29.85	168.2	240		14.51	19	6.82	189.1	10.64		
1054											Back Flush well, had stopped
1100	30.50	121.0	480	1.50	18.42	19	6.83	155.3	10.54	63	
1104	30.12	121.0	600		15.15	18	6.77	167.3	11.14	44	
1108	30.45	121.0	640	2.75	14.42	18	6.73	144.9	11.27	43	
1112	30.48	121.0	600		12.83	18	6.69	147.3	11.31	11	
1116	30.48	121.0	600		12.43	18	6.66	159.9	11.26	6.05	
1120	30.48	121.0	600	4.00	12.26	18	6.65	160.6	11.25	3.65	
1124	30.48	121.0	600	5.00	12.13	18	6.63	174.1	11.20	2.75	
1128	30.48	121.0	600		12.08	18	6.62	174.6	11.20	2.45	
1132	30.48	121.0	600		12.11	18	6.61	175.8	11.20	2.52	
NOTES:					±.36 3%	±0.45 3%	+0.1 unit	+10 mv	10%	10%	

SAMPLE TAKEN AT: 1135

YSI # 000698 TURBIDITY # 39576 Pump - Grunfos Redi-flow II

GWM WELL # SHL-4

U.S. Army Corps of Engineers
Groundwater Sampling Log Sheet
Project Name: Shepley's Hill Landfill, Devens, MA

SCREEN INTERVAL DEPTH: 5.7-15.7'   WELL DIAMETER: 2"
H2O LEVEL: DEPTH, PRE PUMP INSERTION 10.05
DEPTH, POST PUMP INSERTION 10.05
DEPTH SAMPLED: 13   REFERENCE POINT: PVC OR CASING (DEPTHS RECORDED BENEATH) NGVD
DATE: 6/6/05   TIME: 12:20
RECORDED BY: JK SS AG TM   SIGNATURE:
SAMPLED BY: JK SS AG TM   SIGNATURE:

SAMPLE METHOD: EPA LOW STRESS METHOD

Metals/Hardness 1 x 1L HDPE (HNO3)	VOC'S 3 x 40ml glass vials (HCl)
Cyanide 1 x 250ml HDPE (NaOH)	BOD 1 x 1L HDPE
Anions,Alkalinity,TDS 1 x 500ml HDPE	COD 1 x 250mL HDPE (H2SO4)
TSS 1 x 1L HDPE	TOC 3 x 40ml glass vials (H2SO4)

TIME (24hr)	WATER DPTH BELOW MP (feet)	PUMP SETTING	PURGE RATE (ml/min)	CUM. VOLUME PURGED (gal)	WATER TEMP (°C)	SPECIFIC COND. (µS/cm) C	pH	ORP/Eh (mv)	D. O. (mg/L)	TURBIDITY (NTU's)	COMMENTS
1234	10.20	73.0	2000	1 gal							Pumped orange/Rusty water before connect
1237	10.15	70.7	1400	1.5 gal							to YSI
				Connected to	YSI					10.0	Clearer water
1240	10.10	69.0	700	2.5 gal	11.06	142	5.68	117.7	0.95	5.0	
1243	10.10	69.2	700	[illegible]	11.10	142	5.65	117.6	0.60	4.8	
1246	10.10	69.2	700	3.5 gal	11.14	142	5.64	117.6	0.61	4.5	
1249	10.10	69.2	700		11.17	142	5.64	117.7	0.63	4.1	
1252	10.10	69.2	700	4.5 gal	11.17	142	5.63	117.8	0.65	3.8	
1255	10.11	69.2	700		11.15	142	5.63	118.9	0.70	3.5	
1258	10.11	69.2	700	5.5 gal	11.19	141	5.62	120.0	0.77	2.8	
1301	10.11	69.2	700		11.16	141	5.62	120.2	0.79	2.0	
1304	10.11	69.2	700	6.5 gal	11.14	141	5.61	121.5	0.80	1.8	

NOTES: ±0.3 3% ±4.2 3% +0.1 unit +10 mv 10% ±0.0 10% <5

SAMPLE TAKEN AT: 1305

YSI # 00D698   TURBIDITY # 39576   Pump - Grunfos Redi-flow II

GWM WELL # SHL-5

SCREEN INTERVAL DEPTH: 5.1 - 15.1 feet WELL DIAMETER: 2"

H2O LEVEL: DEPTH, PRE PUMP INSERTION 2.62'

DEPTH, POST PUMP INSERTION 2.60

DEPTH SAMPLED: 8.0 ft REFERENCE POINT: PVC OR CASING (DEPTHS RECORDED BENEATH) NGVD

DATE: 6/7/05 TIME: 1145

RECORDED BY: JK SS AG TM SIGNATURE: Thomas J. Marcotte

SAMPLED BY: JK SS AG TM SIGNATURE: Thomas J. Marcotte

U.S. Army Corps of Engineers

Groundwater Sampling Log Sheet

Project Name: Shepley's Hill Landfill, Devens, MA

SAMPLE METHOD: EPA LOW STRESS METHOD

Metals/Hardness 1 x 1L HDPE (HNO3)
VOC'S 3 x 40ml glass vials (HCl)
Cyanide 1 x 250ml HDPE (NaOH)
BOD 1 x 1L HDPE
Anions,Alkalinity,TDS 1 x 500ml HDPE
COD 1 x 250mL HDPE (H2SO4)
TSS 1 x 1L HDPE
TOC 3 x 40ml glass vials (H2SO4)

TIME (24hr)	WATER DPTH BELOW MP (feet)	PUMP SETTING	PURGE RATE (ml/min)	CUM. VOLUME PURGED ~~(gal)~~ l	WATER TEMP (°C)	SPECIFIC COND. (μS/cm)	pH	ORP/Eh (mv)	D. O. (mg/L)	TURBIDITY (NTU's)	COMMENTS
1056	3.05	45.6	560		11.81	92	4.61	123.6	1.12	9.62	
1100	3.03	45.6	400	2 l	12.02	93	4.27	130.7	0.77	5.47	
1104	3.07	45.6	560		12.02	91	4.18	134.2	0.59	3.63	
1108	3.09	45.6	560	5 l	11.95	91	4.11	137.5	0.52	3.49	
1112	3.11	45.6	560		12.08	94	4.08	140.1	0.61	2.80	
1116	2.96	43.7	400	9 l	12.58	95	4.16	141.2	0.43	3.04	
1120	2.96	43.7	400	11	12.65	95	4.13	145.3	0.45	2.65	
1124	2.96	43.7	400		12.49	95	4.06	148.2	0.34	1.40	
1128	2.96	43.7	400	14	12.62	94	4.01	152.6	0.32	1.25	
1132	2.96	43.7	400	15	13.38	94	4.13	152.3	0.38	1.48	
1136	2.96	43.7	400		13.56	94	4.22	152.7	0.35	1.55	
1140	2.96	43.7	400	17	13.60	94	4.24	152.6	0.34	1.47	

NOTES: ±0.36 3% ±2.5 3% +0.1 unit +10 mv ±.04 10% <5 10%

SAMPLE TAKEN AT: 1145

YSI # 98G0508 AA TURBIDITY # 910290 Pump - Grunfos Redi-flow II

GWM WELL # SHL-10

SCREEN INTERVAL DEPTH: 17.8 - 41.8' WELL DIAMETER: 2"

H2O LEVEL: DEPTH, PRE PUMP INSERTION 30.35

DEPTH, POST PUMP INSERTION 30.28

DEPTH SAMPLED: 35' REFERENCE POINT: PVC OR CASING (DEPTHS RECORDED BENEATH) NGVD

DATE: 6/6/05 TIME: 845

RECORDED BY: JK SS AG TM SIGNATURE:

SAMPLED BY: JK SS AG TM SIGNATURE:

U.S. Army Corps of Engineers

Groundwater Sampling Log Sheet

Project Name: Shepley's Hill Landfill, Devens, MA

SAMPLE METHOD: EPA LOW STRESS METHOD

Metals/Hardness 1 x 1L HDPE (HNO3)
VOC'S 3 x 40ml glass vials (HCl)
Cyanide 1 x 250ml HDPE (NaOH)
BOD 1 x 1L HDPE
Anions,Alkalinity,TDS 1 x 500ml HDPE
COD 1 x 250mL HDPE (H2SO4)
TSS 1 x 1L HDPE
TOC 3 x 40ml glass vials (H2SO4)

TIME (24hr)	WATER DPTH BELOW MP (feet)	PUMP SETTING	PURGE RATE (ml/min)	CUM. VOLUME PURGED (gal)	WATER TEMP (°C)	SPECIFIC COND. (µS/cm)	pH	ORP/Eh (mv)	D. O. (mg/L)	TURBIDITY (NTU's)	COMMENTS
906	30.28	120	400		10.78	30	7.17	149.6	11.51	9.5	Very Clear water @ Start
910	30.40	119.5	450		10.70	26	6.72	160.7	11.34	5.0	
914	30.40	119.5	500	1 gallon	12.56	26	6.44	170.6	11.26	1.3	
917	30.40	119.5	500		12.78	26	6.39	176.9	11.29	1.0	
920	30.40	119.5	500		12.86	28	6.37	185.2	11.26	0.8	
923	30.40	119.5	500	2 gallons	12.87	28	6.37	187.2	11.23	0.7	
926	30.40	119.5	500		12.90	28	6.37	193.1	11.24	0.5	
929	30.40	119.5	500		12.89	28	6.37	195.5	11.22	0.4	
932	30.40	119.5	500	3 gallons	12.74	28	6.37	198.1	11.20	0.5	
935	30.40	119.5	500		12.80	28	6.37	202.9	11.13	0.5	
938	30.40	119.5	500	4 gallons	12.80	29	6.36	208.2	11.12	0.3	
941	30.40	119.5	500		12.90	29	6.37	209.1	11.12	0.2	
944	30.40	119.5	500	5 gallons	12.88	29	6.37	210.5	11.16	0.2	

NOTES: 3% ±0.37 ✓ ±0.8 ✓ 3% +0.1 unit ✓ +10 mv ✓ 10% ±1.1 ✓ 10% 4.5 ✓

SAMPLE TAKEN AT: 945

YSI # 9860508 TURBIDITY # 910290 Pump - Grunfos Redi-flow II

GWM WELL # SHM-93-10C	U.S. Army Corps of Engineers Groundwater Sampling Log Sheet Project Name: Shepley's Hill Landfill, Devens, MA

SCREEN INTERVAL DEPTH: 45.7-55.7' WELL DIAMETER: 4"

H2O LEVEL: DEPTH, PRE PUMP INSERTION 28.86

DEPTH, POST PUMP INSERTION 28.70

DEPTH SAMPLED: 50'

REFERENCE POINT: PVC OR CASING (DEPTHS RECORDED BENEATH) NGVD

DATE: 6/6/05 TIME: 0845

RECORDED BY: JK SS AG TM SIGNATURE: [signature]

SAMPLED BY: JK SS AG TM SIGNATURE: [signature]

SAMPLE METHOD: EPA LOW STRESS METHOD

Metals/Hardness 1 x 1L HDPE (HNO3)	VOC'S 3 x 40ml glass vials (HCl)
Cyanide 1 x 250ml HDPE (NaOH)	BOD 1 x 1L HDPE
Anions,Alkalinity,TDS 1 x 500ml HDPE	COD 1 x 250mL HDPE (H2SO4)
TSS 1 x 1L HDPE	TOC 3 x 40ml glass vials (H2SO4)

TIME (24hr)	WATER DPTH BELOW MP (feet)	PUMP SETTING	PURGE RATE (ml/min)	CUM. VOLUME PURGED (gal)	WATER TEMP (°C)	SPECIFIC COND. (µS/cm)	pH	ORP/Eh (mv)	D. O. (mg/L)	TURBIDITY (NTU's)	COMMENTS
0917	29.75	119.5	520		10.86	432	7.14	241.3	1.49	0.22	
0921	29.90	118.7	300	≈1 GAL	11.78	431	7.21	244.5	1.08	0.24	
0924	29.95	118.7	300		11.91	433	7.27	237.5	0.90	0.32	
0929	29.98	118.7	300	≈2 GAL	11.94	433	7.27	239.2	0.85	0.43	
0932	29.98	118.7	300		11.98	433	7.30	241.6	0.77	0.50	
0935	29.98	118.7	300		12.03	433	7.30	243.0	0.77	0.51	
0938	30.0	118.7	300		12.07	433	7.33	245.6	0.75	0.49	
0942	30.0	118.7	300	≈3 GAL	12.13	433	7.34	249.2	0.72	0.52	

NOTES: 3% 3% +0.1 unit +10 mv 10% 10%

SAMPLE TAKEN AT: 0949

YSI # 00D0698 TURBIDITY # 39576 Pump - Grunfos Redi-flow II

GWM WELL # SHL - 11	U.S. Army Corps of Engineers
SCREEN INTERVAL DEPTH: 14.8 - 29.8 feet WELL DIAMETER: 2"	Groundwater Sampling Log Sheet
H2O LEVEL: DEPTH, PRE PUMP INSERTION 18.30 feet	Project Name: Shepley's Hill Landfill, Devens, MA
DEPTH, POST PUMP INSERTION 18.30 feet	SAMPLE METHOD: EPA LOW STRESS METHOD
DEPTH SAMPLED: 25 feet REFERENCE POINT: PVC OR CASING (DEPTHS RECORDED BENEATH) NGVD	Metals/Hardness 1 x 1L HDPE (HNO3) – VOC'S 3 x 40ml glass vials (HCl)
DATE: 6/7/05 TIME: 830	Cyanide 1 x 250ml HDPE (NaOH) – BOD 1 x 1L HDPE
RECORDED BY: JK SS AG TM SIGNATURE:	Anions,Alkalinity,TDS 1 x 500ml HDPE – COD 1 x 250mL HDPE (H2SO4)
SAMPLED BY: JK SS AG TM SIGNATURE:	TSS 1 x 1L HDPE – TOC 3 x 40ml glass vials (H2SO4)

TIME (24hr)	WATER DPTH BELOW MP (feet)	PUMP SETTING	PURGE RATE (ml/min)	CUM. VOLUME PURGED (gal)	WATER TEMP (°C)	SPECIFIC COND. (µS/cm)	pH	ORP/Eh (mv)	D. O. (mg/L)	TURBIDITY (NTU's)	COMMENTS
845	18.35	95.5								1200+	Pumped orange/Rusty water before connecting
848	18.35	95.5		2gal						175	to YSI
			Connected	to YSI							Clearer
850	18.35	95.5	1250	3gal	11.58	550	4.92	-4.1	0.87	130	Reduced pump speed
853	18.35	95.1	1200	4gal	11.61	542	4.71	-17.0	0.48	100	
856	18.35	95.1	1200	5gal	11.61	542	4.48	-19.4	0.47	25	
859	18.35	95.1	1300	6gal	11.63	542	4.25	-20.7	0.49	14.4	Slight odor to water
902	18.34	95.1	1300	7gal	11.61	539	3.97	-20.0	0.50	9.8	
905	18.34	95.1	1300	8gal	11.64	543	3.70	-19.9	0.50	6.6	
908	18.34	95.1	1250	9gal	11.66	542	3.53	-19.0	0.51	5.9	
911	18.34	95.1	1250		11.61	544	3.40	-18.4	0.50	5.1	
913	18.34	95.1	1250	10gal	11.64	546	3.25	-18.5	0.49	4.5	
916	18.34	95.1	1250	11gal	11.61	544	3.03	-15.9	0.52	4.0	
919	18.34	95.1	1250	12gal	11.65	543	2.78	-13.9	0.53	3.8	
922	18.34	95.1	1250	13gal	11.61	546	2.58	-13.4	0.51	3.0	
925	18.34	95.1	1250	14gal	11.61	545	2.36	-11.0	0.54	2.9	
928	18.34	95.1	1250		11.62	548	2.16	-10.2	0.51	2.2	
931	18.34	95.1	1250	15gal	11.65	548	2.01	-9.3	0.51	2.0	
934	18.34	95.1	1250	16gal	11.62	546	1.68	-7.0	0.51	2.1	
							*				Ph sensor is off

NOTES: ±0.3 3% ±15 3% +0.1 unit +10 mv 10% ±0.05 10% <5

SAMPLE TAKEN AT: 935

Due to extremely rusty/orange colored water - 2gallons were pumped out until water became clear before connecting to YSI.

YSI # 98G0508 TURBIDITY # 910290 Pump - Grunfos Redi-flow II

* Sample taken @ 935 all parameters stabilized except ph which is off (well below 2 ph)

GWM WELL # SHL-19

SCREEN INTERVAL DEPTH: 17.0 - 32.0' WELL DIAMETER: 4"

H2O LEVEL: DEPTH, PRE PUMP INSERTION 22.19

DEPTH, POST PUMP INSERTION 22.19

DEPTH SAMPLED: 27' REFERENCE POINT: PVC OR CASING (DEPTHS RECORDED BENEATH) NGVD

DATE: 6/6/05 TIME: 1320

RECORDED BY: JK SS AG TM SIGNATURE: Thomas J Marcotte

SAMPLED BY: JK SS AG TM SIGNATURE: Thomas J. Marcotte

U.S. Army Corps of Engineers

Groundwater Sampling Log Sheet

Project Name: Shepley's Hill Landfill, Devens, MA

SAMPLE METHOD: EPA LOW STRESS METHOD

Metals/Hardness 1 x 1L HDPE (HNO3) VOC'S 3 x 40ml glass vials (HCl)

Cyanide 1 x 250ml HDPE (NaOH) BOD 1 x 1L HDPE

Anions,Alkalinity,TDS 1 x 500ml HDPE COD 1 x 250mL HDPE (H2SO4)

TSS 1 x 1L HDPE TOC 3 x 40ml glass vials (H2SO4)

TIME (24hr)	WATER DPTH BELOW MP (feet)	PUMP SETTING	PURGE RATE (ml/min)	CUM. VOLUME PURGED (gal)	WATER TEMP (°C)	SPECIFIC COND. (µS/cm)	pH	ORP/Eh (mv)	D. O. (mg/L)	TURBIDITY (NTU's)	COMMENTS
1246	22.28	105.2	1280		11.31	104	5.68	32.1	1.21	87.7	reddish-brown slug
1250	22.19	105.2	1500	2.0	11.18	100	5.47	34.1	0.98	61.8	
1254	22.19	105.2	1600	3.5	11.12	96	5.29	41.1	1.08	28.3	
1258	22.25	102.6	960	4.5	11.96	92	5.13	50.7	1.48	16.9	
1302	22.19	102.6	900	5.5	11.94	91	5.11	55.5	1.66	14.8	
1306	22.19	102.6	960	6.5	11.98	90	5.05	59.3	1.66	18.8	
1310	22.19	102.6	900	7.5	11.95	89	4.98	63.7	1.74	20.5	
1314	22.19	102.6	960	8.5	11.99	88	4.92	66.5	1.86	18.5	
1318	22.19	102.6	960	9.5	11.99	88	4.89	68.5	1.88	19.0	

NOTES: ±.35 3% ±2.7 3% +0.1 unit +10 mv 10% 10%

SAMPLE TAKEN AT: 1320

-let well discharge into bucket at start to eliminate slug (~2.5 gallons)

YSI # 98G0508 AA TURBIDITY # 910210 Pump - Grunfos Redi-flow II

GWM WELL # SHL-20

SCREEN INTERVAL DEPTH: 41.0 - 51.0 feet WELL DIAMETER: 4"

H2O LEVEL: DEPTH, PRE PUMP INSERTION 18.65 feet

DEPTH, POST PUMP INSERTION 18.65 feet

DEPTH SAMPLED: 46 feet REFERENCE POINT: PVC OR CASING (DEPTHS RECORDED BENEATH) NGVD

DATE: 6/7/05 TIME: 0830

RECORDED BY: JK SS AG TM SIGNATURE:

SAMPLED BY: JK SS AG TM SIGNATURE:

U.S. Army Corps of Engineers

Groundwater Sampling Log Sheet

Project Name: Shepley's Hill Landfill, Devens, MA

SAMPLE METHOD: EPA LOW STRESS METHOD

Metals/Hardness 1 x 1L HDPE (HNO3)
Cyanide 1 x 250ml HDPE (NaOH)
Anions,Alkalinity,TDS 1 x 500ml HDPE
TSS 1 x 1L HDPE
VOC'S 3 x 40ml glass vials (HCl)
BOD 1 x 1L HDPE
COD 1 x 250mL HDPE (H2SO4)
TOC 3 x 40ml glass vials (H2SO4)

TIME (24hr)	WATER DPTH BELOW MP (feet)	PUMP SETTING	PURGE RATE (ml/min)	CUM. VOLUME PURGED (gal)	WATER TEMP (°C)	SPECIFIC COND. (µS/cm)	pH	ORP/Eh (mv)	D. O. (mg/L)	TURBIDITY (NTU's)	COMMENTS
0840	18.64	92.1	300		12.65	580	6.25	-17.8	1.31	96.0	
0843	18.65	92.1	300		12.94	585	6.24	-15.0	1.07	80.0	
0846	18.65	92.1	300		13.20	587	6.24	-12.5	1.00	65.5	
0849	18.65	92.1	300	≅1 Gallon	13.58	587	6.23	-10.8	0.82	59.3	
0852	18.65	92.1	300		13.72	589	6.20	-8.2	0.71	54.6	
0855	18.65	92.1	300		13.74	589	6.21	-7.3	0.60	50.0	
0858	18.65	92.1	350	≅ 2 Gallons	13.85	587	6.22	-7.0	0.52	38.0	
0901	18.65	92.1	350		13.98	585	6.22	-5.6	0.42	34.2	
0904	18.65	92.1	350		13.93	587	6.21	-5.2	0.41	30.6	
0907	18.65	92.1	350		14.00	585	6.21	-4.2	0.39	28.8	
0910	18.65	92.1	350		14.14	584	6.20	-3.6	0.38	25.5	
0913	18.65	92.1	350	≅ 3 Gallons	14.17	585	6.20	-3.0	0.36	22.8	
0916	18.65	92.1	350		14.13	586	6.19	-2.2	0.34	20.1	
0919	18.65	92.1	350		14.21	586	6.18	-1.5	0.33	18.9	
0922	18.65	92.1	350	≅ 4 Gallons	14.23	586	6.16	-0.5	0.33	17.9	

NOTES: 3% 3% +0.1 unit +10 mv 10% 10%

SAMPLE TAKEN AT: 0924

YSI # 00D0698 TURBIDITY # 39576 Pump - Grunfos Redi-flow II

GWM WELL # SHM-93-22C		U.S. Army Corps of Engineers
SCREEN INTERVAL DEPTH: 124.3 - 134.3'	WELL DIAMETER: 4"	Groundwater Sampling Log Sheet
H2O LEVEL: DEPTH, PRE PUMP INSERTION 6.32'		Project Name: Shepley's Hill Landfill, Devens, MA
DEPTH, POST PUMP INSERTION 5.09'		SAMPLE METHOD: EPA LOW STRESS METHOD
DEPTH SAMPLED: 130'	REFERENCE POINT: PVC OR CASING (DEPTHS RECORDED BENEATH)	Metals/Hardness 1 x 1L HDPE (HNO3) — VOC'S 3 x 40ml glass vials (HCl)
DATE: 6/7/05	TIME: 1040 NGVD	Cyanide 1 x 250ml HDPE (NaOH) — BOD 1 x 1L HDPE
RECORDED BY: JK SS AG TM	SIGNATURE:	Anions,Alkalinity,TDS 1 x 500ml HDPE — COD 1 x 250mL HDPE (H2SO4)
SAMPLED BY: JK SS AG TM	SIGNATURE:	TSS 1 x 1L HDPE — TOC 3 x 40ml glass vials (H2SO4)

TIME (24hr)	WATER DPTH BELOW MP (feet)	PUMP SETTING	PURGE RATE (ml/min)	CUM. VOLUME PURGED (gal)	WATER TEMP (°C)	SPECIFIC C COND. (µS/cm)	pH	ORP/Eh (mv)	D. O. (mg/L)	TURBIDITY (NTU's)	COMMENTS
1045	~~5~~.10	71.3									Clear color
1050	6.30	81.1	Varies as well draw down	2 gal	10.44	433	6.88	-70.9	2.06	3.0	sulfer odor
1055	9.50	97.0		3 gal	10.60	524	6.75	-117.3	0.30	2.8	
1100	17.00	128.1		6 gal	10.67	362	6.73	-90.1	0.21	2.5	
1105	21.40	153.4		10 gal	10.77	272	6.64	-48.1	0.63	2.0	
1110	29.10	152.4		14 gal	10.81	265	6.67	-10.4	0.79	2.3	
1115	34.43	152.4		17 gal	10.92	260	6.69	-1.4	0.92	2.5	Reduced pump speed
1120	37.12	147.2	1400	20 gal	11.05	263	6.62	-1.6	0.93	2.0	Reduced pump speed
1125	38.70	139.3	800	21 gal	11.22	269	6.56	-9.2	0.92	1.8	" " "
1130	39.70	136.0	225		12.17	277	6.67	-15.8	0.92	2.0	
1135	39.75	136.0	200		11.96	278	6.71	-14.0	0.98	1.9	
1140	39.80	136.0	150	22 gal	12.10	280	6.73	-11.3	0.99	2.0	well stopped
1143	39.80	136.0	150		12.21	282	6.75	-9.6	1.03	2.1	drawing down
1146	39.81	136.0	150		12.16	285	6.73	-13.9	1.02	2.0	shaded YSI - sun affecting le
1149	39.81	136.0	150		12.02	289	6.72	-17.0	1.01	2.3	
1152	39.81	136.0	150		11.87	291	6.73	-20.3	1.00	2.0	
1155	39.81	136.0	150		11.93	292	6.75	-23.1	1.00	1.9	

NOTES: ±0.3 3% ±8 3% +0.1 unit +10 mv 10% ±0.1 <5 10%

SAMPLE TAKEN AT: 1155

well has history of low ~~discharge~~ recharge until well is drawn down ≈ 30 feet to increase head in well drawn down at first to reach a level that it will recharge enough to sample

YSI # 00D698

TURBIDITY # 39576

Pump - Grunfos Redi-flow II

January 2006 Monitoring

SHL - 3

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley LF
Sample Source (Well No./Location) SHL - 3
Weather Conditions Clear 40°F
PID NA (ppm) Condition good
Sample Team TB/LL

Project Number:
Date: 1/~~19~~ 21/06 - 1/~~20~~ 21/06

Well Stabilization Data

Well Depth 35 (FT.) Datum
Static Water Level 29.58/29.8 (FT.) Diameter: 2"
Water Column (FT.) Purge Method: ~~Peristaltic Pump~~ / Redi-Flow II

Time Purging begins (T_0):
Water Level at time T_0:
Time Purging ends: (T_1)
Water Level at time T_1:

Time	Volume Removed	pH +/- 0.1	~~SPCOND~~ COND(mS/cm) 19 +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) < 5 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1/19/06 - Water table too deep for peristaltic pump										
1/21/06 - Attempted to pump w/ Grundfos Redi Flow II, well kept going dry @ lowest Flow rate (≥ .5 LPM)										
1008	5 Gal	6.17	.017	11.58	309			109		
Collected sampled after ≥ 5 vol removed, but sample not submitted										

SAMPLING

Date: 1/21/06
Time: 1015
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Method of Shipment:
Remarks:

Analysis: NONE

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
4	0.652		1gallon = 3.78 liters

Project Name Shepley's Hill Landfill
Job Number 284350.OM.02
Field Team TB/LL
Field Conditions clear 40-50°F windy

Date 1/19/06
Page 1 of 1

Well/Sample Number SHL-4
Start Time 1130
Initial Depth to Water 9.69 TOC ≈ 2.75' AGS
Measure Point: Well TOC Steel Casing
Vertical Profiling Bottom of well 13' bgs; 10' screen

Depth ft below TOC	Time	pH	Conductivity mS/cm	Turbidity NTU	Diss. Oxygen mg/L	Temp. °C	Eh / ORP mv

Remarks:

Purge Method: Start @ 1130*
Geopump Ded. Pump Other
Split Sample ID 011906-SHL04
Split Time
Duplicate Sample ID
Dupl. Time
Flow Cell: Y N
Min. Purge Volume (gal)/(L) 0.5 LPM
Purge Rate (gpm)/(mLpm) 0.5 LPM

Time	Vol. Purged gallons / liters	pH	Conductivity mS/cm	Turbidity NTU	Diss. Oxygen mg/L	Temp. °C	Eh / ORP mv
1154	0.5/12L	5.36	.035	NA (clear)	4.15	10.55	326.8
	DTW = 9.71 rate = 0.5 LPM						
1207	18.5L	5.72	.035	NA	4.80	10.79	387
	DTW = 9.71						
1212	22L	5.69	.036	NA	4.66	10.91	405.3
	DTW = 9.71						
1218		5.68	.035	NA	4.79	10.80	417.5
	DTW = 9.71 rate = 0.5 LPM						
1225		5.83	.035	NA	5.98	10.85	411.4
	DTW = 9.71						
1233		5.81	.037		5.28	10.75	412.0

* 11/04 data had anaerobic D.O. (Not sure if this was in-situ) D.O. data from this is via flow cell

Remarks: * start purge @ 1130 w/ 2nd peristaltic pump (only 1 YSI which was tied in @ 1150) water was clear during purging

Project Name Shepley's Hill Landfill

Job Number 284350.OM.02

Field Team TB & CC

Field Conditions Clear 40°F

Date 1/20/06

Page 1 of 1

Well/Sample Number SHL-5

Start Time 8AM

Initial Depth to Water 1.40

Measure Point: Well TOC Steel Casing

Vertical Profiling Lock on well

Depth ft below TOC	Time	pH	Conductivity mS/cm	Turbidity NTU	Diss. Oxygen mg/L	Temp. °C	Eh / ORP mv

Remarks: Army Core 11/04 field data; anaerobic conditions (DO ≤ 1.0 mg/L) w/ + redox

Purge Method: Start @ 0808

Geopump Ded. Pump Other

Split Sample ID 012006-SHL05 Split Time 0850

~~Duplicate Sample ID~~ ~~Dupl. Time~~

Flow Cell: Y / N

Min. Purge Volume (gal)/(L)

Purge Rate (gpm)/(mLpm) 0.3 LPM

Time	Vol. Purged gallons / liters	pH	Conductivity mS/cm	Turbidity NTU	Diss. Oxygen mg/L	Temp. °C	Eh / ORP mv
0819	3 L	5.38	0.074	6.08	1.17	4.13	431
	DTW = 1.98	rate = 0.3 LPM			0.93	4.19	424.1
0830	7 L	5.41	0. ~~128~~ 074	5.17			
	DTW = 1.98						
0834	9 L	5.26	0.078	5.18	0.75	4.21	428.0
	DTW = 1.98, clear			rate = 0.35 LPM			
0843	12.5	5.20	0.080	3.46	0.68	4.20	428.2
	DTW = 1.98						
0847	15 L	5.20	~~0.133~~ .080	2.65	0.62	4.19	426.2
	DTW = 1.98	rate = 0.4 LPM					
0849	17 L	5.20	0.080	2.60	0.65	4.20	425.2
	DTW = 1.98 ✓		✓		✓	✓	✓

Remarks: Temp lot colder than 11/04 data

SHM-96-5C

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley LF
Project Number: 284350
Sample Source (Well No./Location) SHM-96-5C
Date: 1/20/06
Weather Conditions Clear 45°F
PID NA (ppm) Condition good
Sample Team TB/CL

Well Stabilization Data

Well Depth 79' Abs? (FT.) Datum ______
Static Water Level 5.98 TOC (FT.) Diameter: 4" PVC
Water Column ______ (FT.) Purge Method: Peristaltic Pump

Time Purging begins (T_o): 0852
Water Level at time T_o: 5.98
Time Purging ends: (T_1) 0952
Water Level at time T_1: 3.35*

Time	Volume Removed	pH +/- 0.1	SPCOND(mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) < 5 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
0911	8L	6.24	0.777	8.64	205.5	3.35*	0.22	15.8	0.45	clear
0926	15	6.47	0.784	8.75	-58.5	3.34	0.16	2.35	0.45	clear
0932	17.5	6.47	0.786	8.71	-70.7	3.35	0.14	1.92	0.45	
0940	20	6.48	0.786	8.66	-79.2	3.35	0.14	1.33	0.45	
0948	23	6.48	0.780	8.55	-85.4	3.35	0.15	1.46	0.4	
0952	25	6.49	0.779	8.55	-85.9	3.35	0.15	1.39	0.4	
									(battery dying?)	

SAMPLING

Date: 1/20/06
Time: 0951
Field Filtering: ______
Sampling Methodology: Low Flow Sampling
Laboratory: Method of Shipment:
Remarks:

Analysis: 012006-SHM-96-5C

Sample time ID = 0951

Actual Sample time = 0953

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
4	0.652		1gallon = 3.78 liters

Switched to steel casing for reference point

Devens_DataSheets.xlstemplate-low flow

SHM-96-5b

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley LF
Project Number: 284350
Sample Source (Well No./Location) SHM-96-5b
Date: 1/20/06
Weather Conditions clear 40°F
PID NA (ppm) Condition Cle good
Sample Team TB/CC

Well Stabilization Data

Well Depth 92.[illegible]'BGS (FT.) Datum
Static Water Level 3.89 TOC (FT.) Diameter: 4" PVC
Water Column (FT.) Purge Method: Peristaltic Pump

Time Purging begins (T_0): ~~1040~~ 0940
Water Level at time T_0: 3.89
Time Purging ends: (T_1) 1025
Water Level at time T_1: 4.11

Time	Volume Removed	pH +/- 0.1	~~SPCOND~~ (TS) COND(mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) < 5 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1003	13L	6.59	0.509	8.66	-85.5	4.11	0.54	0.6	0.4	Clear
1012	16L	6.54	0.503	8.77	-81.3	4.11	0.26	0.43	0.4	Clear
1016	18L	6.54	0.502	8.74	-81.4	4.11	0.24	0.62	"	Clear
1022	21L	6.53	0.503	8.82	-82.1	4.11	0.22	0.59	0.4	Clear

SAMPLING

Date: 1/20/06
Time: 1040
Analysis: ID = 012006-SHM-96-5b
Field Filtering:
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha
Method of Shipment: Courier
Remarks:

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
4	0.652		1gallon = 3.78 liters

Job Number 284350.OM.02

Field Team T.B & CL

Field Conditions clear 50°F

Date 1/20/06

Page _ of _

Well/Sample Number ~~SHL-10~~ ~~SHL-10~~ SHL-9

Start Time 1400

~~whale~~ pump

Initial Depth to Water 6.72'

Measure Point: Well TOC / Steel Casing

Vertical Profiling Bottom = 25' BGS / 2" Well

Depth ft below TOC	Time	pH	Conductivity mS/cm	Turbidity NTU	Diss. Oxygen mg/L	Temp. °C	Eh / ORP mv

Remarks: Had to cut lock b/c key hole had been welded shut

Purge Method: Begin pump @1400

Geopump / Ded. Pump / Other

Split Sample ID 012006-SHL09

Split Time 1515

Duplicate Sample ID X

Dupl. Time X

Flow Cell: Y / N

Min. Purge Volume (gal)/(L) 0.4 LPM

Purge Rate (gpm)/(mLpm) 0.4 LPM

Time	Vol. Purged gallons / liters	pH	Conductivity mS/cm	Turbidity NTU	Diss. Oxygen mg/L	Temp. °C	Eh / ORP mv
*1441	25 L	6.20	.109	3.10	0.70	9.13	-102.2
	rate = 0.4 LPM		DTW = 7.22				
1451	29 L	5.76	.107	3.89	0.53	9.04	-31.6
	DTW = 7.22		rate = 0.4 LPM				
1456	31 L	5.82	.105	3.49	0.47	9.06	-31.4
1500	33 L	5.87	.108	3.41	0.48	9.00	-27.4
1505	36 L	5.92	.107	3.33	0.45	9.00	-23.4
	DTW = 7.22		rate = 0.4 LPM				

* collected reading as soon flow cell filled w/ H_2O (so may be

Remarks:

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley LF
Project Number:
Sample Source (Well No./Location) SHL - 10
Date: 1 / 25 / 06
Weather Conditions Clear 40°F
PID NA (ppm) Condition good but no lock
Sample Team TB/DR

Well Stabilization Data

Well Depth 39' BGS (FT.) Datum
Static Water Level 30.64 TOC (FT.) Diameter : 4" Steel
Water Column (FT.) Purge Method: ~~Peristaltic Pump~~ (TB) Grundfos Redi Flow II

Time Purging begins (T_0): 1115
Water Level at time T_0: 30.64
Time Purging ends: (T_1) 1240 *
Water Level at time T_1: 30.72

Time	Volume Removed	pH +/- 0.1	~~SPCOND~~ (TB) COND(mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) ** +/- 10%	Turbidity (NTU) < 5 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance	
1150	Can't get w.l. reading; stopped pumping; roped pump 1' &										
	got w.l. reading					30.70					
1210	Connected Flow Cell										
1212	47	7.29	.034	13.87	206.2	*	11.92(?)	1.70	0.6	Clear	127.2
1219	52	6.21	.033	14.22	329.9	*	11.78 ?	0.99	0.6	"	
1224	54	6.08	.032	13.94	355.5	*	11.98 ?	0.59	"	Clear	126.9
1227	56	6.03	.034	13.65	369.2	*	12.08 ?	0.49	0.6	clear	
1230	58	6.02	.033	13.64	367.2	*	12.19 ?	0.17	"	"	126.6

SAMPLING

Date: / /
Time:
Field Filtering:
Sampling Methodology: Low Flow Sampling
Laboratory: Method of Shipment:
Remarks:

Analysis:

see Pg. 2

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
4	0.652		1gallon = 3.78 liters

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley LF
Project Number:
Sample Source (Well No./Location) SHL - 10
Date: 1/25/06
Weather Conditions Clear 40°F
PID NA (ppm) Condition good no lock
Sample Team TB / DR

Well Stabilization Data

Well Depth 39 (FT.) Datum
Static Water Level 30.64 (FT.) Diameter : 4" steel
Water Column (FT.) Purge Method: ~~Peristaltic Pump~~ Grundfos Redi Flow II

Time Purging begins (T_0): 1115
Water Level at time T_0: 30.64
Time Purging ends: (T_1)
Water Level at time T_1:

Time	Volume Removed	pH +/- 0.1	SPCOND(mS/cm) (TB) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) ** +/- 10%	Turbidity (NTU) < 5 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1233	60	6.03	.032	13.66	369.8	*	12.27?	0.11	0.6	Clear
1236	63	6.04	.032	13.69	373.2	*	12.31?	0.13	0.6	Clear 128.7
1240	(Immediately After ~~Pumping~~ Sampling)									
						30.72				
1600	Pumped	10	min @	0.6	LPM	(128.2)				
			.032		330.4		6.71			

SAMPLING

Date: 1/25/06
Time: 1250
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha
Method of Shipment: courier
Remarks:

Analysis: ID = 012506-SHL-10
VOCs, Metals, TCN
Hardness, TDS, Alk,
Cl, NO_3, SO_4, TSS,
BOD, COD, & TOC

Diameter (inch)	Gallon / Foot	* delta w.l. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
4	0.652		1gallon = 3.78 liters

** D.O. meter in YSI 600 not working, returned w/ YSI 85 @ 1600

* Water level not working in well, got le[vel] reading after sampling & pushed down deep[er]

SHM-96-10C 1OF 2

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley LF
Project Number:
Sample Source (Well No./Location) SHM-96-10C
Date: 01/25/06
Weather Conditions Snow Flurries 35°F
PID NA (ppm) Condition good - No lock
Sample Team TB/DR

Well Stabilization Data

Well Depth 54' BGS (FT.) Datum
Static Water Level 28.46 TOC (FT.) Diameter: 4"
Water Column (FT.) Purge Method: ~~Peristaltic Pump~~ Grundfos Redi Flow #

Time Purging begins (T_0): 0910
Water Level at time T_0: 28.46
Time Purging ends: (T_1) 1029
Water Level at time T_1: 31.34

Time	Volume Removed	pH +/- 0.1	~~SP~~COND(mS/cm) TC +/- 3%	TEMP.(C) +/- 0.2 or 3%	*Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	** D.O. (mg/L) +/- 10%	Turbidity (NTU) < 5 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
0917						31.09			1.2	clear
0925		7.63	0.354	11.48	257.8	31.01	0.77	15.0	1.0	
0937	20L		0.354	11.35	239.1	32.19	0.45		0.55	
0953	27L					31.38				
	re-start	pump	@	0955						
1002	30	7.55	0.358	12.05	173.8		0.67	10.34	0.4	clear
1008	33	7.47	0.358	12.11	179.8	31.34	0.36	9.97	0.4	clear 126.2
1008	(CONTINUED)								0.4	

SAMPLING

Date: / /
Time:
Field Filtering:
Sampling Methodology: Low Flow Sampling
Laboratory: Method of Shipment:
Remarks:

Analysis:

See Pg. 2

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
4	0.652		1gallon = 3.78 liters

SHM - 96 - 10C

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley CF
Project Number:
Sample Source (Well No./Location) SHM-96-10C
Date: 1/25/06
Weather Conditions SNOW Flurries 35°F
PID NA (ppm) Condition good No Lock
Sample Team TB DR

Well Stabilization Data

Well Depth 54' (FT.) Datum
Static Water Level 28.46 (FT.) Diameter:
Water Column (FT.) Purge Method: ~~Peristaltic Pump~~ (TB) RCDi Flow II

Time Purging begins (T_0): 0910
Water Level at time T_0: 28.46
Time Purging ends: (T_1) 1029
Water Level at time T_1: 31.27

Time	Volume Removed	pH +/- 0.1	~~SPCOND~~(mS/cm) (TB) +/- 3%	TEMP.(C) +/- 0.2 or 3%	*Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	** D.O. (mg/L) +/- 10%	Turbidity (NTU) < 5 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance	
1015	35L	7.43	.356	12.07	186.2	31.27	0.31	6.55	0.4	Clear	126.2
1023	38L	7.42	0.359	12.14	193.0	31.34	0.29	4.07	0.4	↓	126.2
1029	40L	7.40	.358	12.17	191.6	31.34	0.29	4.01	0.4	↓	126.2
** 1615	Pumped	for	10 min	e 130.0							
				12.04	228.2	in-situ = 0.0 **					

SAMPLING

Date: 01/25/06
Time: 1030
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Method of Shipment:
Remarks:

Analysis: Metals, VOCs, Hardness, SO_4, NO_3, TSS, ~~[illegible]~~ TCN, Alk, Cl, BOD, COD, TOC

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
4	0.652		1gallon = 3.78 liters

ID = 012506 - SHM - 96 - 10C

* Army Corp 11/04 sampling noted D.O. < 1 mg/L & + ORP

Project Name Shepley's Hill Landfill
Job Number 284350.OM.02
Field Team cc/TB
Field Conditions Cold, clear, windy ~40°F

Sampling Event Devens GW sampling
Date 1/19/06
Page 1 of 1

Well/Sample Number SHL-11
Start Time 1307
Initial Depth to Water ~~17.99~~ cc 17.99 TOC
Measure Point: Well TOC Steel Casing

Vertical Profiling Bottom = 27' BGS

Depth ft below TOC	Time	pH	Conductivity mS/cm	Turbidity NTU	Diss. Oxygen mg/L	Temp. °C	Eh / ORP mv

Remarks: [Replacing battery in YSI during 1st part of purging]

Purge Method: Geopump Ded. Pump Other

Split Sample ~~ID~~ Time @ 13:55
Split ID 011906-SHL11
Duplicate Sample ID X
Dupl. Time X

Flow Cell: Y / N
Min. Purge Volume (gal)/(L)
Purge Rate (gpm)/(mLpm) 0.4 LPM

Time	Vol. Purged gallons/liters	pH	Conductivity mS/cm	Turbidity NTU	Diss. Oxygen mg/L	Temp. °C	Eh / ORP mv
13:24	2.0	6.34	0.539	–	0.66	10.50	89.0
13:34	3.5	6.19	0.541	–	0.50	10.57	37.2
	DTW: 18.0	rate = 0.4 LPM					
13:38	~3.7	6.20	0.546	–	0.50	10.55	27.9
13:42	4.0	6.20	0.542	–	0.51	10.55	16.0
13:46	4.5	6.20	0.534	–	0.59	10.27	5.5
13:50	~4.8	6.20	0.532	–	0.63	10.23	3.7
	DTW: 18.0	rate = 0.4 LPM					

Remarks: Sampled @ 1355

Project Name Shepley's Hill Landfill | Sampling Event

Job Number 284350.OM.02 | Date 1/19/06

Field Team CC/TB. | Page 1 of 1

Field Conditions clear, windy, ~40°F

Well/Sample Number SHL-19 | Start Time 1030

Initial Depth to Water 21.49 'TOC | Measure Point: Well TOC Steel Casing

Vertical Profiling Bottom = 30' BGS

Depth ft below TOC	Time	pH	Conductivity mS/cm	Turbidity NTU	Diss. Oxygen mg/L	Temp. °C	Eh / ORP mv
0							

Remarks:

Purge Method: Geopump | Ded. Pump | Other

~~Split~~ Sample ID 011906-SHL19 | Split Time 1140

Duplicate Sample ID X | Dupl. Time X

Flow Cell: Y / N

Min. Purge Volume (gal)/(L)

Purge Rate (gpm)/(mLpm) ~0.5 LPM

Time	Vol. Purged gallons / liters	pH	Specific Conductivity mS/cm	Turbidity NTU	Diss. Oxygen mg/L	Temp. °C	Eh / ORP mv
1038	0.5	6.13	0.137	silty, turbid	0.66	8.66	197.1
1042	1.0	5.99	0.132	–	0.94	8.99	200.3
1046	1.5	5.98	0.131	–	1.03	9.06	201.6
1050	2.0	5.98	0.128	–	1.51	9.09	211.7
1056	2.5	5.77	0.123	–	1.82	9.12	220.1
1102	3.0	5.76	0.129	–	1.84	9.21	230.4
	DTW: 21.51				~~2.21~~	~~9.22~~	~~252.8~~
1115	4.0	5.76	0.123	–	2.21	9.22	252.8
1122	4.5	5.77	0.123	–	2.06	9.30	261.3
1128	5.0	5.78	0.120	–	2.34	9.28	274.0
1135	5.5	5.78	0.120	–	2.42	9.23	282.9

Redox didn't stabilize, sampled after 1 hr.

11/04 sample, Redox did not stabilize

Remarks: MS/MSD taken here: Lg amount of iron precipitate initially, until approximately 3 gallons purged, then started to clear.

SHL-20

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill LF
Project Number: 284350
Sample Source (Well No./Location) SHL-20
Date: 1/19/06
Weather Conditions Clear 50°F
PID NA (ppm) Condition good
Sample Team TB/CC

Well Stabilization Data

Well Depth ______ (FT.) Datum TOC
Static Water Level 18.34 (FT.) Diameter: 4" Steel
Water Column ______ (FT.) Purge Method: Peristaltic Pump

Time Purging begins (T_0): 1415
Water Level at time T_0: 18.34
Time Purging ends: (T_1) 1445
Water Level at time T_1: 18.35

Time	Volume Removed (L)	pH +/- 0.1	SPCOND(mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) < 5 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1426	1.0	6.43	0.471	10.51	0.6	18.34	0.83	NA	0.4	Clear
1429	1.2	6.44	0.479	10.51	0.3	18.35	0.61	NA	0.4	Clear
1434	1.6	6.45	.487	10.64	0.3		0.42		"	
1438	2.0	6.46	0.489	10.57	0.2		.32		.4	
1441	2.3	6.46	0.490	10.64	0.0	18.35	0.29		0.4	
1444	2.5	6.45	.491	10.72	-0.2		0.25		"	
1450	3.0	6.45	0.492	10.69	-0.2		0.22		0.4	
1453	3.2	6.35	0.493	10.65	0.2	18.35	.20		.4	

SAMPLING

Date: 01/19/06
Time: 1455
Field Filtering: ______
Sampling Methodology: Low Flow Sampling
Laboratory: Method of Shipment:
Remarks:

Analysis:

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
4	0.652		1gallon = 3.78 liters

Project Name Shepley's Hill Landfill | Sampling Event [illegible]
Job Number 284350.OM.02 | Date 1/20/06
Field Team TB/CC | Page 1 of 1
Field Conditions clear, cold

Well/Sample Number 4.75ft | Start Time 1217
Initial Depth to Water SHL-22 | Measure Point: Well TOC Steel Casing

Vertical Profiling

Depth ft below TOC	Time	pH	Conductivity mS/cm	Turbidity NTU	Diss. Oxygen mg/L	Temp. °C	Eh / ORP mv

Remarks: * Army Corp 11/04 field data observed + redox w/ D.O. < 1 mg/L also

Purge Method: Start @ 1222 | Geopump | Ded. Pump | Other

Split Sample ID 012006-SHL20 @ ~~13:30~~ ~~13:35~~ cc
~~Duplicate Sample ID~~ | Dupl. Time

Flow Cell: Y N | Min. Purge Volume (gal)/(L) | Purge Rate (gpm)/(mLpm) 0.375

Time	Vol. Purged gallons / liters	pH	Conductivity mS/cm	Turbidity NTU	Diss. Oxygen mg/L	Temp. °C	Eh / ORP mv
1236	6.5L	5.41	0.579	2.03	0.25	9.85	-8.9
	DTW: → 5.22ft						
1241	8.0L	5.25	0.575	0.44	0.23	9.62	13.1
	DTW → 5.22ft						
1247	10 L	5.07	0.577	1.18	0.20	9.89	49.7
	Rate = .375 Lpm DTW = 5.22						
1254	12L	4.99	0.578	1.32	0.17	10.05	92.1
	DTW → 5.22ft		Rate = 0.375 LPM				
1303	16L	5.00	0.575		0.17	9.95	136.0
	DTW = 5.25'						
1309	18.5L	4.99	0.575	2.06	0.17	10.07	169.0
1319	23L	4.97	0.574	1.43	0.16	9.98	215.4
1325	26L	5.17	0.592	1.02	0.16	9.94	208.2
	DTW → 5.25		Rate = 0.375				
	* redox did not stabilize, sampled after 1 hour						

Remarks:

Project Name: Shepley's Hill Landfill
Job Number: 284350.OM.02
Field Team: TB & CL
Field Conditions: Clear, ~45°

Sampling Event: Devens GW
Date: 1/20/06
Page 1 of 1

Well/Sample Number: SHM-93-22B
Start Time: 13:45 start purging
Initial Depth to Water: 4.56 ft TOC
Measure Point: Well TOC / Steel Casing

Vertical Profiling

Depth ft below TOC	Time	pH	Conductivity mS/cm	Turbidity NTU	Diss. Oxygen mg/L	Temp. °C	Eh / ORP mv

Remarks:

Purge Method: Geopump / Ded. Pump / Other

Split Sample ID: 012006-SHM93-22B
Split Time: 14:30
~~Duplicate Sample ID~~
~~Dupl. Time~~

Flow Cell: Y / N
Min. Purge Volume (gal)/(L):
Purge Rate (gpm)/(mLpm): 0.375

Time	Vol. Purged gallons / liters	pH	Conductivity mS/cm	Turbidity NTU	Diss. Oxygen mg/L	Temp. °C	Eh / ORP mv
13:53	3L	6.19	0.554	4.06	0.17	9.31	-106.0
DTW: 4.56	Purge rate: 0.395						
14:04	7L	6.19	0.555	4.21	0.17	9.42	-112.0
DTW: 4.56	Purge Rate: 0.375						
14:11	10L	6.08	0.560	3.2	0.17	9.78	-114.4
DTW: 4.56	Purge Rate: 0.375						
14:17	12L	5.78	0.560	3.0	0.17	9.80	-114.5
DTW 4.56	Purge Rate: 0.375						
14:21	13L	5.63	0.560	2.6	0.17	9.87	-114.3
14:25	14.5L	5.54	0.559	2.73	0.17	9.90	-114.0
DTW 4.56	Rate: 0.375						

Remarks: Sample @ 1430

SHM-93-22C 1 OF 2

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: SHepley LF
Project Number: 284350
Sample Source (Well No./Location) SHM-93-22C
Date: 1/25/06
Weather Conditions Clear 50°F
PID NA (ppm) Condition good
Sample Team TB/DR

Well Stabilization Data

Well Depth ________ (FT.) Datum ________
Static Water Level 6.10* (FT.) Diameter: 4"
Water Column ________ (FT.) Purge Method: ~~Peristaltic Pump~~ (TB) Redi Flow II

Time Purging begins (T_0): 1330
Water Level at time T_0: 6.10*
Time Purging ends: (T_1) 1515*
Water Level at time T_1: 48.29*

Time	Volume Removed	pH +/- 0.1	~~SP~~COND(mS/cm) (TB) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) < 5 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance	
1400	48L					37.15			0.8		
1420		8.72	.236	10.82	73.5	45.93	NOT**	5.79	0.7	Clear	Hz
1423		8.61	.242	10.75	0.9	46.02	WORKING		0.7	↓	164.4
1429		8.52	.249	10.88	-113.5	46.26		4.93	0.7	↓	
1440		8.60	.262	10.85	-154.2	46.78			0.7	↓	
1445		8.60	.270	10.82	-175.4	47.37		5.33	0.7	↓	
1458		8.55	.279	10.85	-199.8	47.93		5.01	0.7	↓	163.2
	72L										

SAMPLING

Date: ___/______/______
Time: ______________
Field Filtering: ________
Sampling Methodology: Low Flow Sampling
Laboratory: Method of Shipment:
Remarks:

Analysis:

See Pg. 2

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
4	0.652		1gallon = 3.78 liters

* Start @ 1330; based on 11/04 Army Corp data large initial drop in water table (w.t.) so pumped @ high flow until 1342

** Generator powering redi-flow ran out of gas @ 1400, restarted @ 1415

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley LF
Project Number:
Sample Source (Well No./Location) SHM-93-22C
Date: 1/25/06
Weather Conditions Clear 50°F
PID N/A (ppm) Condition Good
Sample Team TB/DR

Well Stabilization Data

Well Depth ______ (FT.) Datum ______
Static Water Level 6.10* (FT.) Diameter: 4"
Water Column ______ (FT.) Purge Method: ~~Peristaltic Pump~~ Redi Flow II

Time Purging begins (T_0): 1330*
Water Level at time T_0: 6.10*
Time Purging ends: (T_1) 1515*
Water Level at time T_1: 48.46*

Time	Volume Removed	pH +/- 0.1	SPCOND(mS/cm) (ts) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) < 5 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1505	77L	8.50	.282	10.86	-225.2	48.05	Not working	4.17	0.7	Clear
1510	81	8.52	.288	10.88	-230.0	48.18		4.21	↓	
1515	84L	8.49	.292	10.81	-235.1	48.29		4.18	↓	
1530					~~Reset~~ D.O.					
				* *		w/ YSI 85	0.73			
						& Flow cell				

162.2

SAMPLING

Date: 1/25/06
Time: 1515
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Method of Shipment:
Remarks:

Analysis:
ID = 012506 - SHM 93-22C
Metals, VOC, Hardness
TCN, TDS, Cl, NO_3, SO_4
Alk, BOD, COD, TOC

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
4	0.652		1gallon = 3.78 liters

Appendix C

Comparison of Arsenic Results

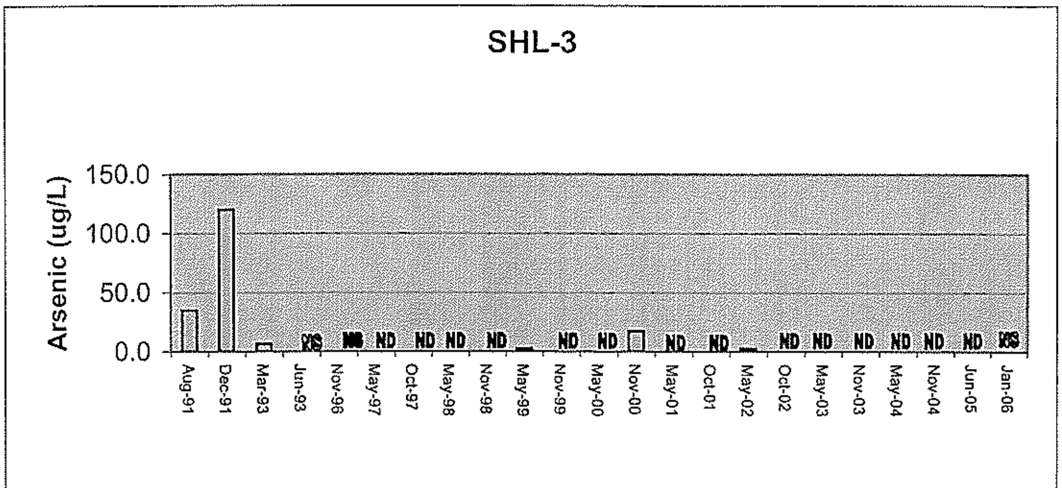
Table 7-4
Comparison of Historic Arsenic Concentrations (ug/L)
Shelpey's Hill Landfill Compliance Point Wells
Devens, Massachusetts

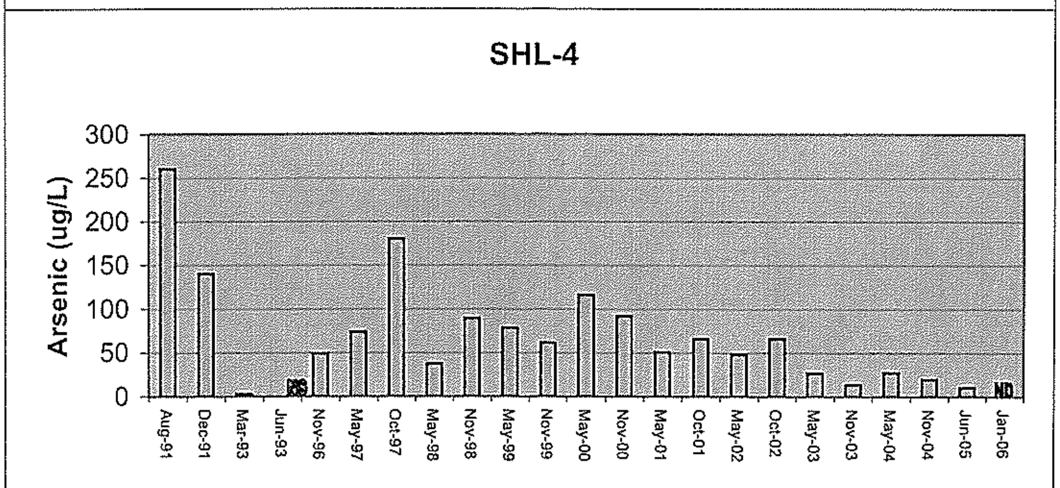
Sample	Monitoring Well ID (group designation)						
Well Group #	2	2	2	2	2	2	2
Date	SHL-3 (1)	SHL-4 (2)	SHL-5 (1)	SHM-96-5B (2)	SHM-96-5C (2)	SHL-9 (1)	SHL-10 (2)
Aug-91	35.0	**260**	23.0	NS	NS	37.0	**67.0**
Dec-91	**120**	**140**	38.0	NS	NS	**67.0**	**120**
Mar-93	6.5	2.54	11.4	NS	NS	42.4	**280**
Jun-93	NS	NS	NS	NS	NS	NS	NS
Nov-96	NS	48.8	12.0	**1,440**	**71**	46.9	3.4 B
May-97	<10	**73.6** J	<10	**3,300** J	43.2	16.1 J	<10
Oct-97	<10	**180**	<10	**2,040**	43.1	25.2	**209**
May-98	<5	37.4	<5	**4,300**	49.5	15.0	<5
Nov-98	<5.4	**89.1**	11.5	**3,080**	46.8	27.2	<5.4
May-99	2.7 B	**78.2**	5.0 B	**3,490**	**57**	**71.3**	2.7 B
Nov-99	<1.9	**61.3**	6.5	**2,700**	44.8	28.5	<1.9
May-00	<2.5	**116**	<2.5	**5,110**	**52.2**	15.0	<2.5
Nov-00	17.4	**91.5**	13.8	**2,500**	40.3	31.4	<4.2
May-01	<4.1	**50.8**	13.8	**3,800**	**80.5**	15.1	<4.1
Oct-01	<1.5	**66.0**	14.8	**1,850**	41.1	28.1	<1.5
May-02	2.8 B	47.8 B	11.9 B	**3,800**	**50.4** B	**144**	4.0 B
Oct-02	<3.2	**66.1**	<3.2	**1,970**	41.3	29	<3.2
May-03	<4.7	26.6	7.3	**3,920**	**55.1**	13.4	<4.7
Nov-03	<4.1	13.4	4.7 B	**3,380**	48.3	30.6	<4.1
May-04	<2.6	27.2	7.4 B	**3,950**	47.1	19.8	<2.6
Nov-04	<5.8	19.5	6.8 B	**2,110**	49.5	32.2	<5.8
Jun-05	<4.5	10.1	7.0 B	NS	NS	NS	<4.5
Jan-06	NS	<5	<5	**4,130**	43.0	18.0	<5

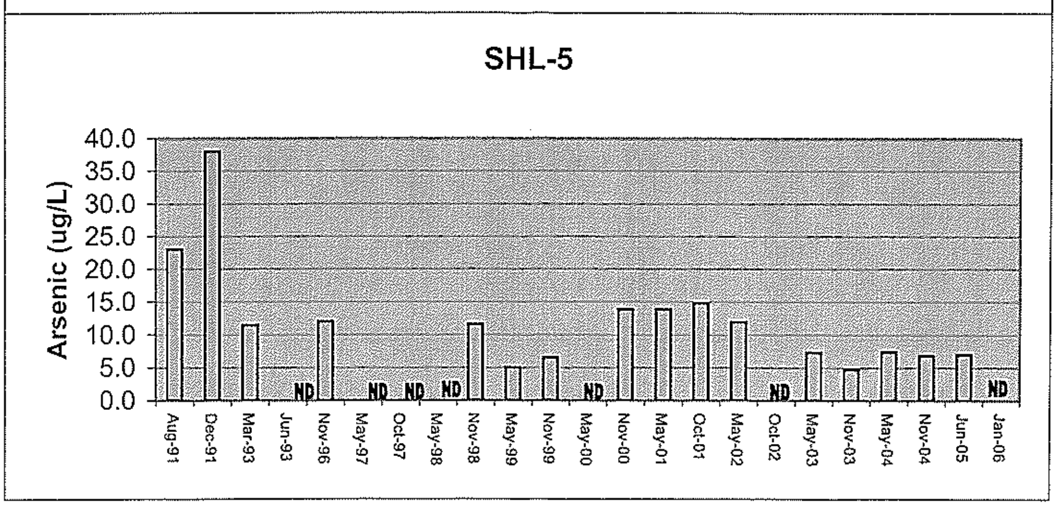
Sample	Monitoring Well ID (group designation)						
Well Group #	2	2	2	2	2	2	2
Date	SHM-93-10C (1)	SHL-11 (2)	SHL-19 (2)	SHL-20 (2)	SHL-22 (1)	SHM-93-22B (2)	SHM-93-22C (1)
Aug-91	NS	**320**	**340**	**98**	27	NS	NS
Dec-91	NS	**320**	**710**	**89**	25	NS	NS
Mar-93	21.3	**340**	**390**	**330**	32.9	NS	**68.9**
Jun-93	18.1	NS	NS	NS	NS	NS	49.8
Nov-96	12.4	**332**	**138**	**244**	24.8	**324**	44.6
May-97	<10	**252** J	**<10**	**<10**	<10	**318** J	40.4
Oct-97	10.5	**366**	**298**	**227**	34.8	**352**	<10
May-98	7.5	**346**	**77.5**	**238**	10.6	**365**	31.6
Nov-98	10.2	**376**	**145**	**218**	<5.4	**406**	51.1
May-99	10.8 B	**431**	**156**	**216**	12.2 B	**707**	42.8
Nov-99	8.7	**492**	**176**	**215**	7.3	**1,440**	33.2
May-00	5.9 J	**404**	**41.4**	**216**	14.6	**1,360**	34.4
Nov-00	8.8	**523**	**154**	**172**	45	**1,180**	47.8
May-01	6.9	**487**	**129**	**186**	47.6	**1,540**	19.7
Oct-01	10.1	**573**	**183**	**165**	44.2	**1,670**	31.6
May-02	11.0 B	**469**	**66.9**	**154**	**55.9** B	**2,040**	30.5 B
Oct-02	7.1	**648**	**164**	**175**	**77.1**	**159**	30.1
May-03	9.8	**498**	36.1	**197**	**101**	**2,070**	21.0
Nov-03	<5.2	**639**	**83.6**	**194**	**76.4**	**2,500**	29.8
May-04	7.2 B	**502**	**75**	**136**	**88.1**	**1,690**	27.8
Nov-04	10.6 B	**617**	**121**	**156**	**65.4**	**2,360**	34.9
Jun-05	8.1 B	**524**	26.3	**159**	NS	NS	15.8
Jan-06	11.0	**567**	**156**	**189**	**154**	**3,320**	23.0

Notes:
Bold Number indicates cleanup level exceedances (MCL cleanup level is 50 ug/L)
B = Value within five times of the greater amount detected in the equipment or preparation blank
J = Estimated value
<5 = Concentration less than the indicated method detection limit
NS = Not Sampled

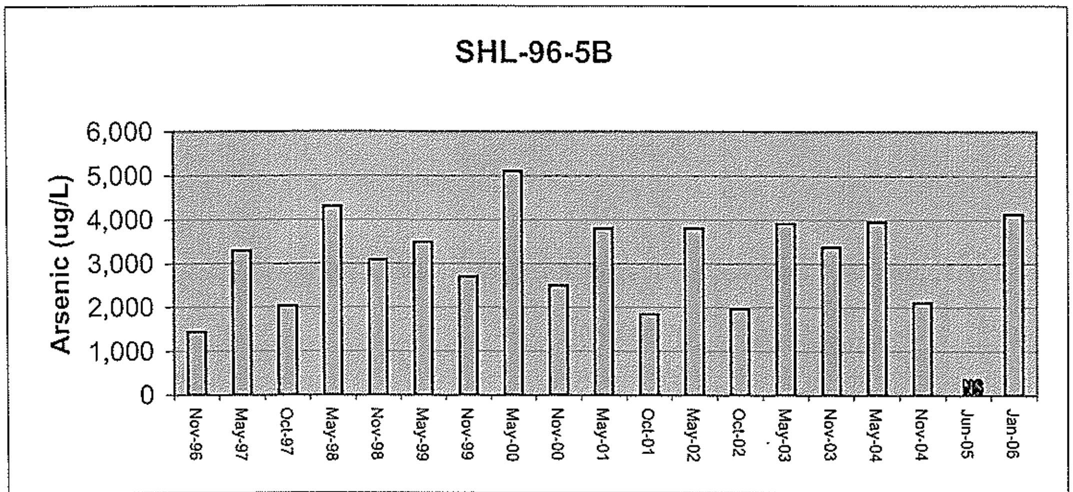
Shepley's Hill Landfill Historic Arsenic Groundwater Concentrations (ug/L)

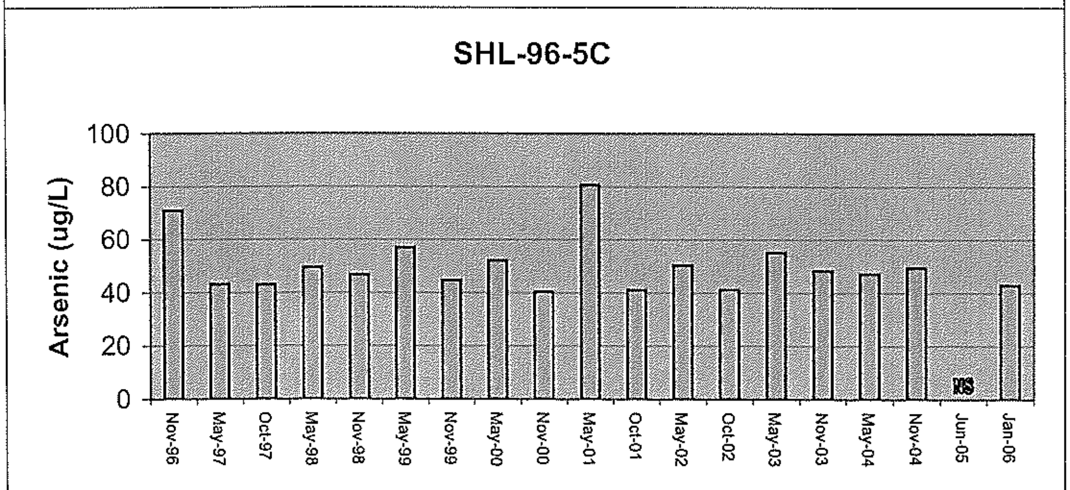


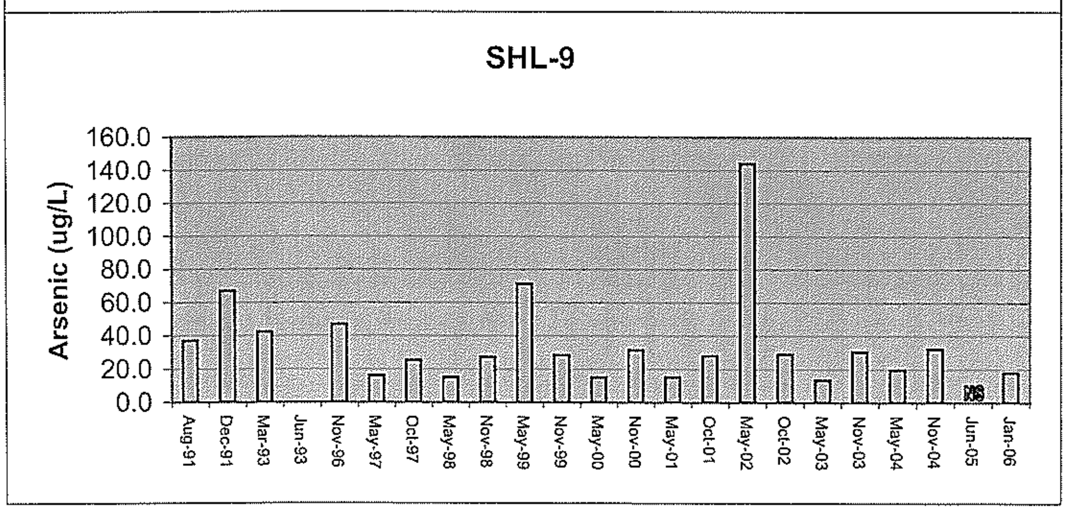




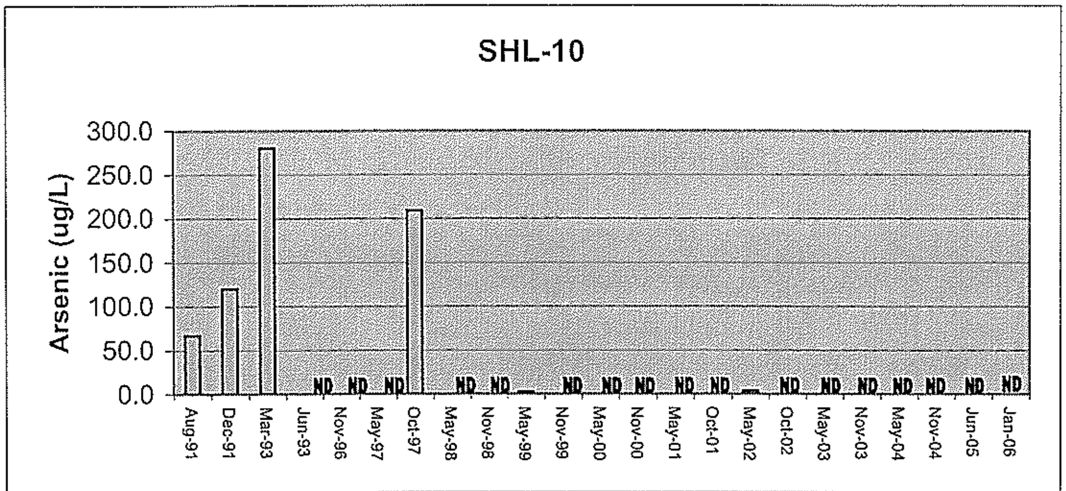
Shepley's Hill Landfill Historic Arsenic Groundwater Concentrations (ug/L)

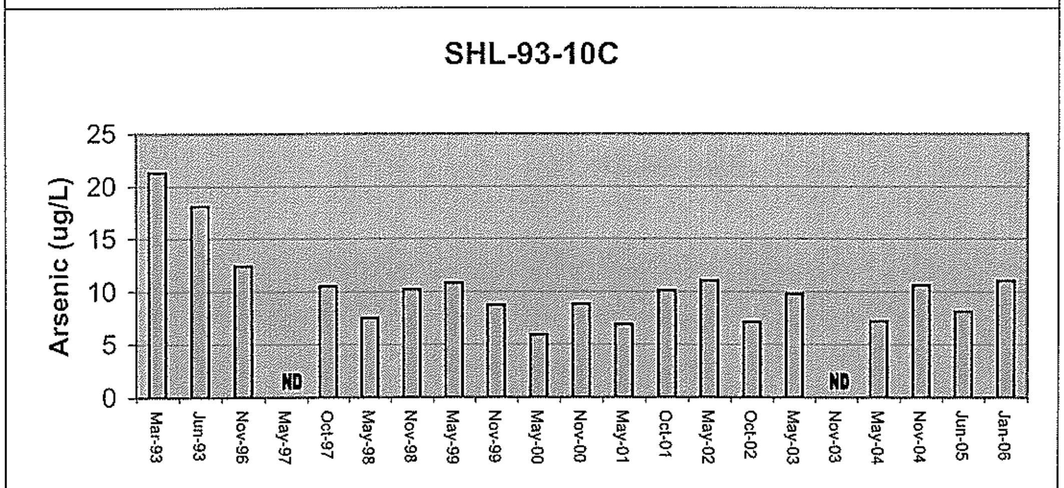


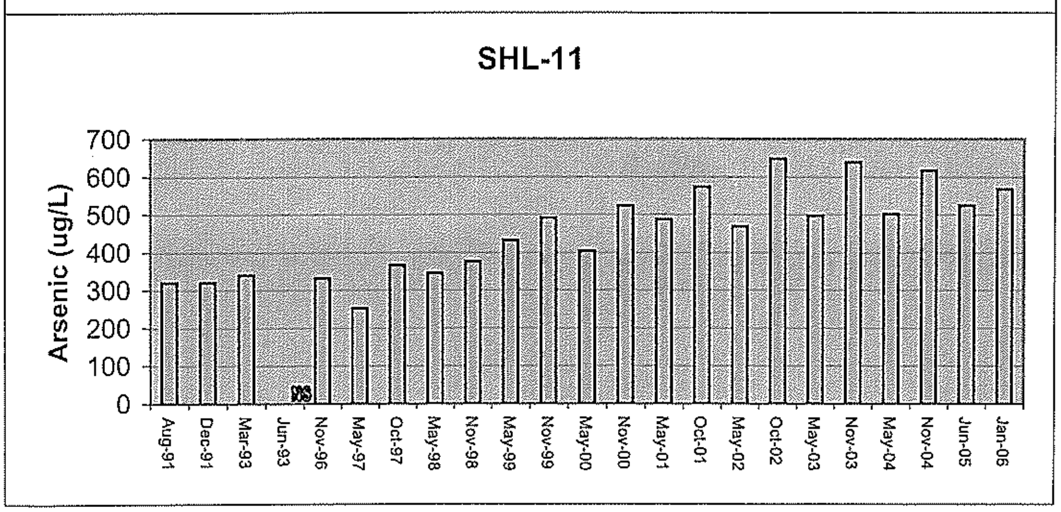




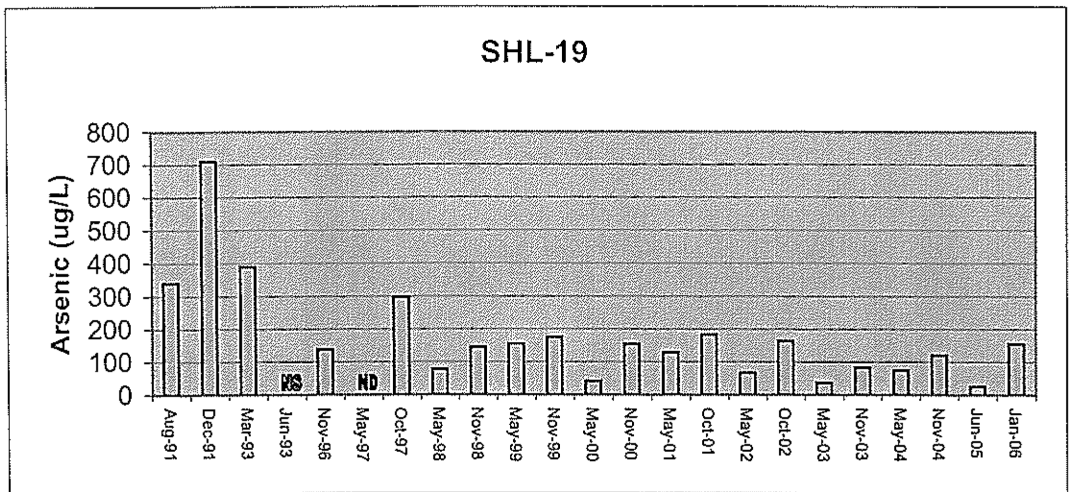
Shepley's Hill Landfill Historic Arsenic Groundwater Concentrations (ug/L)

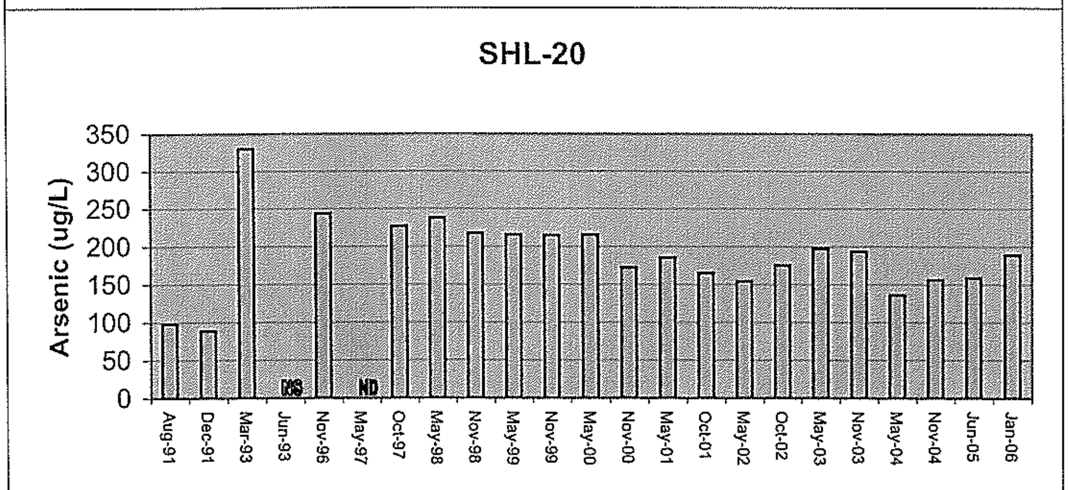


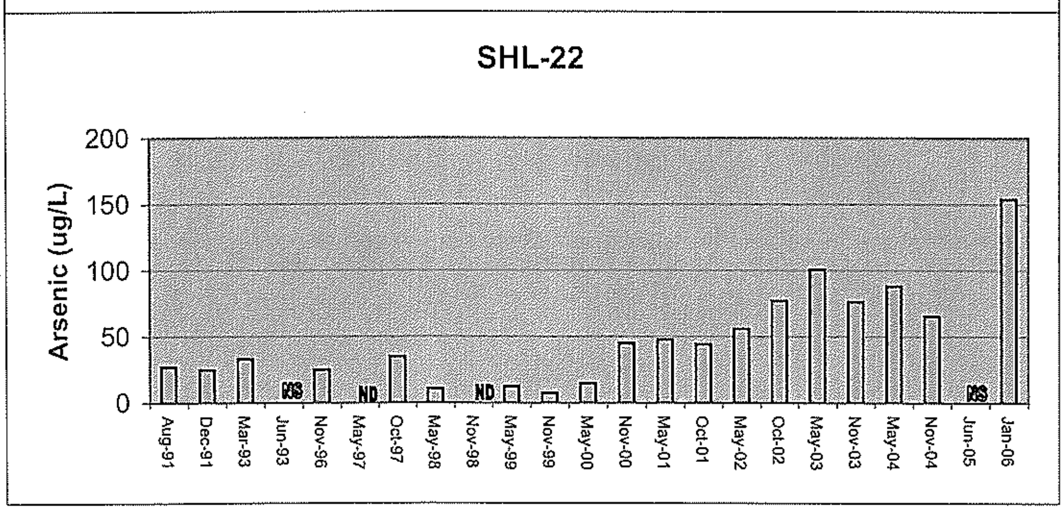




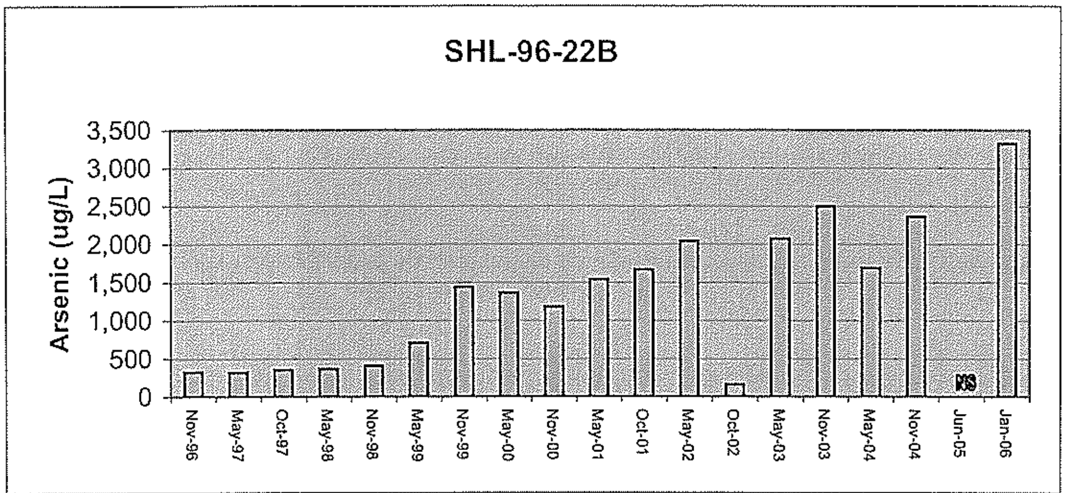
Shepley's Hill Landfill Historic Arsenic Groundwater Concentrations (ug/L)

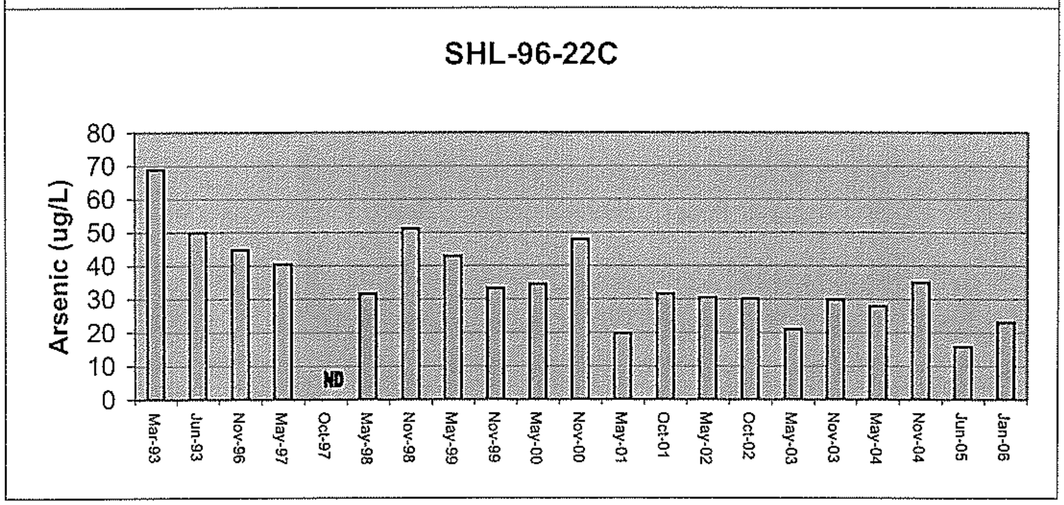






Shepley's Hill Landfill Historic Arsenic Groundwater Concentrations (ug/L)





Appendix D

Data Quality Evaluation and Chemical Quality Analysis Reports

June 2005 Monitoring

Data Evaluation Report
For
Shepley's Hill Landfill, Fort Devens, MA
Long Term Monitoring Groundwater Samples
Samples Collected June 2005

Introduction

Nine total groundwater samples were collected were collected from Shepley's Hill Landfill at the former Fort Devens, Ayer, Massachusetts. The samples were analyzed at Severn Trent Laboratories (in Colchester VT) for Volatile Organic Compounds (VOCs), Project specific Metals, Alkalinity, Anions (Nitrate, Phosphate, Sulfate, and Chloride), Biochemical Oxygen Demand (BOD_5), Chemical Oxygen Demand (COD), Total Hardness, Total Dissolved Solids (TDS), Total Suspended Solids (TSS), Cyanide and Total Organic Carbon (TOC). The samples were collected on June 6 and 7, 2005 (see Groundwater Analytical Results Table.

Laboratory reports were reviewed for adherence to acceptable laboratory practices. The data evaluation elements reviewed include sample shipment temperatures, holding times, blank sample results, surrogate recoveries, LCS/LCSD recoveries and precision, MS/MSD recoveries and precision, and precision between sample duplicates.

The results were evaluated for acceptability in accordance with the laboratory's defined acceptance limits, with standard EPA SW846 guidance, with guidelines provided in EM 200-1-3, Appendix I "Shell For Analytical Requirements", dated 1 February 2001, and/or EM 200- 1 - 10 (DRAFT/Final), "Guidance for Evaluating Performance Based Chemical Data Packages".

Sample Shipment and Receipt

All sample coolers were packed with ice in the field. Sample shipments were received at the laboratory on June 7 and 8, 2005. All samples were appropriately preserved. There are no sample shipment or receipt anomalies associated with these samples.

Data Qualification by Method

Volatile Organic Compounds (VOCs, SW-846 Method 5030/8260B)

SAMPLES :

SHL- 19 - Results for 2-butanone, acetone and xylenes are qualified ("J") estimated due to low matrix spike duplicate recovery, low matrix spike recovery, and low matrix spike recovery and high RPD between MS and MSD, respectively.

SHL-11-DUP - Due to equipment blank contamination, the reported value for acetone for this sample, 2.4 J ug/L, is elevated to the reporting limit for acetone and is reported as 5.0 U ug/L.

Metals (SW-846 Method 601 0B; Mercury Method 7470)

No data review qualifiers were applied. All data is acceptable and useable as reported.

Alkalinity (Method 310.1)

All alkalinity results are qualified as ("J") estimated due to holding time exceedance of date of sampling to date of analysis.

Biological oxygen Demand (BOD_5, EPA Method 405.1)

No data review qualifiers were applied. All data is acceptable and useable as reported.

COD (Method 410.4)

No data review qualifiers were applied. All data is acceptable and useable as reported.

Anions (Method 300.0)

SAMPLES:

SHL-3 - Due to equipment blank contamination, the reporting limit for chloride is elevated to the level found in the sample and reported as 690 U ug/L.

SHL-5 - Due to equipment blank contamination, the reporting limit for sulfate is elevated to the level found in the sample and reported as 910 U ug/L.

SHL-10 - Due to equipment blank contamination, the reporting limit for chloride is elevated to the level found in the sample and reported as 1,100 U ug/L.

SHL-11 - Due to equipment blank contamination, the reporting limit for sulfate is elevated to the level found in the sample and reported as 880 U ug/L

SHL-11 DUP - Due to equipment blank contamination, the reporting limit for sulfate is elevatedto the level found in the sample and reported as 1,200 U ug/L.

SHL-19 - Due to equipment blank contamination, the reporting limit for chloride is elevated to the level found in the sample and reported as 1,100 U ug/L.

All sample results for nitrate are qualified. Due to equipment blank contamination, the reporting limit for nitrate is elevated to the level found in each sample and reported as ("U").

Hardness as $CaC0_3$ (Method 130.2)

No data review qualifiers were applied. All data is acceptable and useable as reported.

Total Cyanide (EPA Method 335.4)

No data review qualifiers were applied. All data is acceptable and useable as reported.

TDS (Method 160.1)

No data review qualifiers were applied. All data is acceptable and useable as reported.

TSS (Method 160.2)

No data review qualifiers were applied. All data is acceptable and useable as reported.

Total Organic Carbon (SW-846 Method 9060)

No data review qualifiers were applied. All data is acceptable and useable as reported.

CHEMICAL QUALITY ASSURANCE REPORT

LONG TERM GROUNDWATER MONITORING AT SHEPLEY'S HILL LANDFILL DEVENS, MASSACHUSETTS JUNE 2005 SAMPLING ROUND

PREPARED BY
DAVID LUBIANEZ
OF THE
GEOLOGY & CHEMISTRY SECTION
ENGINEERING/PLANNING DIVISION

DEPARTMENT OF THE ARMY
NEW ENGLAND DISTRICT, CORPS OF ENGINEERS
CONCORD, MASSACHUSETTS

MARCH 3, 2006

CHEMICAL QUALITY ASSURANCE REPORT

LONG TERM GROUNDWATER MONITORING AT SHEPLEY'S HILL LANDFILL DEVENS, MASSACHUSETTS JUNE 2005 SAMPLING ROUND

One groundwater QA sample from Shepley's Hill Landfill Long Term Monitoring, Devens Massachusetts project was analyzed by the QA laboratory, resulting in a total of 37 target determinations. In 24 of these determinations analytes were detected by one or both laboratories. Results from the analysis of QA samples were compared with results from analyses of the corresponding primary samples.

All primary lab analyses were performed by Severn Trent Laboratories, Inc., Colchester, VT. Analyses performed were VOCs; trace metals, aluminum, arsenic, barium, cadmium, chromium, copper, iron, manganese, lead, nickel, silver, selenium, sodium, zinc, and mercury; total dissolved solids (TDS), chloride, nitrate, sulfate, alkalinity, total cyanide, biological oxygen demand (BOD), total organic carbon (TOC), total suspended solids (TSS) and chemical oxygen demand (COD). QA laboratory analyses were performed by AMRO Environmental Laboratories, Merrimack, NH.

Comparability and agreement was evaluated and expressed in terms of relative percent difference (RPD). For all analyses, RPD values greater than or equal to 75% RPD constituted a data discrepancy. For VOCs and metals, only project specific targets were used for comparison.

The primary and QA samples agreed overall in 33 (89%) of the comparisons. Primary and QA samples agreed quantitatively in 19 out of 24 (79%) of the comparisons. Refer to Table 1 for a QA split sample data comparison summary. Quantitative agreement represents only those determinations where analyte was detected by at least one laboratory.

Primary laboratory QC was evaluated and reported in the data evaluation report. See that report for findings. QA laboratory data was evaluated for custody, holding times, and laboratory QC compliance and found to be within criteria except as noted: sample SHL-11 had the pH adjusted to >12 upon receipt at the laboratory and the analysis for nitrate was performed outside of holding time. These discrepancies could result in possible low bias. Any other noted QC anomalies did not seriously impact the QA data or its usability and are not considered significant. None of the above noted QC issues significantly impact the usability of the QA data. All QA data is acceptable for its intended use and data comparison between laboratories exhibits mostly good agreement except for metals, which exhibited only fair agreement.

Table 1

Quality Assurance Split Sample
Data Comparison Summary

Project: Shepley's Hill Landfill, LTM , Devens, Massachusetts

	Overall Agreement (1)		Quantitative Agreement (2)	
Test Parameter	**Number**	**Percent**	**Number**	**Percent**
VOC	12/12	100	3/3	100
Trace Metals	11/15	73	6/11	54
TDS	1/1	100	1/1	100
Chloride	1/1	100	1/1	100
Nitrate	1/1	100	1/1	100
Sulfate	1/1	100	1/1	100
Alkalinity	1/1	100	1/1	100
Total Cyanide	1/1	100	1/1	100
BOD	1/1	100	1/1	100
COD	1/1	100	1/1	100
TOC	1/1	100	1/1	100
TSS	1/1	100	1/1	100
Total	33/37	89	19/24	79

NOTES:

(1) Represents the number and percentage agreement of all determinations including analytes not detected by either laboratory.

(2) Represents the number and percentage agreement of only those determinations where an analyte was detected by at least one laboratory.

Groundwater Analytical Results - June 6-7, 2005 Sampling Event
Shepley's Hill Landfill
Devens, Massachusetts
(Sheet 1 of 1)

PARAMETERS	Well No. CLEANUP LEVEL (1) µg/L	SHL-11 µg/L	SHL-11-QA µg/L	RPD
VOLATILES (8260B)				
1,1-Dichloroethane	70 (4)	5.0 U	2.0 U	N/A
1,2-Dichlorobenzene	600	5.0 U	2.0 U	N/A
1,2-Dichloroethane	5	5.0 U	5.0 U	N/A
1,2-Dichloroethene (total)	70 (2)	1.4 J	1.2 J	15
1,3-Dichlorobenzene	600 (2)	5.0 U	2.0 U	N/A
1,4-Dichlorobenzene	5	5.0 U	1.6 J	N/A
2-Butanone	-	5.0 U	10 U	N/A
4-Methyl-2-Pentanone	-	5.0 U	10 U	N/A
Acetone	3,000 (4)	5.0 U	10 U	N/A
Benzene	5 (2)	1.5 J	1.4	7
Methyl-t-Butyl Ether	70 (4)	5.0 U	2.0 U	N/A
Xylenes	10,000 (2)	5.0 U	2.0 U	N/A
METALS (6010B or as noted)				
Aluminum	6,870	88 U	480	N/A
Arsenic	50	**524**	**527**	1
Barium	2,000 (2)	78.5 B	67 U	16
Cadmium	5 (2)	0.6 U	5.0 U	N/A
Chromium	100	1.2 U	10.0 U	N/A
Copper	1,300 (3)	6.6 B	4.82 J	31
Iron	9,100	**59400**	**57000**	4
Lead	15	4.8	1.1 J	125
Manganese	1,715	**2380**	**2410**	1
Mercury (7470A)	2 (2)	0.1 U	0.2 U	N/A
Nickel	100	3 U	4.94 J	N/A
Selenium	50 (2)	3.8 U	5.0 U	N/A
Silver	40 (4)	1.8 U	2.36 J	N/A
Sodium	20,000	**21600**	**21100**	2
Zinc	2,000 (4)	5 B	27.4	138
GENERAL CHEMISTRY				
Alkalinity as $CaCO_3$	-	201,000	170,000	17
Biochemical Oxygen Demand	-	1,400	2,000 U	N/A
Chloride	-	23,900	25,000	4
Chemical Oxygen Demand	-	20,000 U	16,000 J	N/A
Cyanide (Total)	200 (2)	10 U	5.0 J	N/A
Hardness as $CaCO_3$	-	127,000	123,000	3
Nitrate as Nitrogen	10,000 (2)	420 U	51 J	N/A
Sulfate	500,000 (2)	880 U	730 J	N/A
Total Dissolved Solids	-	585,000*	380,000	42
Total Suspended Solids	-	33,100	21,000	45
Total Organic Carbon	-	3,600	3,600	0

Notes:

Shaded areas with bold numbers indicate cleanup level exceedance -
B = value within 5 times of the greater amount detected in the equipment or preparation blank samples
B (inorganics)= value below PQL but above IDL
J = estimated value
U = Below laboratory RL
* = duplicate analysis Relative Percent Difference outside acceptance limits
N/A = not applicable

January 2006 Monitoring

Fort Devens
2005 Annual Shepley's Hill Sampling
Data Quality Evaluation Report

Introduction

The objective of this Data Quality Evaluation (DQE) report is to assess the data quality of analytical results for water samples collected for Fort Devens during the 2005 Annual Shepley's Hill sampling event. Individual method requirements, guidelines from the USEPA Contract Laboratory National Functional Guidelines for Inorganic Data Review, July 2002 (NFG) were used in this assessment.

This report is intended as a general data quality assessment designed to summarize data issues.

Analytical Data

This DQE report covers 17 normal (N) and one field duplicate (FD) environmental samples. These samples were reported under three sample delivery groups. Samples were collected between January 19 and January 25, 2006 and delivered to the laboratory the same day as collection. Alpha Analytical Laboratories (APHW) in Westborough, Massachusetts performed the analyses. Selected samples were analyzed for the following analytes/methods:

Table 1
Analytical Parameters

Parameter	Method	Laboratory
Total Alkalinity	A2320B	APHW
Total Dissolved Solids	A2540C	APHW
Total Suspended Solids	A2540D	APHW
Total Cyanide	SW9014	APHW
Chloride	SW9251	APHW
Nitrogen, Nitrate	A4500	APHW
Sulfate	SW9038	APHW
Chemical Oxygen Demand	A5220D	APHW
Biochemical Oxygen Demand (5-day)	A5210B	APHW
Total Organic Carbon	SW9060	APHW
Hardness	A2340B	APHW
Methylene Chloride	SW8260B	APHW
1,1-Dichloroethane	SW8260B	APHW
Chloroform	SW8260B	APHW
Carbon Tetrachloride	SW8260B	APHW
1,2-Dichloropropane	SW8260B	APHW

Table 1
Analytical Parameters

Parameter	Method	Laboratory
Dibromochloromethane	SW8260B	APHW
1,1,2-Trichloroethane	SW8260B	APHW
Tetrachloroethene	SW8260B	APHW
Chlorobenzene	SW8260B	APHW
Trichlorofluoromethane	SW8260B	APHW
1,2-Dichloroethane	SW8260B	APHW
1,1,1-Trichloroethane	SW8260B	APHW
Bromodichloromethane	SW8260B	APHW
trans-1,3-Dichloropropene	SW8260B	APHW
cis-1,3-Dichloropropene	SW8260B	APHW
1,1-Dichloropropene	SW8260B	APHW
Bromoform	SW8260B	APHW
1,1,2,2-Tetrachloroethane	SW8260B	APHW
Benzene	SW8260B	APHW
Toluene	SW8260B	APHW
Ethylbenzene	SW8260B	APHW
Chloromethane	SW8260B	APHW
Bromomethane	SW8260B	APHW
Vinyl Chloride	SW8260B	APHW
Chloroethane	SW8260B	APHW
1,1-Dichloroethene	SW8260B	APHW
trans-1,2-Dichloroethene	SW8260B	APHW
Trichloroethene	SW8260B	APHW
1,2-Dichlorobenzene	SW8260B	APHW
1,3-Dichlorobenzene	SW8260B	APHW
1,4-Dichlorobenzene	SW8260B	APHW
Methyl tert butyl ether	SW8260B	APHW
m,p-Xylene	SW8260B	APHW
o-Xylene	SW8260B	APHW
cis-1,2-Dichloroethene	SW8260B	APHW
Dibromomethane	SW8260B	APHW
1,2,3-Trichloropropane	SW8260B	APHW
Styrene	SW8260B	APHW
Dichlorodifluoromethane	SW8260B	APHW
Acetone	SW8260B	APHW
Carbon disulfide	SW8260B	APHW

Table 1
Analytical Parameters

Parameter	Method	Laboratory
2-Butanone	SW8260B	APHW
4-Methyl-2-pentanone	SW8260B	APHW
2-Hexanone	SW8260B	APHW
Bromochloromethane	SW8260B	APHW
Tetrahydrofuran	SW8260B	APHW
2,2-Dichloropropane	SW8260B	APHW
1,2-Dibromoethane	SW8260B	APHW
1,3-Dichloropropane	SW8260B	APHW
1,1,1,2-Tetrachloroethane	SW8260B	APHW
Bromobenzene	SW8260B	APHW
n-Butylbenzene	SW8260B	APHW
sec-Butylbenzene	SW8260B	APHW
tert-Butylbenzene	SW8260B	APHW
o-Chlorotoluene	SW8260B	APHW
p-Chlorotoluene	SW8260B	APHW
1,2-Dibromo-3-chloropropane	SW8260B	APHW
Hexachlorobutadiene	SW8260B	APHW
Isopropylbenzene	SW8260B	APHW
p-Isopropyltoluene	SW8260B	APHW
Naphthalene	SW8260B	APHW
n-Propylbenzene	SW8260B	APHW
1,2,3-Trichlorobenzene	SW8260B	APHW
1,2,4-Trichlorobenzene	SW8260B	APHW
1,3,5-Trimethylbenzene	SW8260B	APHW
1,2,4-Trimethylbenzene	SW8260B	APHW
Ethyl ether	SW8260B	APHW
Isopropyl ether	SW8260B	APHW
Ethyl tert butyl ether	SW8260B	APHW
Tertiary amyl methyl ether	SW8260B	APHW
1,4-Dioxane	SW8260B	APHW
Total Aluminum	SW6010B	APHW
Total Arsenic	SW6010B	APHW
Total Barium	SW6010B	APHW
Total Cadmium	SW6010B	APHW
Total Chromium	SW6010B	APHW
Total Copper	SW6010B	APHW

Table 1
Analytical Parameters

Parameter	Method	Laboratory
Total Iron	SW6010B	APHW
Total Manganese	SW6010B	APHW
Total Mercury	SW7470A	APHW
Total Nickel	SW6010B	APHW
Total Silver	SW6010B	APHW
Total Sodium	SW6010B	APHW
Total Zinc	SW6010B	APHW

The assessment of data includes a review of: (1) the Chain-of-Custody (CoC) documentation; (2) holding time compliance; (3) the required quality control (QC) samples at the specified frequencies; (4) flagging for method blanks; (5) laboratory control spiking samples (LCS); (6) analytical spike data; (7) matrix spike/matrix spike duplicate (MS/MSD) samples; and (8) flagging for equipment blank.

Data flags were assigned according to the NFG. Multiple flags are routinely applied to specific sample method/matrix/analyte combinations, but there will be only one final flag. A final flag is applied to the data and is the most conservative of the applied validation flags. The final flag also includes matrix and blank sample impacts.

The data flags are those listed in the NFG and are defined below:

- J = Analyte is present but the reported value may not be accurate or precise (estimated).
- R = The data are unusable due to deficiencies in the ability to analyze the sample and meet QC criteria.
- U = Analyte was not detected at the specified detection limit.
- UJ = Analyte was not detected and the specified detection limit may not be accurate or precise (estimated).

Findings

The overall summaries of the data validation findings are contained in the following sections:

Holding Times

All holding-time criteria were met.

Method Blanks

Method blanks were analyzed at the required frequency and were free of contamination.

Equipment Blank

An equipment blank was collected and analyzed at the required frequency. Methylene chloride, chloroform, and acetone were detected in the equipment blank. None of these target analytes were detected in any of the samples so no flags were applied.

Trip Blank

Trip blanks were collected and analyzed at the required frequency. No target analytes were detected in the trip blanks so all acceptance criteria were met.

Field Duplicates

FDs were collected and analyzed at the required frequency. The relative percent differences (RPD) between the N and FD results met the acceptance criteria.

Laboratory Control Samples

Laboratory control sample/laboratory control sample duplicates were analyzed as required. Tetrahydrofuran was above the RPD limit but all samples were non-detects and no flagging is required per the NFG. Carbon tetrachloride and 1,2,3-trichloropropane was above the laboratory control limit but all samples were non-detects so no flags were applied. All other accuracy and precision criteria were met.

Matrix Spike/Matrix Spike Duplicate Samples

Matrix spike/matrix spike duplicates (MS/SD) were analyzed as required. Total mercruy did not meet MS/SD acceptance criteria for sample 011906-SHL19. The associated result was non-detect so no flags were applied. All other accuracy and precision criteria were met.

Chain of Custody

Methods outlined on the CoC were performed by the lab using the equivalent Standard Method. No other discrepancies were noted.

Completeness

Out of approximately 1350 points, there were no data points rejected due to QC exceedances, no data points were qualified as non-detect due to blank exceedances, and no data points were qualified as estimated due to QC exceedances. These numbers indicate that the overall completeness goals for the project were met and that the quality of the analytical program and laboratory is sufficient to meet the project data quality objectives.

Overall Assessment

The final activity in the data quality evaluation is an assessment of whether the data meets the data quality objectives. The goal of this assessment is to demonstrate that a sufficient number of representative samples were collected and the resulting analytical data can be used to support the decisionmaking process. The precision, accuracy, representativeness, completeness and comparability are addressed in the NFG. The following summary highlights the data evaluation findings for the above-defined events:

1. The completeness objectives were met for all method/analyte combinations.
2. There were no results qualified because of low-level blank contamination.
3. The precision and accuracy of the data, as measured by laboratory QC indicators, suggest that the NFG goals have been met.

Appendix E

On-Site Discharge Evaluation Technical Memorandum (See Enclosed CD)

Appendix F

Extraction Test
Technical Memorandum
(See Enclosed CD)

Appendix G

Start-Up Process Testing Technical Memorandum (See Enclosed CD)

Appendix H
Response to Comments

Follow-up Comments from EPA/DEP and Resolution

EPA

Resolution: In an email dated April 5, 2007 EPA provided approval to finalize the 2005 Annual Report.

MADEP

In a letter dated April 19, 2007, Hui Liang of DEP provided six (6) additional comments relating to the 2005 Annual Report.

General Response/Resolution: A detailed response on the DEP follow-up comments on the 2005 AR regarding issue of methane monitoring (both landfill gas monitoring and monitoring of dissolved methane in groundwater - Comments 1, 2, and 3 will be provided in a separate Army response letter. However, in general, the Army did not commit to performing quarterly monitoring of dissolved methane as stated in the comment letter. The Army did state in the referenced telecon that additional characterization of dissolved methane would be performed under the supplemental groundwater monitoring work plan in order to confirm the methane in groundwater sampling data collected to date. This data indicated that levels of dissolved methane in groundwater in the area of Scully Road do not pose a safety risk based on both the concentrations detected in groundwater and on the methane gas monitoring data collected in this area. The data also indicated that the methane concentrations in groundwater are attenuating in the down-gradient direction. The additional "off-site" groundwater characterization effort will include analyses for dissolved methane in order to confirm these conditions and the Army will work with the MADEP and USEPA in selecting the appropriate locations for this analysis.

Comment 4, similar to a comment from EPA, requested further discussion of the LTMMP network including SHL-3. This was undertaken at the April 26, 2007 BCT as part of finalization of that document (refer to RTC for Revised LTMMP). Responses to the other two comments on the Draft 2005 Annual Report (No. 5 and 6) are provided below. Comment 6 was also referenced by DEP in their comments on the Revised Long Term Monitoring and Maintenance Plan.

DEP Follow-Up Comment No. 5: As most of the sampling at SHL has focused on arsenic and geochemical parameters associated with reduction/oxidizing potential, MassDEP requests that a subset of monitoring wells be sampled quarterly for a year to establish and more fully characterize the leachate that now may exist. The subset of wells should be within 150 meter of the landfill footprint and must include SHP-15, SHP-99-29X, SHM-96-5B, SHL-11 and SHP-01-38A. MassDEP believes this is necessary for three reasons:

1) The RI/FS work was based on a recently capped landfill (1991-3) and leachate characteristics may have changed over time.
2) The ecological risk screening that determined the RI/FS CoPCs did not evaluate fish and benthic invertebrates as sensitive receptors. The CoPC list developed for the SHL source control remedy in 1992-3 and those associated with both the northern plume discharged at Nonacoicus Brook and at Red Cove in 2007 may not be comparable.

Follow-up Comments from EPA/DEP and Resolution

3) Solid Waste Regulation 310 CMR 19.118 (2) (a) 2 and 310 CMR 132 (1) (h) require the surface and ground water at landfills be adequately monitored and give minimum environmental monitoring requirements.

Response/Resolution: The Army believes that current monitoring network and plant sampling addresses the COCs for the site and is consistent with historical data and the requirements of the ROD. As indicated in the Army's initial response to DEP, the identified analytes are not COC's for the landfill, based on the initial RI and subsequent data collection. While the primary goal of monitoring is directed at assessing arsenic, as the principal COC, and geochemical indicator parameters, many of the requested analytes are currently assessed in the plant effluent. As indicated in the Revised LTMMP, VOCs are scheduled to be sampled annually each fall and several metals are sampled quarterly in plant effluent in accordance with POTW Permit #20. The permit also requires total toxic organics (TTO) sampling to be conducted annually on effluent (NPDES pretreatment requirements). TTO analysis includes a wide spectrum of VOC, SVOC, PCB, and pesticide analysis. This plant effluent sampling provides an indication of general contaminant characteristics (those not specifically addressed by the treatment train).

While the requested suite of analytes are not sampled in the monitoring well network, it is not clear that there are any indications that source loading, and therefore, leachate characteristics have deleteriously changed since capping. Site data do not suggest that leachate characteristics have changed such that: a) the original investigation is no longer reflective of site conditions; and b) the COCs identified in the site ROD are not appropriate. The age of the landfill suggests that leachate development and contaminant diversity was likely greatest prior to landfill capping. Capping which occurred in the 1980s and 1990s reduced infiltration and leachate development, and likely greatly reduced contaminant diversity and loading. The reduction of contaminant loading results in reduced groundwater concentrations with time. Site data support the assertion of reduced source loading and improving groundwater quality as evidenced by the waning of anoxic/reducing conditions beneath and downgradient of the landfill and declining trends in COC contaminant concentrations.

It is recognized that there is some uncertainty regarding groundwater quality emanating from the landfill, however, the request to greatly expand the analytical program is not well supported based on both current (on-going) and historical data collection. It is recommended that the need for (and scope of) an expanded monitoring program be revisited following completion of the next phase of investigation i.e., the Supplemental Groundwater and Landfill Cap Assessment for Long Term Monitoring and Maintenance and the AOC 72 Remedial Investigation.

DEP Follow-Up Comment No. 6: To fulfill these requirements MassDEP requests that the subset of monitoring wells referenced in Comment #5 be sampled and analyzed for Indicator Parameters, Inorganics and compounds included in EPA Method 8260 including MEK, MIK, acetone and 1, 4 dioxane, as identified in MassDEP Solid Waste Regulations 310 CMR 19.132 (1) (h) Environmental Monitoring Requirements. Please note that 1, 4 dioxane was added in 2005. In addition ammonia has been identified as possibly contributing to the toxicity at the Plow Shop Pond and should also be included.

Response/Resolution: Please see response to Specific Comment No. 5.

Response to EPA Comments
(Letter dated February 5, 2007)

EPA Comments on
Draft 2005 Annual Report
Shepley's Hill Landfill
Long Term Monitoring & Maintenance
Devens, Massachusetts
December 2006

Specific Comments:

1. Executive Summary, Page ES-1, Last Para: The last sentence on this page indicates that "(m)aintenance activities are scheduled to be performed including repairs to fencing and gates, maintenance to remove wetland vegetation from drainage swales, and drainage improvements for the landfill cap involving filling of low spots resulting from subsidence." Although the fencing and gate repairs were completed, as reported later in the report, the other maintenance activities are not currently scheduled, and elsewhere in the report, it is noted that these activities are anticipated to occur upon completion of the CSA/CAAA. Please clarify. Note that EPA recently requested that the Army evaluate whether removing wetland vegetation from drainage swales could be completed in the near future (i.e., not waiting until completion of the CSA) and Army is considering this.

Army Response: The Army is considering moving up some of the maintenance activities that have been deferred including removal of wetlands vegetation, subject to the availability of funding. In 2005, fences were repaired, new signage was installed, and permanent landfill gas probes were installed on the south end.

2. Executive Summary, Page ES-2, 2nd Para: It is acknowledged that the primary purpose of this report is to document the routine monitoring and maintenance activities, and not to provide data analysis or interpretation. Nevertheless, the statement regarding increased readings in landfill gas vents prompted further scrutiny of previous Annual Reports as well as the data reported in the 2005 document. It is particularly interesting to note that methane concentrations in several gas vents located in the central part of the landfill (e.g., GV-6, GV-7, GV -9, and GV-10) appear to be increasing systematically (please see attached figure). SHL is a "mature" landfill and it is expected that concentrations of methane should show an overall decrease, as the readily-degradable carbon is consumed early in a landfill's history. Therefore, the observed increases may be significant and results of continued monitoring should be assessed.

Army Response: Comment noted. Further assessment of methane generation across the landfill will be conducted in future reports.

3. Executive Summary, Page ES-2, 3rd Para: The report notes that the five wells that were not monitored in June 2005 as part of the LTMP were sampled under the Performance Monitoring Plan for the Contingency Remedy and that those results "...are reported elsewhere." Please provide the reference for these data.

Response to EPA Comments
(Letter dated February 5, 2007)

Army Response: Baseline performance monitoring data, in accordance with the Performance Monitoring Plan (PMP) for the Contingency Remedy, were collected in February and August 2005. These data were collected at the five well locations that were not monitored during the USACE, June 2005 LTMMP event. The PMP data have been provided to the BCT in data summaries provided at technical meetings and on the FTP site. In addition, these data are included in the Appendix A of the recently Revised LTMMP.

4. Section 5.0, Page 7, 2nd Para: This section states that groundwater levels were measured on August 24 and August 26, 2006, as part of the extraction test. The data in Table 5-2 indicate that baseline water levels were measured on 8/24/2005 and maximum drawdown was measured on 8/26/2006. Also, water level elevations are shown on Figures 5-1 and 5-2 for pre-test and maximum drawdown conditions, respectively. The figure captions indicate that these measurements were taken on August 24 and 26, 2005. Please correct these dates.

Army Response: Corrections relating to date references will be made.

5. Section 5.0, Page 7: Water-level measurements taken during August 2006 confirm the general northerly direction of groundwater flow in the overburden. The last sentence in this section suggests that results of the extraction test indicate "...that the operation of the groundwater extraction system will create an even greater northerly flow." Comparison of groundwater elevation contours on Figures 5-1 and 5-2 shows essentially no difference in the direction of groundwater flow, except in the immediate vicinity of the extraction wells. Please either explain what is meant by "...even greater northerly flow" or delete this statement.

Army Response: Modeling work suggests that the pumping stress applied at the north end of the landfill results in a greater number of flow lines (or flow tubes) directed to the north. Pumping stresses affect flow over the long term from distal points toward pumping centers through subtle pressure changes and gradient shifts neither readily observable with field instrumentation nor easily discerned on contour plots of synoptic field measurements. However, the observed water levels agree reasonably well with modeled water levels such that longer-term, steady-state simulations, involving particle-tracking of flow under un-pumped and pumped conditions are supported and provide a means to assess water flow over longer time frames.

6. Section 7.3.1, Page 12, 3rd Para: This section notes that "...the highest historic level of arsenic, 3320 ug/L, was recorded at SHM-96-22B during the January 2006 sampling." Does this statement refer only to this well? Please reconcile this statement with the data in Table 7-4, in which the highest historic level of arsenic, 5110 ug/L, was found in (May 2000 sampling round).

Army Response: The text was intended to be referring to the highest level detected at SHM-96-22B, historically. The commenter is correct that SHM-96-5B has had the highest levels detected of all wells in the LTM network. The text at the identified location and in the Executive Summary has been edited to provide clarification.

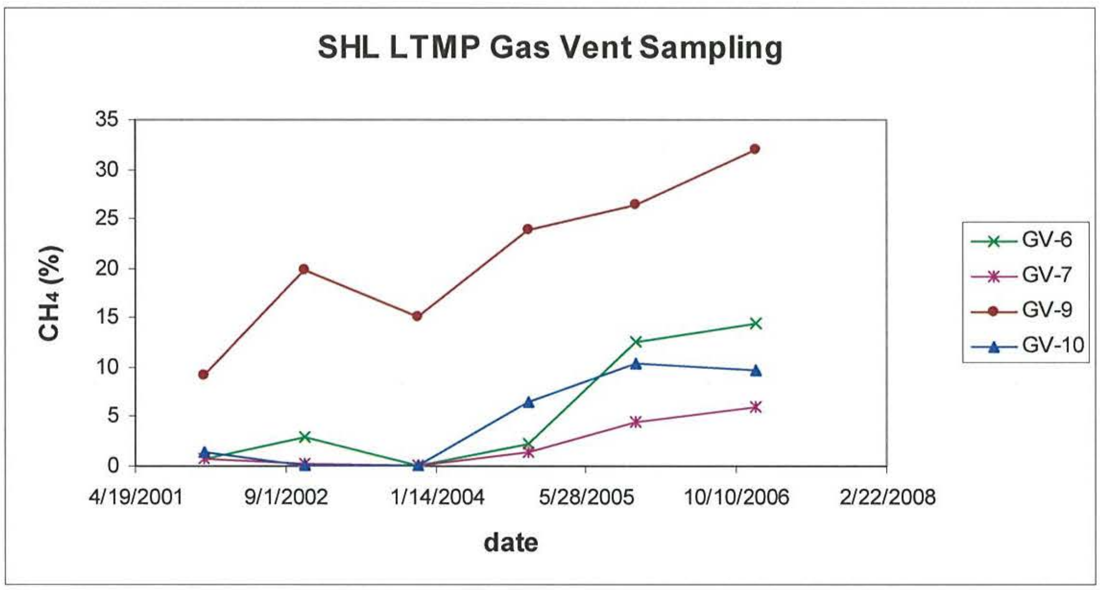
7. Section 10.1, Page 17, 1st Bullet: The FYR referenced here is the 2000 FYR, not the 2005. Please correct the reference.

Army Response: This has been corrected.

8. Section 10.1, Page 17, 2nd Bullet: This bullet repeats text from Section 5.0 regarding the expectation that the groundwater extraction system will create an "...even greater northerly flow." Please see previous Specific Comment 5.

Army Response: Pease refer to response to Specific Comment 5.

[Figure relating to Specific Comment #2]



Response to DEP Comments
(Letter dated February 1, 2007)

[DEP Letter to Mr. Robert Simeone dated February 1, 2007]

RE: 2005 Annual Report, Shepley's Hill Landfill, Long Term Monitoring and Maintenance (2005 AR), Devens, Massachusetts, December 2006
Revised Long Term Monitoring and Maintenance Plan for Shepley's Hill Landfill (Revised LTMMP), Devens, Massachusetts, December 2006

Dear Mr. Simeone:

The Massachusetts Department of Environmental Protection (MassDEP) has reviewed the above two submittals prepared by CH2M Hill, contractors for the Army's Shepley's Hill Landfill Contingency Remedy, per the DSMOA for Devens. MassDEP is providing the following comments for the two reports separately:

2005 AR:

1. Please provide detail information of recently installed landfill gas monitoring probes at southern perimeter of Shepley's Hill Landfill (SHL).

Army Response: This information has been provided to MA DEP under separate cover.

2. The gas vent V-18 was positioned at the last capped cell of Phase IV-B and had registered significant landfill gas until 2002. For the last four years the vent has only recorded nothing but air and should be pressure tested to determine whether it is functioning properly.

Army Response: No problems with the vent were noted during the last round of purging and monitoring conducted in December, 2006. During this event, data again indicated that air with O_2 near saturation was present in the vent system. If methane production is not occurring, the detected conditions may develop as air moves in through the vadose zone from uncapped areas.

3. MassDEP has always noted the lack of vegetation on the east side of SHL, along the perimeter of the cap. Based on the Landfill Cap Assessment-Focused Test Pitting Summary Report drafted by AMEC and dated July 17, 2006 it may be caused by the capping system did not extend to that area. Further assessment and repair are necessary around those areas.

Army Response: The lack of vegetation is likely due to sandy soil conditions and resultant poor moisture retention (ie. loam is not present to support vegetation). This area will be improved as other maintenance activities on the landfill are completed following the Supplemental Groundwater Investigation and Landfill Cap Assessment (in progress).

4. Monitoring well SHL-3 went dry and was not sampled during 2006 winter monitoring. The well should be redeveloped and re-sampled.

Army Response: This well will be redeveloped to the extent possible, if monitoring continues. It has been redeveloped in the past by USACE and CH2M HILL but continues to have poor recovery when sampled. In responses to comments on the Revised LTMMP (December, 2006), per EPA's suggestion, we have decided that SHL-3 is a good candidate to remove from the LTM network.

5. Please see attached memorandum dated October 24, 2005 regarding further evaluation about surface water disposal option of treated water for Arsenic Treatment Plant that would be necessary before final implementation.

Army Response: Comment noted.

6. The MassDEP has concerns with the recommendations in the report, and requests the following two items be addressed:
   a. Full suites of VOC, SVOC, PCB, pesticides, metal, and UXO should be analyzed, biannually at initial LTM network wells, at minimum. MassDEP Office of Research and Standards is concerned that contaminants, other than the flocculent and arsenic, from the landfill may migrate into Red Cove in the future and cause additional ecological impacts. Because the wastes disposed in the Shepley's Hill Landfill have not been well characterized, it is not possible to determine what contaminants may mobilize from these wastes in the future and get into groundwater and subsequently discharge into Red Cove. This creates an unknown ecological risk for Red Cove.

Army Response: The identified analytes are not currently COC's for the landfill, based on the initial RI and historical data collection since. However, as requested by EPA during development of the Performance Monitoring Plan (CH2M HILL, 2005) for the groundwater extraction and treatment system, monitoring for VOC's in plant influent is being conducted annually. The Revised LTMMP calls for this being conducted during the fall monitoring event. In addition, in accordance with POTW Permit #20 (June 26, 2006), several metals are analyzed for in plant effluent on a quarterly basis and arsenic is collected monthly. The permit also calls for total toxic organics (TTO) sampling to be conducted annually on effluent (NPDES pretreatment requirements). TTO analysis includes a wide spectrum of VOC, SVOC, PCB, and pesticide analysis.

   b. Lead, copper, nickel and silver should not be eliminated for monitoring wells adjacent to Red Cove before the Plow Shop Pond remedial investigation is finalized, and ammonia should also be included.

Army Response: Based upon the original remedial investigation and risk assessment, lead (Pb) and nickel had clean-up levels established in the ROD (1995) but copper and silver did not. These clean-up levels were based on a groundwater action level of 15 ug/L and a Federal MCL of 100 ug/L for lead and nickel, respectively. Federal MCLs or State MMCL have been used to establish the clean-up levels for most parameters in the ROD table of clean-up levels. Lead and nickel have been below 15 ug/L and 100 ug/L clean-up standards, respectively, for groundwater at all compliance wells over many years. Although ROD clean-up levels are not formally established for copper and silver, they have been below MCLs or MMCLs at all compliance wells for many years. As mentioned in the response to Comment #6, quarterly sampling for metals including lead, copper, nickel, and silver is conducted on effluent.

Compliance wells have total nitrate-nitrite well below the MCLs of nitrate (10 mg/L), nitrite (1 mg/L), or total nitrate-nitrite (10 mg/L). There is no MCL for ammonia. Ammonia is not considered to be present as a significant source in the landfill due to the low levels of nitrate detected distally (nitrification would convert ammonia to nitrate) and no history of septage disposal at the landfill.