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Engineering and Geological Services

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Assessment of Corrective Measures

Halifax County Landfill
Halifax, North Carolina

Prepared For:

Halifax County
P.O. Box 70
Halifax, North Carolina 27839

Prepared By:

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December, 2007

ASSESSMENT OF CORRECTIVE MEASURES

Halifax County Landfill
Aurelian Springs, North Carolina

Prepared for:

Halifax County
P.O. Box 70
Halifax, North Carolina 27839

RSG Project No. Halifax-8

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December, 2007

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1.0 INTRODUCTION

1.1 Project Description

The Halifax County Landfill (North Carolina Permit # 42-04) is located southwest of the town of Roanoke Rapids, North Carolina near Aurelian Springs. The landfill stopped accepting municipal solid waste (MSW) in December, 1997 and a cover was completed in September, 1998. Halifax County is currently transporting MSW to a Subtitle D landfill in Virginia and accepting construction and demolition waste in order to bring the closed landfill area up to final closure contours. Halifax County also operates an ash monofill site to the north of the MSW landfill. The site map (**Figure 1**) includes the current topography and operating conditions at the landfill.

Ground and surface water monitoring for Appendix I constituents was initiated at the Halifax County Landfill in December, 1993. The monitoring has included Appendix I detection monitoring (1993 - 1995), and Appendix II assessment monitoring (1995 - present).

1.2 Background

Richardson Smith Gardner and Associates, Inc. (RSG) has performed ongoing evaluations of ground water quality at the site including statistical analyses of laboratory data. Ground water monitoring has been ongoing on a semi-annual basis at the site since 1993. Based upon these analyses, five wells (MW-2a, MW-2ad, MW-3a, MW-15r and MW-16A) have detections above ground water standards (2L) and/or statistically significant detections.

This assessment of corrective measures is written in response to the statistically significant ground water impact detected in the area downgradient of the landfill and in one area upgradient (MW-15r and MW-16a).

Monitoring wells MW-15r and MW-16a are located upgradient of the landfill. Given their distance from the landfill, upgradient location and prior investigations in this area, landfill gas has been determined to be the source of impact in these wells.

It should be noted that a Ground Water Assessment was conducted in 1999 to evaluate potential receptors and further actions for ground water monitoring at the site. At that time, NCDENR approved recommendations to install additional wells downgradient of the landfill (MW-2ad, and MW-3d, and to cease monitoring shallow wells MW-6 and MW-7 (downgradient) and replace them with deeper wells MW-6d and MW-7d.

1.3 Assessment of Corrective Measures Objectives

The objectives of the site Assessment of Corrective Measures (ACM) program for the Halifax County Landfill site are to review the types, magnitude, and extent of environmental contaminants present and attributable to past solid waste disposal activities at the site, to identify and reduce the risk to potential human and environmental receptors, and to evaluate remedial options to reduce/eliminate the environmental impact.

2.0 SITE CHARACTERISTICS

2.1 Site Topography

The landfill occupies a ridge and slope between Brewers Creek and an unnamed tributary. The landfill is approximately triangular shaped due to the narrowing of this ridge as it nears the confluence of the two creeks. The landfill is bordered on the west, and south by these streams and ponded areas, primarily created by beaver dam construction. The ridge continues off the property to the east. The site and surrounding area is shown on **Figure 1**.

2.2 Surrounding Land Use

The local area is a mix of agricultural and timberland as well as regenerated forest. Immediately adjacent to the landfill, on the eastern side, are old abandoned agricultural lands, which are inside the property boundary. The land adjacent to the property boundary is predominantly forested. The surrounding land use can be seen on the aerial photograph included as **Figure 2**.

2.3 Site Geology

2.3.1 <u>Regional Geologic Characteristics</u>

A review of the *1985 North Carolina Geological Map* as well as *Ground Water in the Halifax Area, North Carolina* (Dept. of Conservation and Development Bulletin #51, 1946) indicates that the landfill site is situated on the eastern edge of the Eastern Piedmont Physiographic

Province. The site is just west of the Coastal Plain overlap. Western Halifax County is underlain by an assemblage of felsic to intermediate crystalline igneous and metamorphic rocks of early to late Paleozoic age. The rocks of the eastern piedmont exhibit a northeast strike and locally dip gently eastward as a result of regional metamorphism and folding which produced a broad plunging anticline. The area was simultaneously intruded by a number of felsic (granite) plutons. The rock formation underlying the subject site is a granitic pluton identified as the Butterwood Creek intrusive.

A few miles east of the site, the crystalline rocks of the Piedmont plunge beneath non-indurated fluvial and deep marine sedimentary deposits of the Coastal Plain. During late Tertiary times, portions of the eastern Piedmont were over washed by deltaic streams and shallow seas. This resulted in the deposition of a thin veneer of clayey sands and rounded quartz gravel, which is still visible along the uplands near the site.

2.3.2 Site Geologic Characteristics

Currently, there are 14 wells located around the site that vary in depth from 19 to 52 feet below grade. Nine (9) of these wells are currently included in the ground water monitoring network (MW-1, MW-2a, MW-2ad, MW-3a, MW-3d, MW-6d, MW-7d, MW-15r and MW-16a). Additional wells not included in the monitoring network are MW-6, MW-7, MW-17, MW-18s and MW-18d. Boring logs for the shallow wells indicate they are installed in a series of sands and silts with some clay while MW-2ad and MW-18d are installed in granite. Boring logs and well construction diagrams are included in **Appendix A**.

2.4 Site Hydrogeology

Depths to ground water generally range from near surface in lowland areas along Brewer's Creek and its tributary to up to 45 ft. below grade along the ridge east of the landfill. The potentiometric surface map for the most recent sampling event is included as **Figure 3**. The direction of ground water flow represented in this figure is consistent with previous flow patterns since 1993. **Table 1** presents the ground water velocities for the last sampling event. Ground water velocities on-site ranged from 0.057 ft/day in MW-16a to 1.835 ft/day in MW-2a during the most recent sampling event.

As can be seen from the potentiometric map, ground water at the site is flowing generally to the west towards Brewer's Creek and its tributary. There are minor seasonal variations in the flow pattern, but overall the direction of flow is the same. It should be noted that Brewer's Creek has historically been blocked by a beaver dam downgradient of the site. This had impacted the area near MW-2a and MW-3a with slow moving water and an enlarged area of ponded water. The beaver dam was broken in October 2007.

Water levels are collected from piezometers upgradient of MW-15r to evaluate ground water direction in this area. This data indicates ground water flow is consistently to the west and there is no ground water reversal in the area of MW-15r. The potentiometric map for this sampling event is shown as **Figure 3**.

3.0 PREVIOUS INVESTIGATIONS AND SOURCE CONTROL MEASURES

3.1 Previous Investigations

3.1.1 Potential Receptor/Ground Water End Use Evaluation

RSG personnel have evaluated the surrounding areas for potential receptors that could potentially be impacted by contaminated ground water. A potable well survey identified 24 potable water wells within 2000 feet of the site boundary, None of the area water wells are considered to be downgradient of the closed MSW landfill. The potable well users are shown on **Figure 4**.

Significant ground water users within two miles of the site include two schools: a high school located approximately 1.5 miles northeast of the site, and an elementary school located approximately 0.8 miles south of the facility boundary. Neither ground water user facility is downgradient of the site.

There are no public water supply wells in the vicinity of the site. No surface water intakes or residential subdivisions are known to exist within two miles of the site. The nearest known public water service is Roanoke Rapids. Municipal water is available in the vicinity. Municipal water is purchased from the Roanoke Rapids Sanitary District and is resold by the County. The source of the municipal water supplied in this area is the Roanoke River.

3.1.2 Landfill Gas Monitoring

Ongoing landfill gas (LFG) monitoring in probes around the landfill indicate no detectable LFG levels at the property line. However, LFG has been noted in the vicinity of monitoring wells MW-15r and MW-16a. Prior actions to remediate the LFG in this area include the installation of a LFG passive vent trench in the immediate vicinity of MW-15r.

3.1.3 Sensitive Receptors, Exposure Pathways and Media of Concern

The primary sensitive receptors and exposure pathways are the residential potable wells. Secondary sensitive receptors include Brewers Creek downgradient. The exposure pathways for the potable wells include ingestion and through skin contact. The exposure pathway for the surface water is primarily through skin contact. Semi-annual surface water monitoring has indicated no impact from the landfill.

Based upon this information, this assessment of corrective measures will focus on the ground water impact downgradient of the landfill as the media of concern with a secondary media of concern being the LFG that is impacting wells upgradient of the landfill.

3.1.4 Ground Water Assessment Monitoring

Ground water monitoring has been performed since 1993 at the Halifax County Landfill. An extensive database of ground water quality data has been gathered since that time. Ground water monitoring at the site has detected several inorganic and organic constituents. In general, these constituents were found at low levels.

A summary of ground water monitoring results for the Fall 2007 monitoring event are reported in **Table 2**. Graphs of detected constituents over time indicate mildly fluctuating concentrations. Graphical representations of detected constituents from 1994 to the present are included in **Appendix B**.

3.1.5 Background Concentrations and Ground Water Protection Standards

Monitoring well MW-1 is the current background ground water monitoring well for the site. This well is located upgradient of the ash monofill site and continually indicates no detectable concentrations for assessment monitoring constituents. For this evaluation of impact we have used ground water standards (15A NCAC 2L.0200) or Federal Maximum Contaminant Levels (MCLs) where NC 2L standards were not available.

3.1.6 Constituents of Concern

Constituents in ground water at the site that have been detected with levels above the ground water standards are: benzene, methylene chloride, toluene, trichloroethene, and vinyl chloride. These detections are limited to monitoring wells MW-2ad,MW-3a, MW-6d, MW-15r, MW-16a and MW-17. These constituents are believed to be due to impact from the unlined landfill waste masses.

Additionally, two pesticides (alpha BHC and heptachlor) have been found in ground water from well MW-15r. These may be due to old farm practices on this property prior to development as a landfill. It should be noted that bis (2 ethyl hexyl) phthalate was also detected above ground water standards during the most recent event. However, this constituent has not been detected consistently prior to this event and is known to usually be from issues arising from field sampling techniques. Therefore, bis (2 ethyl hexyl) phthalate is not considered to be a contaminant of concern at this time. Should future sampling events indicate this constituent is consistently present, it will be re-evaluated for inclusion as a contaminant of concern.

Several inorganic constituents have been detected at levels above ground water standards or are found to be statistically significant. However, due to the age of the wells and the turbidity noted during sampling, we believe these detections are more likely due to suspended solids in the samples. Further evaluation will be needed to determined whether inorganic constituents are migrating both downgradient and upgradient of the landfill. However, upgradient migration of inorganic constituents is unlikely.

3.2 Previous Source Control Measures

Three corrective actions have previously been put into action at the site. These are:

- Installation of an LFG collection trench in the area of MW-15r.
- Closure of the unlined landfill in 1998
- Ongoing placement of C&D waste on top of the landfill to create final contours that will drain water more efficiently and minimize the infiltration of water into the waste mass in the long term.

The closure of the landfill consisted of a compacted soil cover on the sideslopes and an interim compacted soil cover over the area where C&D is currently being interred. Once closure contours are achieved with C&D waste a geomembrane or geosynthetic clay cover will be placed over it for closure.

4.0 Conceptual Site Model

4.1 Ground Water Impact Over Time

The current ground water monitoring network has been monitored since 1999. Analytical data from these wells indicate mildly fluctuating but overall stable levels for most constituents with the exception of detections in MW-16a which appear to fluctuate more dramatically. In general, only three constituents (benzene, trichloroethene and vinyl chloride) are detected in downgradient monitoring wells above ground water standards, while four constituents (methylene chloride, tetrachloroethylene, heptachlor and alpha BHC) are detected upgradient of the landfill. **Table 4** has a summary of the past 7 years and **Appendix B** for graphs of constituents over time. **Figure 5** shows the site hydrogeological cross-sections which include ground water impact.

The low levels of other chlorinated solvents (cis 1,2 dichloroethene, 1,1 dichloroethane and trichloroethene) in conjunction with the detected vinyl chloride could be indicative of reductive dechlorination ongoing at the site. In samples from MW-3a,.levels of cis-1,2 dichloroethane appear to be decreasing over time. This could indicate microbial dechlorination and natural attenuation already occurring at the site. The relative stability of the plume and lack of downgradient migration further support the idea that natural attenuation is occurring at the site.

4.2 Area of Impact

The area of ground water impact is limited to a relatively small area immediately downgradient of the landfill near MW-3a, MW-3d, and MW-2a, MW-2d and MW-17. Upgradient of the landfill, the area near MW-15r and MW-16a also has impacted ground water, however, this impact is due to the migration of landfill gas and phase transference.

Downgradient of the landfill, the impact is limited to approximately 200 feet from the waste mass. Upgradient, the impact in the area adjacent to MW-15r is approximately 200 feet from the waste mass. Monitoring well MW-16a is located only ~100 feet from the waste mass, so an estimate of impact in this area is uncertain, however, it is likely within 200 feet from the waste mass.

5.0 RISK ASSESSMENT

Historical monitoring at the site indicate that only ground water is impacted above protection standards, therefore this risk assessment (RA) will concentrate on ground water as the potential exposure media at the site. Although landfill gas is present at the site, it is detected at levels below 5% methane near the property line and is therefore not considered as part of this RA.

Soils at the site are not considered to be an exposure medium since the impact to soils is likely to be limited to soils immediately below the landfill footprint. As stated above, LFG migrating from the waste mass is not found in sufficient quantities near off-site receptors (the property line) to merit consideration of soils as a medium of exposure.

Historical surface water data indicate that surface water at this site has not been impacted by the unlined MSW landfill. Therefore, surface water is not considered an exposure medium for this site.

Human exposure pathways are inhalation, ingestion and dermal contact. Pathways for plants and animals include uptake/consumption of impacted water, inhalation/uptake of impacted air, or contact with/ingestion of impacted soil.

To evaluate the risk posed by the impacts to ground water at this site to potential receptors RSG evaluated the risk associated with constituents detected above ground water standards. According to U.S. EPA, an acceptable range for cumulative excess cancer risk is 1E06 to 1E04 (1 person in 1,000,000 to 1 person in 10,000). Seven constituents (benzene, bis (2ethyl hexyl) phthalate, heptachlor, methylene chloride, tetrachloroethene, trichloroethene, and vinyl chloride) were evaluated for Hazard Index and excess cancer risk.

5.1 Plume Evaluation

The COCs are outlined in **Section 3.1.6**. There are eight (8) organic constituents (including two pesticides). These are benzene, alpha BHC, heptachlor, trichloroethene, vinyl chloride and dieldrin. At this time, no inorganic constituents are considered to be COCs. The COCs at the site have been detected within the property boundaries. The wells closest to the property line currently remain free of detectable levels of COCs.

5.1.1 Potential Impact to Facility Contract Workers

The total average daily dose excess carcinogenic risk associated with the ground water plume at the Halifax County Landfill was calculated according to U.S. EPA protocols. These calculations are included in **Tables 7 and 8** and are based upon benzene levels detected in monitoring wells at the site. The assessment assumed an exposure time of 8 hours per event and 4 days per year for 30 years. The ingestion rate was chosen as 2 liters per event to gain a more conservative estimate of the excess carcinogenic risk. No contract worker is expected to ingest any impacted water during sampling activities. Based upon these assumptions, the overall expected excess carcinogenic risk for the contaminants of concern at the site was calculated to be 1.99×10^{-6}. This is within the range of acceptable excess carcinogenic risk according to the U.S. EPA. The Hazard Index (HI) for the contaminants at the site was calculated to be 1.18×10^{-2} which is also within the acceptable range set forth by the U.S. EPA. Therefore, no additional measures or remedial actions are necessary to protect the health of contract workers who will come in contact with the ground water at the Halifax County Landfill.

6.0 ASSESSMENT CONCLUSIONS

The ground water assessment activities at the Halifax County landfill have indicated the following:

1) The low VOCs present are due to unlined landfilling practices dating back to the 1980's.

2) The horizontal impact to ground water is limited to approximately 200 feet downgradient and upgradient of the landfill.

3) Calculations of Hazard Index and excess cancer risk are within U.S. EPA acceptable limits.

4) Based upon both the limited extent of impact, the long term stability of constituents detected above ground water standards and indications of progressive dechlorination it is likely that natural attenuation of the impact is already occurring at the site.

7.0 CORRECTIVE MEASURES SCREENING AND EVALUATION

7.1 Overview

The following sections will give a brief overview of various corrective measures options and their validity for use on this project. Based upon assessment activities contaminants in ground water immediately surrounding the unlined landfill that are above ground water standards need to be addressed at the site.

An evaluation of remedial alternatives is presented as **Table 9**. Of these alternatives, the following three alternatives are evaluated for the downgradient based upon this remedial action goal:

1) Monitored Natural Attenuation
2) Enhanced Bioremediation
3) Ground Water Recovery and Treatment

It should be noted that whatever system is chosen for the downgradient area of impact, a landfill gas collection system will be necessary upgradient of the landfill in the areas of MW-15r and MW-16a. Two options for landfill gas collection are outlined in **Section 7.5**.

7.2 Monitored Natural Attenuation

Monitored Natural Attenuation (MNA) consists of monitoring the natural attenuation processes. This is a proven remedial technology and is appropriate for sites that do not pose a substantial or immediate risk to the environment or human health. MNA allows both physical and biological processes that naturally occur (including dilution, adsorption, volatilization, dispersion and biological degradation of contaminants) to manage the impact to ground water.

MNA requires that ground water at the site be monitored at regular intervals to monitor the progress of the degradation process by various indicators. This regular monitoring is also designed to ensure that the dissolved phase plume is not migrating toward a receptor

At landfill sites, MNA includes the action of naturally occurring anaerobic bacteria which degrade chlorinated hydrocarbons in a process called reductive dechlorination. Reductive dechlorination can stabilize and even decrease the size of plumes.

As stated above, the long term stability of the impacted area with no continued downgradient migration and the reductive dechlorination of certain constituents indicate natural attenuation may already be occurring at the site. Due to the low risk to human health and the environment posed by the ground water impacts, MNA is an appropriate remedial strategy for this site.

MNA remedial strategy requires the monitoring of several processes/indicators that aid in the evaluation of changing plume geometry (whether the plume is stable, expanding or shrinking). Primary evidence for natural attenuation is a stable plume at a site, such as we have observed at the Halifax County Landfill.

The monitoring frequency for MNA varies by site conditions such as water table fluctuations, ground water velocity, seasonal variability and plume migration. Due to the stability of the plume geometry, the distance to a sensitive receptor, and the stability of the general aquifer conditions at the site, one year of quarterly monitoring for MNA indicators and normal assessment monitoring parameters will be sufficient to establish a baseline for continued MNA evaluations over time.

7.2.1 Performance and Reliability

MNA is a remedial strategy that is proven effective and reliable once established. MNA is usually coupled with other remedial strategies such as source control. Currently, Halifax County is placing C&D waste over the old MSW landfills in order to create closure contours that will shed rain water and minimize infiltration and the creation of leachate. Due to the ongoing effort by Halifax County toward source control and the lack of sensitive receptors downgradient, MNA is an ideal remedial strategy for this site.

7.2.2 Implementation Requirements

Implementation of MNA requires a comprehensive initial round of sampling to evaluate the degradation rates and active biological processes at the site. If the evaluation of the initial round of data indicates conditions conducive to natural attenuation, a MNA water quality monitoring plan will be developed for the site.

The MNA water quality monitoring plan will identify all sampling locations, sampling frequency and analyte and field parameter list. The MNA water quality monitoring plan will also propose a series of trigger concentrations or site conditions that would require the re-evaluation of MNA as the site remedial strategy and the evaluation of other technologies for remediation of the site. Once approved, the MNA water quality monitoring plan could be implemented immediately.

7.2.3 Remediation Impacts

There are no impacts associated with the implementation of MNA at the site. Additional purge water may be generated by increased sampling, however, since sampling would be ongoing regardless of the remedial strategy, this slight increase is considered minor.

7.2.4 Remedial Timeframe

MNA should be effective in maintaining the current plume geometry and preventing off-site migration. The timeframe for achieving remedial objectives should be similar to other remedial strategies.

7.2.5 Remedial Costs

The costs associated with the implementation of MNA include the preparation of the MNA water quality monitoring plan, installation of additional wells (if required), sampling, analysis and evaluation of ground water data from one event, and reporting.

Initial Start-up Costs:	
Design and Preparation of MNA Water Quality Monitoring Plan Sampling, analysis, data evaluation and reporting	$35,000.00
Construction Costs:	
Installation of Additional Wells (up to three if required)	$20,000.00
Subtotal	$55,000.00
Contingency (10%)	$5,500.00
Total Cost	**$60,500.00**

Final costs for MNA will be determined upon completion of the initial start-up evaluation.

7.3 Enhanced Bioremediation

Bioremediation is the process whereby microorganisms within the aquifer degrade contaminants through metabolization. Enhanced Bioremediation (EB) is an in-situ active treatment method that introduces chemicals and/or bacteria into the impacted aquifer to enhance the biodegradation process. Chemicals that assist the biodegradation process are oxygen (air injection) and hydrogen peroxide (both which supply oxygen to the microorganisms), or Hydrogen Release Compounds (HRCs) which provide hydrogen ions to the microorganisms to assist in reductive dehalogenation to strip chlorine atoms from chlorinated hydrocarbons as part of their metabolization.

7.3.1 Reliability and Performance

EB is a proven remedial technology and has been used at many sites across the U.S. and can enhance the destruction of contaminants in the subsurface. However, the main limitation of EB is providing a system whereby enough of the impacted aquifer receives contact with the treatment.

EB at the Halifax County Landfill would consist of the injection of bio-enhancing agents into several "injection points" downgradient of the landfill within the impacted aquifer area. Several options for bio-enhancing agents are available. These include HRCs which produce lactic acid in the subsurface that is metabolized by existing microbes to produce hydrogen ions, or dilute hydrogen peroxide or air (oxygen) which will produce an aerobic environment for the destruction of contaminants.

Given the existence of microorganisms already within the aquifer, and their likely anaerobic environment, using oxygen or hydrogen peroxide to change the environment to aerobic is the less attractive of these options as it will upset the existing system which appears to be producing effective results in the form of a stable plume.

7.3.2 Implementation Requirements

The use of EB at the site would require preliminary laboratory testing to evaluate the existing system in greater detail and determine the most effective enhancing agent. This information would be used to design a field test to evaluate the effectiveness of enhancing agents prior to the implementation of a full-scale system. Upon completion of the field test, a full scale design would be submitted and implemented. This would include the location of injection points and a plan for evaluating the effectiveness of the enhancements and criteria for when reapplication may be necessary to maintain effectiveness.

7.3.3 Remediation Impacts

There are no cross-media impacts associated with EB. Purge water would be generated during ground water sampling, however, since sampling will be ongoing at the site, this is not a significant change. Some safety hazards may be presented by the enhancing agent (such as hydrogen peroxide or HRC). These will be thoroughly reviewed and evaluated by all who will come in contact with the agent and will be included in safety communications regarding site work.

7.3.4 Remediation Timeframe

The timeframe required for EB to demonstrate effectiveness will depend upon the enhancing agent used. However, given the low concentrations of constituents seen on the site it is likely that EB will demonstrate effectiveness within two years. Given that the source for leachate impact to the ground water will still exist, it is likely that re-applications will be required and that site remediation will be an ongoing process until source reduction is completed with the closure of landfill that includes a means to reduce infiltration into the landfill waste mass.

7.3.5 Remediation Costs

EB would be utilized along the northeastern portions of the site (hydraulically downgradient). Due to the presence of two separate landfills, two areas would require EB injection. The cost associated with the design, installation of injection wells, purchase of the bio-agent, evaluation and full-scale system implementation are estimated to be as follows:

Design Costs	$25,000.00
Injection Point and Monitoring Point Installation Costs	$95,000.00
Bio-agent costs (HRC, hydrogen peroxide or other)	$70,000.00 to $90,000.00
Evaluation Costs and Reporting	$35,000.00
Subtotal	$245,000.00
Contingency (10%)	$24,500.00
Total Cost	**$269,500.00**

7.4 Ground Water Recovery and Treatment

Ground water recovery and treatment is a process whereby ground water is pumped from a recovery well and then treated to remove contaminants before being utilized for irrigation or disposed in the POTW. In general, these systems are utilized to remediate small plumes or to prevent off-site migration or migration toward a sensitive receptor. As the downgradient plume at the Halifax County Landfill is located along approximately 400 feet of stream, this remedial technology is not the most ideal for this site.

Ground water recovery in this instance would likely be necessary from at least four ground water recovery wells along Brewer's Creek and would result in the treatment of a significant amount of stream water. Treatment of the recovered ground water could be performed through the use of an air stripper system. This system would not be particularly impacted by the suspended solids that would likely be present due to the stream water that would also be recovered.

7.4.1 Reliability and Performance

Ground water recovery with the use of an air stripper system for treatment is a proven remedial technology. As long as the system is maintained it can perform well and function reliably for years.

7.4.2 Implementation Requirements

In order to implement this technology, an initial six-inch diameter ground water recovery well would be installed. An aquifer pumping test would be performed upon this well to evaluate optimal flowrates, zones of influence and contaminant levels in collected ground water. From this data, a full-scale system would then be designed and implemented. The full-scale system would likely include several recovery wells and a method for ground water treatment such as an air stripper system.

7.4.3 Remediation Impacts

Cross media impacts from this system include the release of removed contaminants into the air. Given the low levels of contaminants, this should not be a significant issue.

7.4.4 Remediation Timeframe

The timeframe for remediation will not be significantly better than MNA due to the low levels of impact seen in the ground water and the ongoing nature of the source. Once the site is closed with a less permeable cover, remedial timeframes are expected to improve.

7.4.5 Remedial Costs

Ground water recovery would occur in the southwest portion of the site, downgradient from the landfill. Initial start-up costs would include the installation of one 6-inch diameter ground water recovery well, performance of aquifer testing and laboratory analysis of recovered ground water, sizing and design of the ground water recovery and treatment system, report preparation and then full-scale implementation.

Design Costs (including aquifer testing, system design and reporting)		$120,000.00
Recovery Well Installation Costs (one recovery well)		$20,000.00
Full-scale system construction (estimate)		$200,000.00 to $400,000.00
	Subtotal	$540,000.00
	Contingency (10%)	$54,000.00
	Total Cost	**$594,000.00**

7.5 Active LFG Collection from the Existing Landfill Gas Trench and Wells

Currently, a landfill gas trench is installed in the area of MW-15r. This trench is shown on **Figure 3**. This trench is installed to the depth a backhoe can excavate (approximately 15 feet below grade), and is fitted with passive vents to allow for the release of LFG from the subsurface. This trench historically appeared to assist in improving ground water quality this area, however, during the Fall 2007 event, a number of constituents that had not been detected for 2 years, were again detected. Therefore additional measures in this area will be necessary.

Active LFG recovery utilizing a blower system to remove LFG from the trench in a more aggressive fashion is one option for LFG recovery. The recovered LFG would be vented to atmosphere in the same fashion as it is now.

Additionally, two LFG extraction wells installed in the waste closest to MW-16a will assist in removing LFG from this area and minimize phase transference. Further evaluation of the waste in the area will be needed prior to implementation to evaluate placement and LFG flowrates.

7.5.1 Reliability and Performance

The removal of landfill gas from the subsurface through the use of a blower and underground trench system is a proven remedial technology. As long as the system is maintained, it can perform well and function reliably for many years.

7.5.2 Implementation Requirements

To implement this technology, a pilot study will need to be performed to evaluate the flow of LFG from the trench system. Upon evaluation of the data from the pilot study, a system will be designed and a blower will be installed. Minor modifications to the trench will be necessary to accommodate recovery from one of the passive vent pipes (and to prevent the migration of LFG from other vent pipes).

Additionally, in the area of MW-16a, two LFG extraction wells in the waste will be necessary. An evaluation of waste thickness in this area and LFG flowrates will be needed for a final LFG recovery design from both these systems.

7.5.3 Remediation Impacts

Cross media impacts from this system include release of the LFG into the air. However, at this time, LFG is passively releasing into the air. The increase in recovery rate is not expected to trigger Title V requirements.

7.5.4 Remediation Timeframe

Given the impact the installation of the trench initially had on the ground water quality in MW-15r, it is likely that the impact from this remedial strategy will be noticeable within two years.

However, once the site is closed with a less permeable cover, the reduction in the production of methane (due to drying of the waste) will make this system even more effective.

7.5.5 Remedial Costs

LFG collection will occur in the western portion of the site adjacent to MW-15r and MW-16a. Initial start-up costs will include the installation of two 24-inch diameter LFG recovery wells near MW-16a and a pilot study to evaluate LFG recovery from the existing LFG trench near MW-15r. Upon completion of the pilot study a report will be prepared outlining the results with a full-scale design.

Design Costs (including pilot studies, system design and reporting)		$15,000.00
Recovery Well Installation Costs (two LFG recovery wells)		$30,000.00
Full-scale system construction (estimate)		$15,000.00 to $40,000.00
	Subtotal	$85,000.00
	Contingency (10%)	$8,500.00
	Total Cost:	**$93,500.00**

8.0 Conclusions

Based upon this evaluation, we recommend MNA for the prevention of downgradient migration and the remediation of impacted ground water at the site at this time. If this proves ineffective (as outlined in the MNA Water Quality Monitoring Plan that will be prepared), then this remedial strategy will be re-evaluated and other remedial strategies will be further evaluated. Additionally, we recommend the LFG collection system outlined in **Section 7.5** to remediate LFG in the area upgradient of the landfill to minimize/prevent phase transference into ground water.

Upon approval of this Assessment of Corrective Measures from the Department, Halifax County will begin the public meeting process, and RSG will begin initial field data collection and evaluation in order to prepare a detailed Corrective Action Plan with revised MNA Water Quality Monitoring Plan for the site. This plan will outline future sampling requirements and evaluation protocols.

Table 1

Well Construction Information
Halifax County Landfill
Aurelian Springs, North Carolina

Well	Top of Casing Elev.	Depth to Bottom	Screened Interval	Soil Type Adjacent to Screen
MW-2a	246.43	14	4 - 14	silt and sand
MW-2ad	245.65	40	35 - 40	granite
MW-3a	252.68	9	4 - 9	sand
MW-3d	251.73	19	9 - 19	clayey silt/silty sand
MW-6d	253.22	40	25 - 40	sandy silt
MW-7d	249.09	40	25 - 40	sandy silt
MW-15r	299.78	45	30 - 40	sandy silt
MW-16a	271.46	15	4 - 14	clayey sand
MW-17	na	25	15 - 25	saprolite
MW-18s	na	19	8 - 18	clayey silty sand
MW-18d	na	52	47 - 52	granite

All measurements in feet
NA = Well construction information not available

Table 2
Summary of Porosity, Permeability and Soil Types
Halifax County Landfill
Aurelian Springs, North Carolina

Well	Est. Total Porosity %	Est. Effective Porosity %	Slug Test Conductivity (cm/sec)	Soil types in screened interval
MW-2a	0.35	0.2	1.835	silt and sand
MW-2ad	na	na	na	granite
MW-3a	0.35	0.2	0.311	sand
MW-3d	0.45	0.25	na	clayey silt/silty sand
MW-6d	0.35	0.2	na	sandy silt
MW-7d	0.35	0.2	na	sandy silt
MW-15r	0.35	0.2	na	sandy silt
MW-16a	0.35	0.2	0.057	clayey sand
MW-17	0.4	0.3	na	saprolite
MW-18s	0.38	0.15	na	clayey silty sand
MW-18d	na	na	na	granite

Total and Effective porosity are estimated based upon soil type.

Table 3
Historical Ground Water Elevations
Halifax County Landfill
Aurelian Springs, North Carolina

	Ground Water Elevation													
Well	2/6/2001	8/28/2001	2/7/2002	8/14/2002	2/13/2003	8/7/2003	2/24/2004	08/12/04	2/16/2005	8/16/2005	2/14/2006	8/22/2006	2/14/2007	8/9/2007
MW-2a	241.24	241.32	241.47	240.96	241.68	241.49	241.04	241.28	241.55	241.22	241.59	241.21	241.73	241.26
MW-2ad	240.86	240.91	241.14	240.52	241.38	241.11	240.83	240.94	241.24	240.86	241.25	240.87	241.47	240.9
MW-3a	243.47	243.55	243.98	243.39	244.51	244.03	243.11	243.66	244.11	243.72	244.18	243.49	244.33	243.78
MW-3d	243.28	243.35	243.81	243.23	244.29	243.78	242.8	243.39	243.87	243.45	243.91	243.25	243.95	243.56
MW-6d	240.57	240.28	240.92	240.22	241.57	241.19	241.66	241.02	241.68	240.9	241.45	240.87	241.87	240.99
MW-7d	245.09	244.57	245.11	244.22	245.79	245.35	246.35	245.95	245.99	245.3	245.84	245.1	246.32	245.14
MW-15r	268.71	263.1	267.59	266.45	269.01	274.18	271.02	269.29	270.03	268.33	268.41	269.2	273.14	270.24
MW-16a	265.97	265.02	265.67	263.55	267.2	268.11	267.12	265.98	266.64	265.09	266.15	264.85	268.07	265.04
BP-3	179.80	--	--	--	--	--	--	--	--	--	--	285.97	289.58	287.19
BP-9	--	--	--	--	--	--	--	--	284.72	280.55	265.09	278.21	280.67	275.92

All measurements are feet above mean sea level
Measurements collected from top of casing.
NA indicates water level measurement not collected during this event.

Table 4
Historical Ground Water Results
Halifax County Landfill
Aurelian Springs, North Carolina

MW-1														
Constituent	**2/6/01**	**8/26/01**	**2/7/02**	**8/14/02**	**2/12/03**	**8/7/03**	**2/24/04**	**8/12/04**	**2/16/05**	**8/16/05**	**2/14/06**	**8/22/06**	**2/14/07**	**8/9/07**
Beryllium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1	ND
Barium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	106	ND
Cadmium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cobalt	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Copper	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.2
Cromium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tin	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Lead	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Zinc	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	20	ND
2,4-D	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromochloromethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,2-Dichlorethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endrin	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Xylene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

MW-2a														
Constituent	**2/6/01**	**8/26/01**	**2/7/02**	**8/14/02**	**2/12/03**	**8/7/03**	**2/24/04**	**8/12/04**	**2/16/05**	**8/16/05**	**2/14/06**	**8/22/06**	**2/14/07**	**8/9/07**
Beryllium	ND	ND	ND	ND	ND	ND	ND	ND	ND	4	ND	ND	9	ND
Barium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	542	ND
Cadmium	ND	ND	ND	ND	1	1	ND	ND	ND	ND	ND	ND	3	ND
Cobalt	11	ND	ND	ND	ND	31	10	ND	34	ND	ND	ND	ND	ND
Copper	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10	ND
Chromium	ND	ND	ND	ND	ND	36	ND	ND	29	ND	ND	ND	14	ND
Tin	ND	ND	ND	ND	ND	134	ND	ND	ND	ND	ND	ND	ND	ND
Lead	ND	ND	ND	ND	ND	ND	ND	ND	16	19	ND	ND	30	ND
Zinc	ND	ND	ND	ND	ND	155	ND	ND	124	114	ND	ND	293	ND
2,4-D	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND	ND	7.5	5.2	ND	22.6	ND	13	5	8.2	ND	ND	ND
Bezene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromochloromethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,2-Dichlorethene	ND	ND	ND	ND	ND	ND	16.7	ND	11.6	ND	7.6	ND	ND	ND
Endrin	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	ND	ND	ND	ND	ND	ND	10.3	ND	5.2	ND	ND	ND	ND	ND
Vanadium	ND	ND	ND	ND	ND	84	ND	ND	76	ND	ND	ND	39	ND
Xylene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Table 4
Historical Ground Water Results
Halifax County Landfill
Aurelian Springs, North Carolina

MW-2ad														
Constituent	**2/6/01**	**8/26/01**	**2/7/02**	**8/14/02**	**2/12/03**	**8/7/03**	**2/24/04**	**8/12/04**	**2/16/05**	**8/16/05**	**2/14/06**	**8/22/06**	**2/14/07**	**8/9/07**
Arsenic	ND	ND	ND	ND	ND	ND	ND	ND	ND	12	ND	ND	ND	ND
Beryllium	ND	ND	ND	ND	ND	ND	ND	ND	40	7	ND	ND	6	ND
Barium	ND	ND	ND	ND	ND	ND	ND	ND	3643	2708	ND	ND	662	108
Cadmium	ND	ND	ND	ND	ND	ND	1	ND	6	14	1	ND	3	ND
Cobalt	ND	ND	ND	ND	ND	ND	ND	ND	705	16	ND	ND	ND	ND
Copper	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	17	ND
Chromium	ND	ND	ND	ND	ND	ND	ND	ND	230	ND	ND	ND	ND	ND
Tin	143	321	367	230	ND	153	ND	ND	765	ND	ND	ND	ND	ND
Lead	ND	ND	ND	ND	ND	ND	ND	ND	83	87	ND	ND	39	ND
Nickel	ND	ND	ND	ND	ND	ND	ND	ND	717	ND	ND	ND	ND	ND
Zinc	ND	ND	ND	ND	ND	ND	ND	ND	955	2888	ND	ND	630	ND
2,4-D	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	26	26	6.6	ND	9.9	14.4	27.3	31.5	20.6	30.4	27.2	26.6	ND	36.8
Benzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromochloromethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,2-Dichlorethene	ND	ND	ND	ND	ND	ND	ND	11.8	5.2	13.6	11	16	ND	22.9
Endrin	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	ND	ND	ND	ND	ND	ND	ND	5.5	ND	ND	ND	ND	ND	5.4
Vanadium	ND	ND	ND	ND	ND	ND	ND	ND	1118	48	ND	ND	33	ND
Vinyl Chloride	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.8
Xylene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

MW-3a														
Constituent	**2/6/01**	**8/26/01**	**2/7/02**	**8/14/02**	**2/12/03**	**8/7/03**	**2/24/04**	**8/12/04**	**2/16/05**	**8/16/05**	**2/14/06**	**8/22/06**	**2/14/07**	**8/9/07**
Arsenic	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	16	ND
Beryllium	ND	ND	ND	ND	ND	ND	ND	ND	ND	3	ND	ND	4	ND
Barium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	147	ND
Cadmium	ND	ND	ND	ND	ND	ND	ND	ND	2	ND	1	ND	1	ND
Cobalt	ND	ND	ND	ND	ND	10	ND	ND	21	ND	ND	ND	13	ND
Tin	ND	201	248	113	ND	122	ND	ND	ND	ND	ND	ND	ND	ND
Lead	ND	ND	ND	ND	ND	ND	ND	ND	43	18	ND	ND	19	ND
Zinc	ND	ND	ND	ND	ND	ND	ND	ND	146	83	ND	ND	99	ND
2,4-D	ND	ND	ND	ND	3.8	2.7	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	20	21	8.9	13.2	11.9	10.5	11.3	7.1	7.3	8.4	8.3	ND	5.6
Benzene	ND	ND	5.2	ND	ND	ND	ND	6.1	ND	ND	ND	ND	ND	ND
Bromochloromethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	ND	11	15	ND	12.4	6.5	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,2-Dichlorethene	ND	52	84	24.8	56.5	57.3	46.8	43.2	27	11.8	17.1	5.8	ND	8.1
Endrin	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	ND	ND	8.7	ND	ND	ND	7.7	ND	ND	ND	ND	ND	ND	ND
Vinyl Chloride	ND	ND	ND	ND	16.2	16.3	11.8	11.8	ND	ND	ND	ND	ND	4.7
Vanadium	ND	ND	ND	ND	ND	ND	ND	ND	69	ND	ND	ND	ND	ND
Xylene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Table 4
Historical Ground Water Results
Halifax County Landfill
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MW-3d														
Constituent	2/6/01	8/26/01	2/7/02	8/14/02	2/12/03	8/7/03	2/24/04	8/12/04	2/16/05	8/16/05	2/14/06	8/22/06	2/14/07	8/9/07
Beryllium	ND	ND	ND	ND	ND	ND	ND	ND	ND	4	ND	ND	ND	ND
Barium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	100	ND
Cadmium	ND	ND	ND	ND	2	3	6	ND	11	16	5	ND	ND	ND
Cobalt	ND	ND	ND	ND	ND	ND	ND	ND	22	ND	ND	ND	ND	ND
Tin	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Lead	ND	ND	ND	ND	ND	ND	ND	ND	23	20	ND	ND	ND	ND
Zinc	ND	ND	ND	ND	ND	ND	ND	ND	196	183	ND	ND	170	ND
2,4-D	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromochloromethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,2-Dichlorethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endrin	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Delta BHC	ND	ND	ND	ND	ND	ND	ND	0.067	ND	ND	ND	ND	ND	ND
Bis (2 ethyl hexyl) phthalate	ND	ND	ND	ND	ND	ND	ND	32	ND	ND	ND	ND	ND	ND
Vanadium	ND	ND	ND	ND	ND	ND	ND	ND	41	ND	ND	ND	ND	ND
Xylene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

MW-6d														
Constituent	2/6/01	8/26/01	2/7/02	8/14/02	2/12/03	8/7/03	2/24/04	8/12/04	2/16/05	8/16/05	2/14/06	8/22/06	2/14/07	8/9/07
Arsenic	ND	ND	ND	ND	ND	ND	ND	ND	26	ND	ND	ND	ND	ND
Beryllium	ND	ND	ND	ND	ND	ND	ND	ND	262	11	ND	ND	4	ND
Barium	ND	ND	ND	504	ND	ND	ND	ND	29389	1126	ND	593	364	547
Cadmium	ND	ND	ND	ND	2	ND	ND	ND	20	6	ND	ND	1	ND
Cobalt	ND	ND	ND	ND	ND	ND	ND	ND	1151	ND	ND	ND	ND	ND
Chromium	ND	ND	ND	ND	ND	ND	ND	ND	685	ND	ND	ND	ND	ND
Tin	ND	ND	ND	246	ND	ND	ND	ND	1664	ND	ND	ND	ND	ND
Lead	ND	ND	ND	ND	ND	ND	ND	ND	284	27	ND	ND	ND	ND
Zinc	ND	ND	ND	ND	ND	ND	ND	ND	5900	285	ND	ND	61	ND
2,4-D	ND	ND	ND	ND	ND	ND	3.1	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.1
Bromochloromethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bis-(2-Ethylhexyl) Phthalate	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	15.1
Chlorobenzene	ND	ND	7.4	15.7	7.5	5.5	ND	ND	ND	7.9	7.5	7.6	ND	9.7
cis-1,2-Dichlorethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endrin	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Mercury	ND	ND	ND	ND	ND	ND	ND	ND	8.1	1	ND	ND	ND	ND
Nickel	ND	ND	ND	ND	ND	ND	ND	ND	952	ND	ND	ND	ND	ND
Silver	ND	ND	ND	ND	ND	ND	ND	ND	91	ND	ND	ND	ND	ND
Tetrachloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Delta BHC	ND	ND	ND	ND	ND	ND	ND	0.084	ND	ND	ND	ND	ND	ND
Vanadium	ND	ND	ND	ND	ND	ND	ND	ND	2846	ND	ND	ND	ND	ND
Vinyl Chloride	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.4
Xylene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Table 4
Historical Ground Water Results
Halifax County Landfill
Aurelian Springs, North Carolina

MW-7d														
Constituent	**2/6/01**	**8/26/01**	**2/7/02**	**8/14/02**	**2/12/03**	**8/7/03**	**2/24/04**	**8/12/04**	**2/16/05**	**8/16/05**	**2/14/06**	**8/22/06**	**2/14/07**	**8/9/07**
Beryllium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2	ND
Barium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	211	ND
Cadmium	ND	ND	ND	ND	ND	3	ND	ND	ND	ND	ND	ND	ND	ND
Cobalt	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tin	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Lead	12	12	ND	ND	ND	12	ND	ND	ND	ND	ND	ND	11	ND
Zinc	ND	54	51	ND	ND	62	ND	ND	ND	ND	ND	ND	59	ND
2,4-D	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromochloromethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,2-Dichlorethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endrin	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bis (2 ethyl hexyl) phthalate	ND	ND	ND	ND	ND	ND	ND	ND	31	ND	ND	ND	ND	ND
Xylene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

MW-15r														
Constituent	**2/6/01**	**8/26/01**	**2/7/02**	**8/14/02**	**2/12/03**	**8/7/03**	**2/24/04**	**8/12/04**	**2/16/05**	**8/16/05**	**2/14/06**	**8/22/06**	**2/14/07**	**8/9/07**
Beryllium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Barium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	113	ND
Cadmium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cobalt	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tin	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Lead	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Zinc	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4-D	2.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	27	22	18	23.4	24	24.7	18.1	17	9.3	13	12.4	13.1	ND	10.3
1,4 dichlorobenzene	ND	ND	ND	ND	6.7	8.5	14.7	10.5	5.7	ND	ND	ND	ND	10.2
Benzene	ND	6.5	5.6	8	9	7.2	ND	ND	ND	ND	ND	ND	ND	ND
Bromochloromethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,2-Dichlorethene	20	17	26	31.3	36.7	32.3	11.1	11.9	7.9	ND	ND	ND	ND	7.8
Endrin	0.177	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor	0.069	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	16	29	24	40	45.3	33.1	12.5	ND	ND	ND	ND	ND	ND	6.5
Mercury	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.82	6.65
Tetrachloroethene	5.6	5.4	5.6	6.3	5.6	ND	5.1	ND	ND	ND	ND	ND	ND	3.3
Trichloroethene	22	25	21	21	20	16.2	8.6	8.5	ND	ND	ND	ND	ND	4.4
Alpha BHC	ND	ND	ND	ND	ND	ND	ND	0.054	ND	ND	ND	ND	ND	ND
Beta BHC	ND	ND	ND	ND	ND	ND	ND	0.43	0.433	0.27	ND	ND	ND	ND
Delta BHC	ND	ND	ND	ND	ND	ND	ND	0.12	0.089	ND	ND	ND	ND	ND
Gamma BHC	ND	ND	ND	ND	ND	ND	ND	ND	0.085	ND	ND	ND	0.098	ND
Xylene	14	17	17	22.3	23.8	24.9	5.9	ND	ND	ND	ND	ND	ND	ND
Bis-(2-Ethylhexyl) Phthalate	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	24	ND	31
Heptachlor	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.1
Apha-BHC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.094	0.292

Table 4
Historical Ground Water Results
Halifax County Landfill
Aurelian Springs, North Carolina

	MW-16a													
Constituent	**2/6/01**	**8/26/01**	**2/7/02**	**8/14/02**	**2/12/03**	**8/7/03**	**2/24/04**	**8/12/04**	**2/16/05**	**8/16/05**	**2/14/06**	**8/22/06**	**2/14/07**	**8/9/07**
Beryllium	ND	ND	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	10	ND
Barium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	347	ND
Cadmium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1	ND
Cobalt	ND	ND	ND	14	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tin	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Lead	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	20	ND
Zinc	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	123	ND
2,4-D	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND	ND	ND	ND	ND	9.6	12.3	9.8	12.1	12.9	13.6	ND	14.3
Benzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.9
Bromochloromethane	ND	ND	ND	6.8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,2-Dichlorethene	ND	ND	ND	ND	ND	ND	9.6	20.3	22.1	27.7	27.3	32.4	ND	40.5
Endrin	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	ND	ND	ND	ND	ND	ND	18.5	42.1	49.3	53.4	46.6	18.3	ND	22.5
Mercury	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.44
Tetrachloroethene	ND	ND	5.8	ND	5.1	7.5	16.7	21.7	15.6	20.9	23.2	22.1	ND	26.6
Trichloroethene	ND	ND	ND	ND	ND	6.2	12.4	17.2	14.1	16.8	18.3	19.2	ND	20.8
Xylene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	7.1	ND	ND	ND
Trichlorofluoromethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.3
Bis-(2-Ethylhexyl) Phthalate	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	11.1

Table 5
Field Parameter Data
Halifax County Landfill
Aurelian Springs, North Carolina

8/9/2007

Well	pH (Std units)	Spec Cond (umhos/cm)	Temp (celsius)
MW-2a	6.4	223	19
MW-2ad	6.6	541	18
MW-3a	6.4	401	18
MW-3d	6.0	183	17
MW-6d	6.1	576	17
MW-7d	6.0	44	20
MW-15r	5.0	88	18
MW-16a	5.8	161	17
MW-17	6.6	90	19
MW-18s	6.6	170	19
MW-18d	6.4	170	18
SW-1 (upstream)	6.7	122	25
SW-2 (downstream)	6.7	431	28
SW-3	6.7	1053	22

Field measurements taken by Environment 1, Inc. personnel

Table 6
August 2007 Detected Constituents
Halifax County Landfill
Aurelian Springs, North Carolina

08/09/07

Constituent	PQL	2L Standard	MW-1	MW-2a	MW-2ad	MW-3a	MW-3d	MW-6d	MW-7d	MW-15r	MW-16a	MW-17	MW-18s	MW-18d	SW-1	SW-2	SW-3
Antimony	6	—	0.1 J	0.1 J	ND	ND	ND	ND	ND	0.1 J	ND	ND	ND	ND	ND	ND	ND
Arsenic	10	50	ND	1.7 J	0.9 J	1.4 J	ND	ND	ND	ND	ND	0.6 J	1.4 J	ND	1.6 J	1.9 J	1.6 J
Barium	100	2000	35.1 J	93.3 J	**108**	33.7 J	60.4 J	**547**	43.1 J	89.6 J	91.9 J	**110**	**139**	77.5 J	48 J	82.9 J	45 J
Beryllium	1	—	0.1 J	0.4 J	ND	0.1 J	0.3 J	0.4 J	0.2 J	0.2 J	0.5 J	**2**	0.9 J	ND	ND	ND	0.8 J
Cadmium	1	5	0.1 J	0.1 J	0.4 J	0.6 J	0.1 J	0.2 J	0.1 J	0.3 J	0.5 J	0.2 J	0.2 J	ND	0.2 J	0.6 J	0.9 J
Chromium, total	10	50	0.4 J	4.1 J	6.6 J	ND	0.4 J	ND	1.4 J	0.6 J	ND	1.7 J	2.1 J	ND	0.7 J	ND	ND
Cobalt	10	—	0.6 J	5.9 J	4.5 J	2.7 J	ND	4.4 J	ND	0.5 J	ND	2.5 J	5.3 J	ND	1.8 J	1.3 J	2.5 J
Copper	10	1000	1.2 J	1.1 J	0.9 J	0.5 J	0.5 J	0.8 J	1.1 J	1.5 J	0.9 J	3.6 J	3.6 J	ND	1.3 J	0.6 J	1 J
Lead	10	15	0.2 J	0.8 J	0.2 J	0.2 J	0.3 J	0.3 J	1 J	0.1 J	0.3 J	7.5 J	3.9 J	0.4 J	2.5 J	0.1 J	0.1 J
Mercury	0.2	1.1	ND	ND	0.06 J	0.04 J	0.15 J	0.08 J	ND	**6.65**	**0.44**	ND	ND	ND	ND	ND	ND
Nickel	50	100		2.5 J	5.7 J	ND	0.7 J	2.3 J	1.1 J	ND	ND	2.7 J	3 J	0.9 J	ND	1.2 J	3.3 J
Selenium	10	50	0.8 J	ND	ND	ND	ND	0.8 J	ND	ND	ND	ND	0.5 J	ND	ND	2.5 J	7.5 J
Thallium	5	—	0.1 J	ND	ND	ND	ND	ND	ND	0.2 J	ND	0.1 J	0.2 J	ND	ND	ND	ND
Tin	100	—	ND	0.9 J	0.8 J	0.6 J	0.6 J	1 J	0.7 J	1.3 J	0.6 J	ND	ND	ND	ND	ND	ND
Vanadium	25	—	ND	2.9 J	ND	ND	ND	0.7 J	ND	ND	ND	9.6 J	15.3 J	2 J	2.9 J	ND	3 J
Zinc	10	2100	3.1 J	4.6 J	5.8 J	2.7 J	5.5 J	ND	8.9 J	3.6 J	6.9 J	**36**	**44**	5.3 J	ND	2.9 J	ND
1,1,1-Trichloroethane	1	200	ND	ND	ND	ND	ND	ND	ND	0.2 J	0.3 J	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	5	700	ND	4.4 J	**36.8**	**5.6**	4.3 J	1 J	ND	**10.3**	**14.3**	3.10 J	1.2 J	1.5 J	ND	ND	ND
1,1-Dichloroethene	5	7	ND	0.2 J	0.4 J	0.3 J	0.3 J	ND	ND	ND	0.4 J	0.2 J	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	5	620	ND	ND	ND	ND	ND	0.3 J	ND	ND	0.9 J	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	1	0.38	ND	0.4 J	ND	ND	ND	0.2 J	ND	0.6 J	0.3 J	ND	ND	ND	ND	ND	ND
1,4-Dichloropropane	1	—	ND	ND	0.2 J	0.3 J	ND	ND	ND	ND	0.6 J	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	3	75	ND	ND	0.7 J	0.4 J	ND	1.9 J	ND	**10.2**	1.4 J	ND	ND	ND	ND	ND	ND
2-Butane	100	—	1.8 J	2.1 J	1.7 J	2.2 J	1 J	1.8 J	1.9 J	1.8 J	2.1 J	ND	1.4 J	ND	1.9 J	3.8 J	1.7 J
Acetone	100	700	ND	1.4 J	ND	1.4 J	ND	1.3 J	1.3 J	1.5 J	2.1 J	ND	9.10 J	ND	ND	2.2 J	2.6 J
Benzene	1	1	ND	ND	0.9 J	0.8 J	0.2 J	**2.1**	ND	0.3 J	**2.9**	ND	ND	ND	ND	ND	ND
Bis-(2-Ethylhexyl) Phthalate	15	—	ND	ND	ND	ND	ND	**15.1**	ND	**31**	**11.1**	ND	ND	ND	ND	ND	ND
cis-1,2-Dichlorethene	5	70	ND	2.7 J	**22.9**	**8.1**	1.2 J	ND	ND	**7.8**	**40.5**	1.4 J	0.2 J	0.8 J	ND	ND	ND
Chlorobenzene	3	50	ND	0.2 J	1.1 J	0.6 J	ND	**9.7**	ND	0.2 J	1.1 J	ND	ND	ND	ND	ND	ND
Chloroethane		2800	ND	2.5 J	ND	0.7 J	ND	0.6 J	ND	0.3 J	0.9 J	ND	ND	ND	ND	ND	ND
Dichlorodifluoromethane	5	1400	ND	0.3 J	0.3 J	0.2 J	1.8 J	0.2 J	ND	0.4 J	4.7 J	ND	ND	ND	ND	ND	ND
Methylene chloride	5	5	ND	ND	0.2 J	ND	0.7 J	0.2 J	ND	**6.5**	**22.5**	0.2 J	ND	ND	ND	ND	ND
Tetrachloroethene	3	0.7	ND	ND	ND	0.4 J	1.9 J	ND	ND	**3.3**	**26.6**	**1.1**	ND	ND	ND	ND	ND
Trichloroethene	3	2.8	ND	0.6 J	**5.4**	2 J	1.9 J	ND	ND	**4.4**	**20.8**	**1.8**	ND	0.3 J	ND	ND	ND
Toluene	1	1000	0.4 J	0.4 J	0.5 J	0.5 J	0.6 J	0.5 J	0.4 J	0.4 J	0.6 J	ND	0.3 J	ND	0.4 J	0.3 J	0.3 J
Trans-1,2,-Dichloroethene	5	70	ND	ND	0.3 J	ND	ND	ND	ND	ND	0.4 J	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane	1	2.8	ND	ND	ND	ND	ND	ND	ND	0.3 J	**1.3**	0.3 J	ND	ND	ND	ND	ND
Vinyl Chloride	5	0.015	ND	1.8 J	**5.8**	**4.7**	ND	**1.4**	ND	ND	0.8 J	ND	0.7 J	ND	ND	ND	ND
Xylenes	4	530	ND	ND	ND	ND	ND	ND	ND	2.2 J	2.3 J	ND	ND	ND	ND	ND	ND
Heptachlor	0.05	0.008	ND	ND	ND	ND	ND	ND	ND	**0.1**	ND	ND	ND	ND	ND	ND	ND
Alpha-BHC	0.05	—	ND	ND	ND	ND	ND	ND	ND	**0.292**	ND	ND	ND	ND	ND	ND	ND

ND - Not detected at or above PQL
Shading - Levels above 2L standard or no 2L standard
Bold Letters - Constituent detected above PQL
J - Detected constituents below PQL limit

All PQLs, 2L Standards and Results are in ug/l.

Table 7
Average Daily Dose
Halifax County Landfill
Aurelian Springs, North Carolina

Contract Worker - Ingestion Evaluation

ADD =C x IR x ED / (BW x AT)

Where ADD = Average Daily Dose for a Contract Worker
C = Concentration in mg/l
IR = Ingestion Rate (given as 2 L/day)
ED = Exposure Duration (60 days over 30 years for contract workers)
BW = Body Weight (average for an adult - 77 kg)
AT = Averaging Time (average days of exposure for an adult worker, assumed to be 30 years)

$$ADD = \frac{0.0029\ \text{mg/l} \times 2\ \text{L} \times 60\ \text{days}}{77\ \text{kg} \times 10950\ \text{days}} = \frac{0.348}{843150\ \text{kg day}} = 4.1 \times 10^{-7}\ \text{mg/kg}$$

Notes:
The 0.0029 mg/l is the highest concentration of benzene in on-site wells.

No contract worker is expected to drink 2L of impacted water from the site, however, this amount was chosen to evaluate a conservative estimate of risk.

Table 8
Risk Calculations
Halifax County Landfill
Aurelian Springs, North Carolina

Compound	RfDo (mg/kg/d)	CSFo 1/mg/kg/d	Water Source	Concentration (ug/l)	Risk (unitless)	
					HI	Cancer
Benzene	4.00E-03	5.5E-02	MW-16a	2.9	1.03E-04	9.73E-09
Bis(2 ethyl hexyl) phthalate	2.00 E-02	1.4E-02	MW-15r	31	2.21E-04	2.65E-08
Heptachlor	5.00E-04	4.5E+00	MW-15r	0.1	2.85E-05	2.74E-08
Methylene Chloride	6.00E-02	7.5E-03	MW-16a	22.5	5.34E-05	1.03E-08
Tetrachloroethene	1.00E-02	5.4E-01	MW-16a	26.6	3.79E-04	8.76E-07
Trichloroethene	3.00E-04	4.00E-01	MW-16a	20.8	9.87E-03	5.07E-07
Vinyl chloride*	3.00E-03	1.50E+00	MW-2ad	5.8	2.75E-04	5.31E-07
				Total Risk/HI	1.18E-02	1.99E-06

Excess cancer risks that range between 1E-06 and 1E-04 and Hazard Indices (HI) of less than 1 are generally considered to be acceptable
(see Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions (Memorandum from D. R. Clay, OSWER 9355.0-30, April 1991)

*Vinyl Chloride calculated using adult reference dose as site workers will only be adults.

FIELD BOREHOLE LOG

BOREHOLE NUMBER
MW-2A

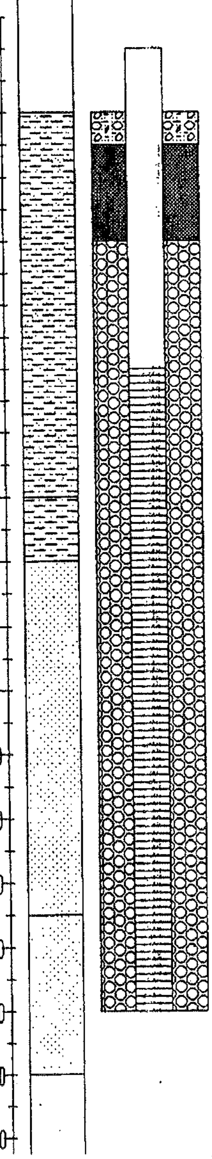
PROJECT NUMBER HALIFAX-2
PROJECT NAME: HALIFAX COUNTY LANDFILL
LOCATION HALIFAX, NC
DRILLING COMPANY BORE & CORE
RIG TYPE & NUMBER MOBILE B-57 ATV
DRILLING METHOD: HOLLOW STEM AUGER
WEATHER: HOT, HUMID
FIELD PARTY: BILL BROW
GEOLOGIST DAVID GARRETT
DATE BEGUN: 7/25/95 DATE COMPLETED: 7/26/95

TOP OF CASING ELEVATION -
TOTAL DEPTH 16.0
GROUND SURFACE ELEVATION -
SHEET 1 OF 1

STATIC WATER LEVEL (BLS)		
WD=While Drilling AB=After Boring		
Depth(ft)	7.3 FT	
Time	2:00 PM	
Date	7/25/95	

DEPTH	BLOW COUNTS	SAMPLING METHOD	SAMPLE NUMBER	MOISTURE	CONSISTANCY	SAMPLE RECOVERY	DRILL METHOD	LITHOLOGY DESCRIPTION	DEPTH
1.0									1.0
0.0								SILTY SAND: Loose red-brown very silty clayey coarse-fine SAND; SM-ML; fill pad.	0.0
1.0									1.0
2.0				D					2.0
3.0		Ss	S1						3.0
4.0	2							SILT: M. stiff black-gray fine sandy clayey SILT; wet; alluvium; ML.	4.0
5.0	3 3								5.0
6.0	8	Ss	S2						6.0
7.0	10 11							SAND: Loose light-gray and red-gray slightly silty-clayey fine-coarse SAND; alluvium; very clayey from 9.5' to 10.5'; fine rounded gravel from 10.5' to 12.5'; Water level at 7.3 ft; SW-SM; SC, CL, SW.	7.0
8.0									8.0
9.0	10	Ss	S3						9.0
10.0	7 7			W					10.0
11.0									11.0
12.0									12.0
13.0								SAND: V. dense brown clayey fine SAND w/ scattered coarse sand; SM-ML; residual soil; well developed upon completion by surging and overpumping.	13.0
14.0	26	Ss							14.0
15.0	50/0.4'								15.0
16.0									16.0

LITHOLOGY WELL INSTALLATION



FIELD BOREHOLE LOG

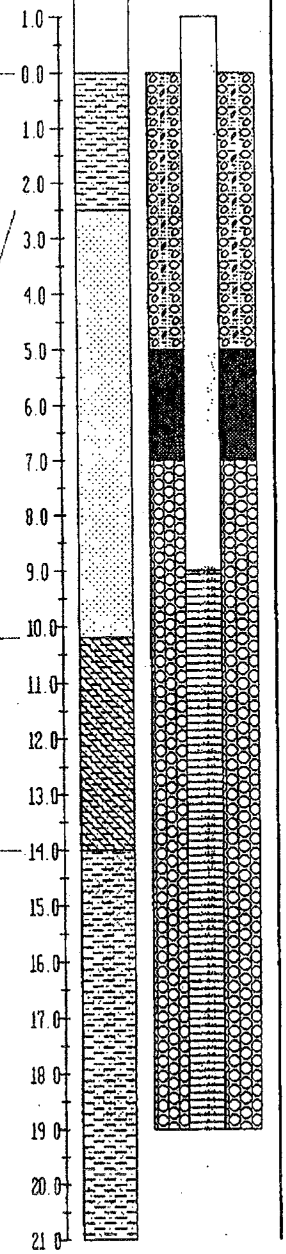
BOREHOLE NUMBER: MW-3A-S

PROJECT NUMBER: HALIFAX-2
PROJECT NAME: HALIFAX COUNTY LANDFILL
LOCATION: HALIFAX, NC
DRILLING COMPANY: BORE & CORE
RIG TYPE & NUMBER: MOBILE B-57 ATV
DRILLING METHOD: HOLLOW STEM AUGER
WEATHER: HOT, HUMID
FIELD PARTY: BILL BROW
GEOLOGIST: DAVID GARRETT
DATE BEGUN: 7/25/95   DATE COMPLETED: 7/25/95

TOP OF CASING ELEVATION: -
TOTAL DEPTH: 21
GROUND SURFACE ELEVATION: -
SHEET 1 OF 1

STATIC WATER LEVEL (BLS)		
WD=While Drilling AB=After Boring		
Depth (ft)	6.0 FT	
Time	3:45PM	
Date	7/25/95	

DEPTH	BLOW COUNTS	SAMPLING METHOD	SAMPLE NUMBER	MOISTURE	CONSISTANCY	SAMPLE RECOVERY	DRILL METHOD	LITHOLOGY DESCRIPTION
0.0								SILTY SAND: Loose brwon-gray dry silty fine SAND w/ scattered roots, sticks, and inert debris on surface; SM.
2.0–3.0				D				
3.0–4.0	2 1 1	Ss	S1					SAND: Soft, dark brown wet clayey silty fine SAND w/ small sticks, rounded pebbles; alluvium; CL/ML.
9.0–10.0	4 4 6	Ss	S2	W				
10.0								CLAYEY SILT: Stiff orange-yellow clayey SILT w/ coarse sand, scattered mica; relict rock texture; residual soil; ML; saturated below 11'.
14.0								SILTY SAND: Orange-white mottled silty fine-coarse SAND, trace clay, mica; residual soil, weathered granite; SM.
14.0–15.0	6 6 7	Ss	S3					
19.0–20.0	8 9 13	Ss	S4					
21.0								



FIELD BOREHOLE LOG

BOREHOLE NUMBER
MW-16A

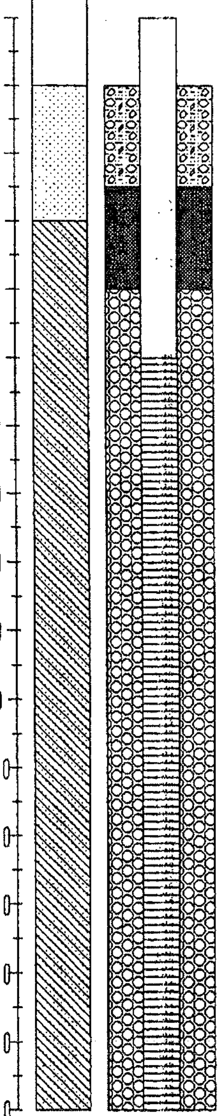
PROJECT NUMBER: HALIFAX-2
PROJECT NAME: HALIFAX COUNTY LANDFILL
LOCATION: HALIFAX, NC
DRILLING COMPANY: BORE & CORE
RIG TYPE & NUMBER: MOBILE B-57 ATV
DRILLING METHOD: HOLLOW STEM AUGER
WEATHER: HOT, HUMID
FIELD PARTY: BILL BROW
GEOLOGIST: GREG MILLS
DATE BEGUN: 7/26/95 DATE COMPLETED: 7/26/95

TOP OF CASING ELEVATION: -
TOTAL DEPTH: 16.0
GROUND SURFACE ELEVATION: -
SHEET: 1 OF 1

STATIC WATER LEVEL (BLS)		
WD=While Drilling AB=After Boring		
Depth(ft)	7.2 FT	
Time	3:00 PM	
Date	7/26/95	

DEPTH	BLOW COUNTS	SAMPLING METHOD	SAMPLE NUMBER	MOISTURE	CONSISTANCY	SAMPLE RECOVERY	DRILL METHOD	LITHOLOGY DESCRIPTION	DEPTH
1.0									1.0
0.0								SAND: Tan coarse grained SAND w/ some organics.	0.0
1.0									1.0
2.0				D				CLAYEY SAND: White, pink and orange coarse grained clayey SAND with mica, feldspar, K-feldspar, and some quartz; weathered granite; residual soil; SC.	2.0
3.0									3.0
4.0	6 7 9	Ss	S1						4.0
5.0									5.0
6.0									6.0
7.0									7.0
8.0									8.0
9.0	5 8 8	Ss	S2	W					9.0
10.0									10.0
11.0									11.0
12.0									12.0
13.0									13.0
14.0	86 50/0.4'	Ss	S3						14.0
15.0									15.0

LITHOLOGY / WELL INSTALLATION



N. C. Department of Human Resources
Division of Health Services

MW 6S

WELL COMPLETION RECORD

...MPLETE ALL INFORMATION REQUESTED BELOW FOR EACH WELL INSTALLED, AND RETURN FORM TO THE N.C. ...EPARTMENT OF HUMAN RESOURCES, SOLID AND HAZARDOUS WASTE MANAGEMENT BRANCH
...P. O. BOX 2091, RALEIGH, N.C. 27602

SOLID WASTE SECTION JAN 27 ...

NAME OF SITE: Halifax County Landfill

PERMIT NO.: 41-0176-WM-0033

ADDRESS: S.R. 1417 Aurelian Springs, N.C.

OWNER (print): Halifax County

DRILLING CONTRACTOR: Bore and Core, Inc.

REGISTRATION NO.: 763

Casing Type: PVC dia. 2 in.
Casing Depth: from 3'2 to -8'8 ft. - dia. 2 in.
Screen Type: .010 slotted PVC dia. 2 in.
Screen Depth: from -8'8 to -23' ft. - dia. 2 in.

Grout Depth: from 0 to -6' ft. - dia. 7 in
Bentonite Seal: from -6 to -7' ft. - dia. 7 in.
Sand/Gravel PK: from -7 to -23 ft. - dia. 7 in
Total Well Depth: from 3 to -23' ft. - dia. 7 in

Static Water Level: 11'4" below ground surface ~~feet from top of casing~~

Date Measured 1 / 6 / 92

Yield (gpm): ______ Method of Testing: ______ Casing is ______ feet above land surface

DRILLING LOG

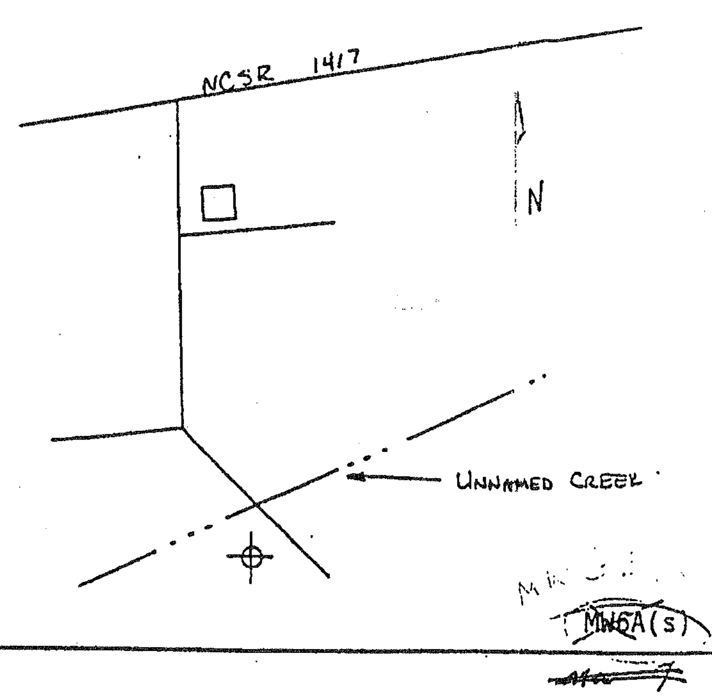
DEPTH FROM	TO	FORMATION DESCRIPTION
0.0	8.4	Brown fine sandy silt
8.4	23.0	Wet, brown, silty fine to medium sand

Well numbering scheme changed on 12-13-93 to match scheme used during past sampling episodes.

LK

LOCATION SKETCH

(show distance to numbered roads, or other map reference points)



DATE: 1/6/92 SIGNATURE: John D Barnard

S 3342 (6/85)

MW6S

MW 6 S

TEST BORING FIELD REPORT

Name Halifax County Landfill Aurelian Springs, N.C. Job No. MW-7 3720

ield Supervisor Tony Crew Ken Hrs. Drilling ____ Hrs. Moving ____ ~~MW6A(s)~~ Boring # ____

a e 1/6/92 Weather Cool Ground Surface Elevation ____

c...	To	Soil Strata Soil Description and Remarks	Sampling/Blows per F No.	Depth	1st6"	2nd6"	3r
.0	8.4	Brown fine sandy silt					
..	23.0	Wet brown silty fine to medium sand/gravel B.T. 23.0'					
		Set 2"x 15' screen at 23.0 with 10' riser 4 bags sand					
		½ bucket bentonite, grout to top, 1 2" locking cap 1 4"x 5'					
		protective casing					

Level 11'4" at TOB

Level ____ at ____

t Level ____ at 24 Hours

t r Losses ____

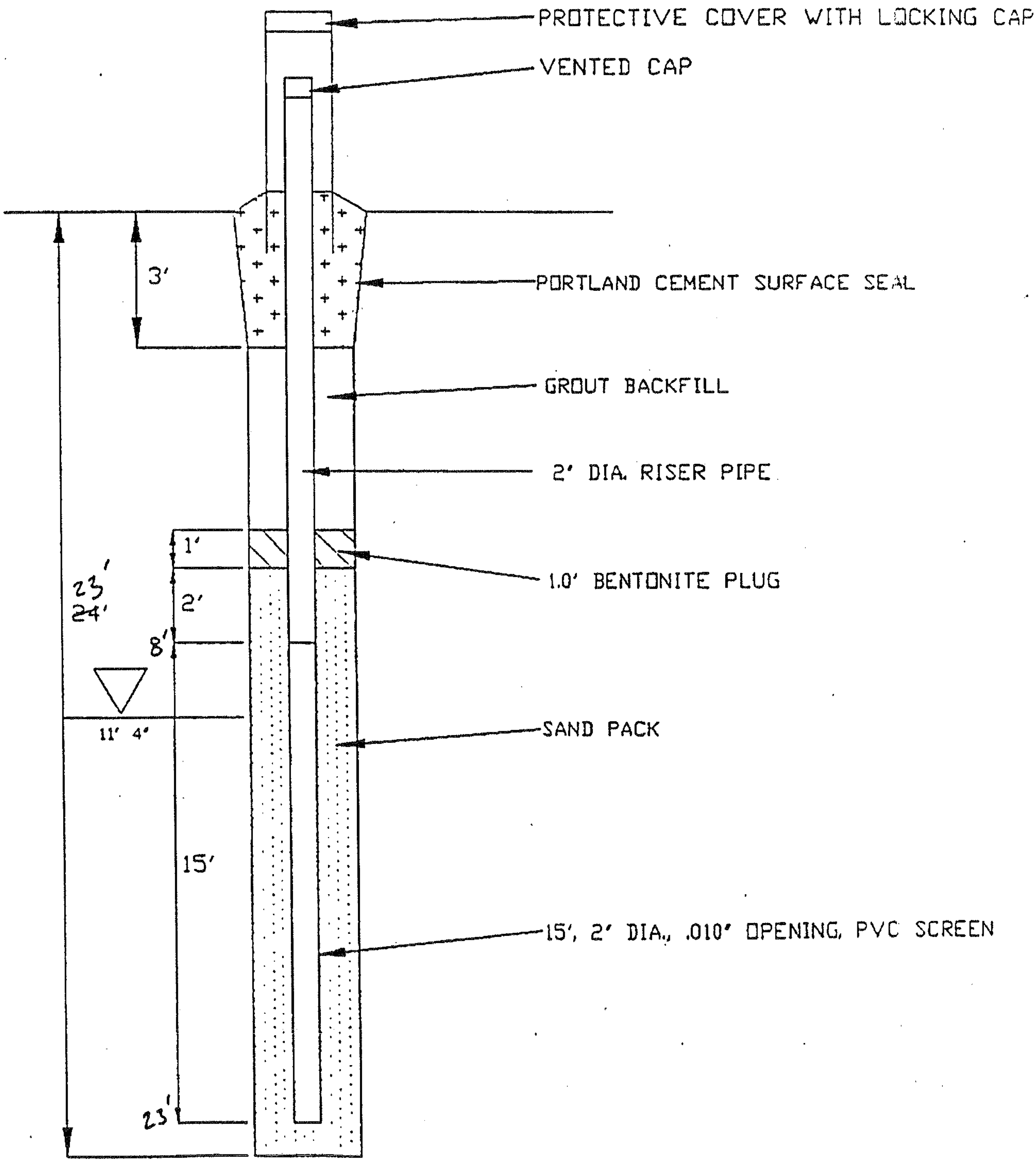
sing, Size Length ____

Note: (Record Methods of Drilling & Depths)

CME 450 ATV
4¼" I.D. H.S.A.
0.0' - 23.0'

TYPICAL MONITORING WELL SCHEMATIC

PROJECT HALIFAX COUNTY LANDFILL VERTICAL EXPANSION
WELL NUMBER MW-6a(s)



WELL COMPLETION RECORD

MW-6A MW-6d

'I ETE ALL INFORMATION REQUESTED BELOW FOR EACH WELL INSTALLED, AND RETURN FORM TO THE N.C. 'MENT OF HUMAN RESOURCES, SOLID AND HAZARDOUS WASTE MANAGEMENT BRANCH, '91, RALEIGH, N.C. 27602

OF SITE: 1'fax County Sanitary Landfill	PERMIT NO.: 41-0176-WM-0033
ES: R. 1417 Aurelian Springs, N.C.	OWNER (print): Halifax County
I G CONTRACTOR: ore & Core, Inc.	REGISTRATION NO.: 763

ype:	PVC dia. 2 in.	Grout Depth:	from 0' to -21' ft. - dia. 4 in.
epth:	from 2' to -25 ft. - dia. 2 in.	Bentonite Seal:	from -21' to -23 ft. - dia. 4 in.
Type:	slotted .010 dia. 2 in.	Sand/Gravel PK:	from -23 to -40 ft. - dia. 4 in.
epth:	from -25 to -40 ft. - dia. 2 in.	Total Well Depth:	from 2' to -41 ft. - dia. 4 in.

Water Level: 11' 7" Below ground surface ~~feet from top of casing~~ Date Measured 11 / 26 / 91

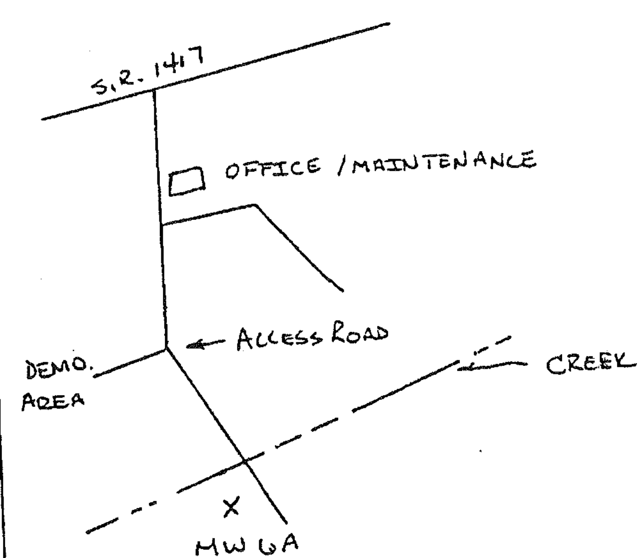
(g m): ______ Method of Testing: ______ Casing is ______ feet above land surface

DRILLING LOG

DEPTH FROM	TO	FORMATION DESCRIPTION
	2.8	Brown fine sandy silt
	10.6	Brown medium to fine silt
.0 6	22.4	Damp DrkBr.Med. sandy silt
2.4	40.0	Wet Br. fine sandy silt

LOCATION SKETCH

(show distance to numbered roads, or other map reference points)



RKS: Well screened too deep.
Static water level is above the screen.

______ SIGNATURE: ______

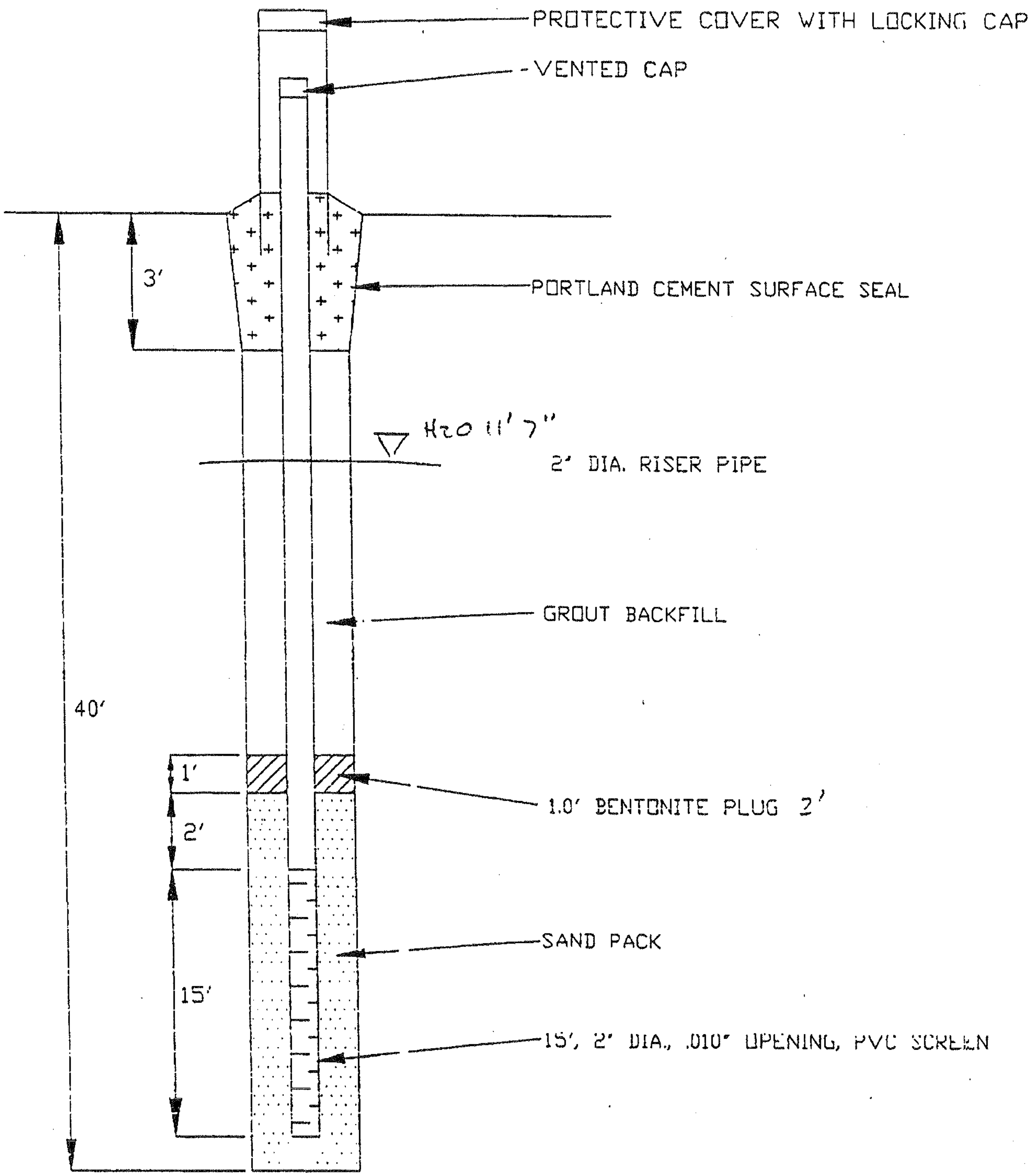
3342 (6/85)
& Hazardous Waste Management Branch

TYPICAL MONITORING WELL SCHEMATIC

PROJECT HALIFAX COUNTY LANDFILL VERTICAL EXPANSION

WELL NUMBER MW-6A

6d



TEST BORING FIELD REPORT

MW 6d

Name Halifax County Landfill Vertical Expansion Job No. ____

Supervisor Tony Crew Ben Hrs. Drilling ____ Hrs. Moving ____ Boring # MW6

a e 10/30/91 Weather ____ Ground Surface Elevation ____

Soil Strata			Sampling/Blows per Ft.				
o	To	Soil Description and Remarks	No.	Depth	1st6"	2nd6"	3rd6"
.0	2.8	Brown fine sandy silt w/rocks					
.8	10.6	Brown medium to fine sandy silt					
.6	22.4	Damp dark brown medium sandy silt					
.4	40.0	Wet brown fine sandy silt					
		B.T. 40.0					
		Set 2"x15' PVC screen at 40.0 with 30' PVC riser 4 bags					
		sand, ½ bucket bentonite 1 2" locking cap, 1 4"x5'					
		protective casing					

ter Level ____ at TOB

er Level ____ at ____

er Level ____ at 24 Hours

Note: (Record Methods of Drilling & Depths)

CME 450 ATV

4½" ID hollow stem auger

0.0 - 40.0

Losses ____

sing, Size ____ Length ____

N. C. Department of Human Resources
Division of Health Services

MW 7s

WELL COMPLETION RECORD

)MPLETE ALL INFORMATION REQUESTED BELOW FOR EACH WELL INSTALLED, AND RETURN FORM TO THE N.C EPARTMENT OF HUMAN RESOURCES, SOLID AND HAZARDOUS WASTE MANAGEMENT BRANCH P. O. BOX 2091, RALEIGH, N.C. 27602

NAME OF SITE: Halifax County Landfill	PERMIT NO.: 41-0176-WW-0033
ADDRESS: S.R. 141/ Aurelian Springs, NC	OWNER (print): Halifax County
DRILLING CONTRACTOR: Bore and Core, Inc.	REGISTRATION NO.: 763

C sing Type: PVC dia. 2 in. Grout Depth: from 0 to -1 ft. - dia. 7 in
Casing Depth: from 2.5 to -2.5 ft. - dia. 2 in. Bentonite Seal: from -1 to -2 ft. - dia. 7 in
Screen Type: .010 slotted PVC dia. 2 in. Sand/Gravel PK: from -2 to -17 ft. - dia. 7 in
S een Depth: from -2.5 to -17.5' ft. - dia. 2 in. Total Well Depth: from 2.5 to -17.5 ft. - dia. 7 in

below ground surface

Static Water Level: 3'2" ~~feet from top of casing~~ Thin sand pack between bentonite & screen. Date Measured 1 / 7 / 92

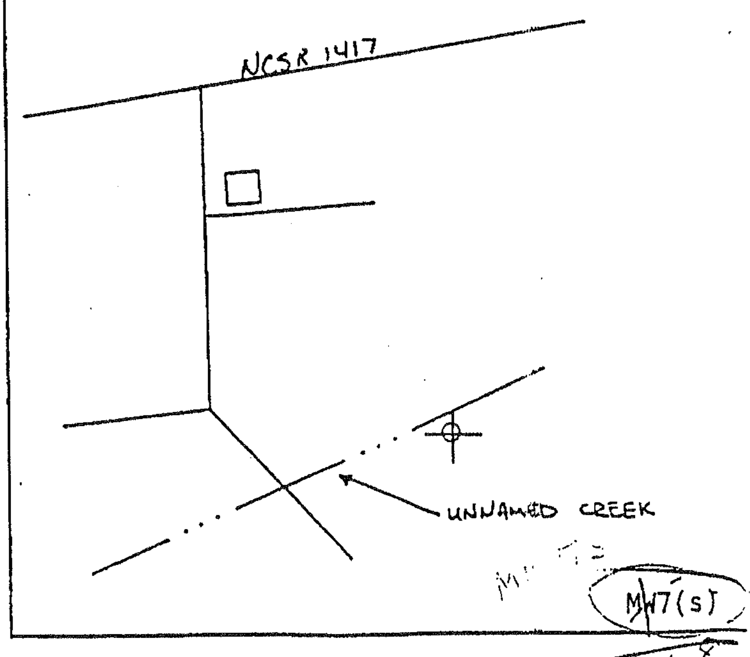
Y ld (gpm): ____ Method of Testing: ____ Casing is ____ feet above land surfac

DRILLING LOG

DEPTH FROM	TO	FORMATION DESCRIPTION
.0	3.4	Brown fine to medium sandy silt
.4	17.0	Damp brown fine to medium sand/gravel

LOCATION SKETCH

(show distance to numbered roads, or other map reference points)



R' ARKS: ____

D TE: 1-7-92 SIGNATURE: John O Barnard

MW 7S

TEST BORING FIELD REPORT

Name Halifax County Landfill - Aurelian Springs, N.C. Job No. 3720

Field Supervisor Tony Crew Ken Hrs. Drilling ___ Hrs. Moving ___ Boring # MW7-S

Date 1-7-92 Weather Cool Ground Surface Elevation ___

From	To	Soil Strata Soil Description and Remarks	Sampling/Blows per No.	Depth	1st 6"	2nd 6"	3
0.0	3.4	Brown fine to medium sandy silt					
3.4	17.0	Damp brown fine to medium sand/gravel B.T. 17.0					
		Set 2"x 15' screen at 17.5' with 5.0' riser 4 bags					
		sand, ½ bucket bentonite, grout to top. 1, 2" locking cap					
		1, 4"x 5' protective casing.					

Water Level 3'2" at TOB

Water Level ___ at ___

Water Level ___ at 24 Hours

Water Losses ___

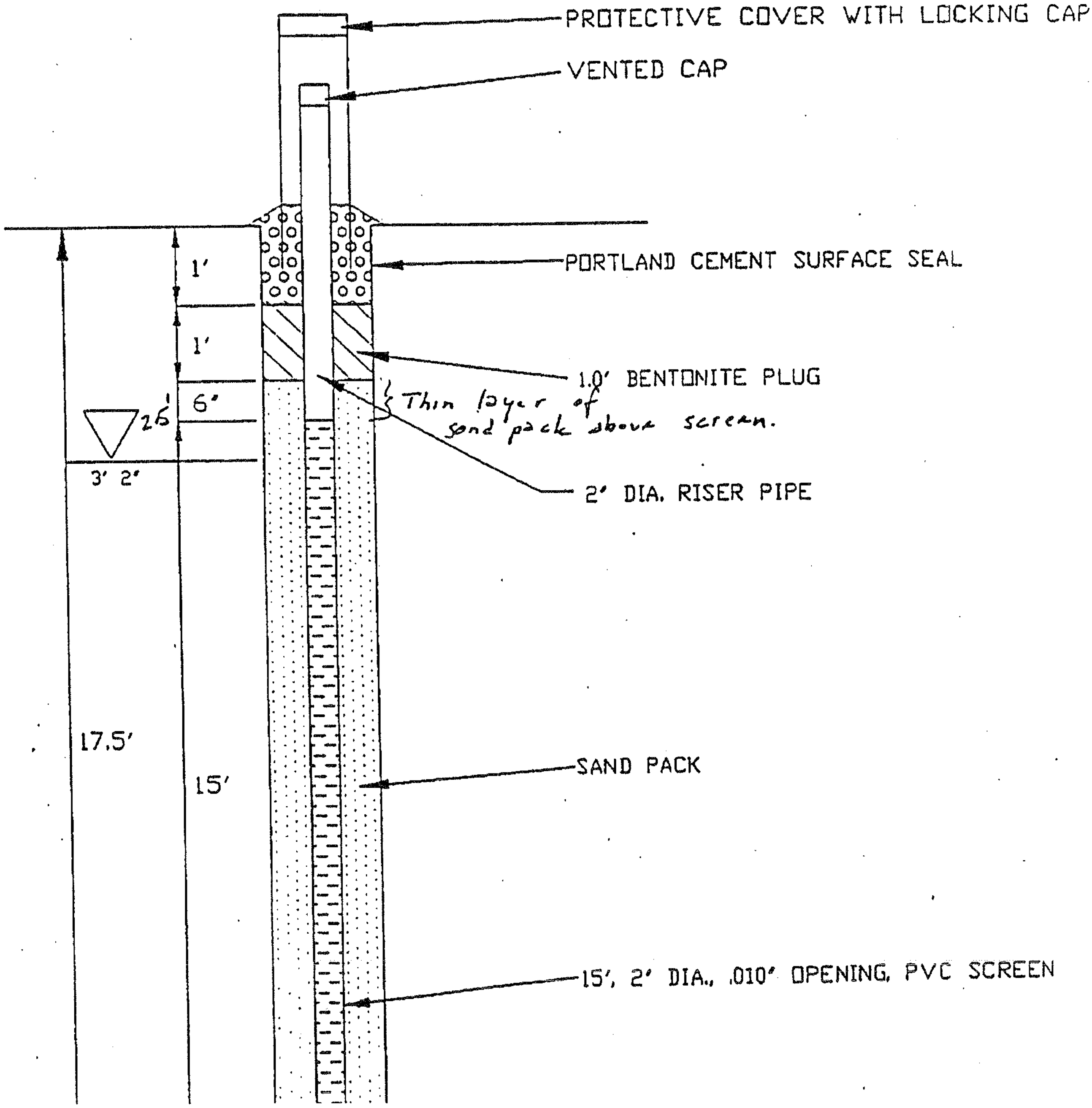
Casing, Size ___ Length ___

Note: (Record Methods of Drilling & Depths)

CME 450 ATV
4¼" I.D. H.S.A.
0.0' - 17.0'

TYPICAL MONITORING WELL SCHEMATIC

PROJECT HALIFAX COUNTY LANDFILL VERTICAL EXPANSION
WELL NUMBER MW-7(S)



WELL COMPLETION RECORD

MW-7 MW-7d

'LETE ALL INFORMATION REQUESTED BELOW FOR EACH WELL INSTALLED, AND RETURN FORM TO THE N.C. ~MENT OF HUMAN RESOURCES, SOLID AND HAZARDOUS WASTE MANAGEMENT BRANCH, ~91, RALEIGH, N.C. 27602

.OF SITE: ifax County Sanitary Landfill	PERMIT NO.: 41-0176-WM-0033
.E S: .. 1417 Aurelian Springs, N.C.	OWNER (print): Halifax County
.I G CONTRACTOR: 'e & Core, Inc.	REGISTRATION NO.: 763

/pe:	PVC	dia. 2 in.	Grout Depth:	from 0	to -21'	ft. - dia. 4" in.
epth:	from 2 to -25	ft. - dia. 2 in.	Bentonite Seal:	from -21'	to -23'	ft. - dia. 4" in.
Type:	slotted PVC .010	dia. 2 in.	Sand/Gravel PK:	from -23'	to 40'	ft. - dia. 4" in.
Depth:	from -25 to -40	ft. - dia. 2 in.	Total Well Depth:	from 2'	to -40'	ft. - dia. 4" in.

Water Level: 3' 11" Below ground surface feet from top of casing   Date Measured 11 / 26 / 91

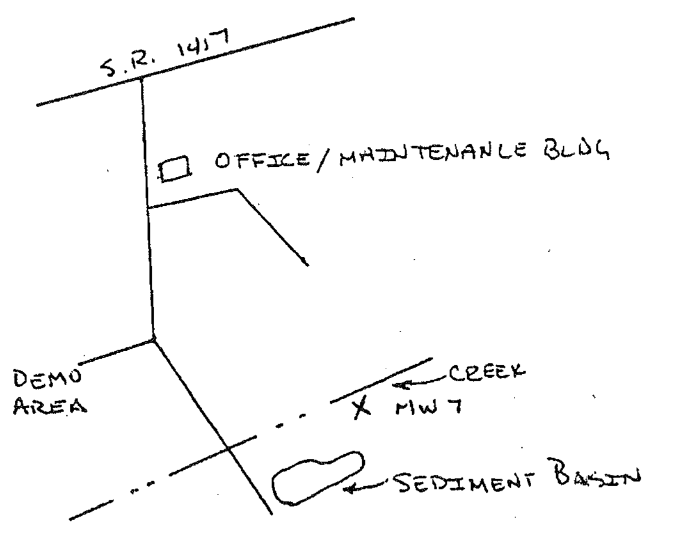
(g m): ______ Method of Testing: ______ Casing is ______ feet above land surface

DRILLING LOG

DEPTH FROM	TO	FORMATION DESCRIPTION
	1.4	Brown fine sandy silt
4	6.7	Brown fine sandy silt
7	14.3	Damp DrkBr. fine very sandy silt.
4 ?	40.0	Wet Brown medium sandy silt/gravel

LOCATION SKETCH

(show distance to numbered roads, or other map reference points)



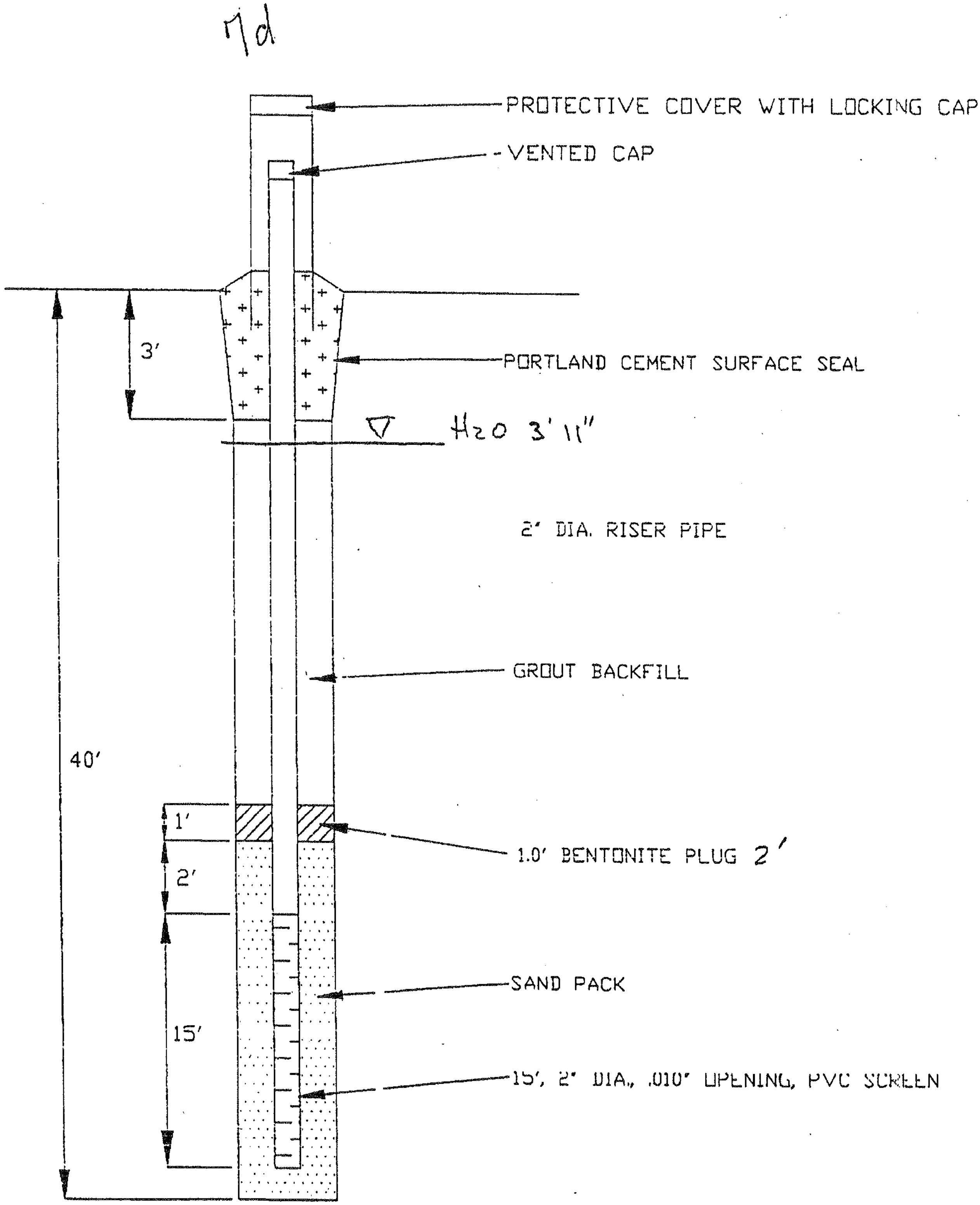
RKS: Well screened too deep. Static water table is above the screen.

______ SIGNATURE: ______

3342 (6/85)
& Hazardous Waste Management Branch

TYPICAL MONITORING WELL SCHEMATIC

PROJECT HALIFAX COUNTY LANDFILL VERTICAL EXPANSION
WELL NUMBER MW-7



TEST BORING FIELD REPORT

MW7d

Name Halifax County Landfill Vertical Expansion Job No. ______

Supervisor Tony Crew Ben Hrs. Drilling ____ Hrs. Moving ____ Boring # MW7

Date 10/31/91 Weather ______ Ground Surface Elevation ______

Soil Strata			Sampling/Blows per Ft				
From	To	Soil Description and Remarks	No.	Depth	1st6"	2nd6"	3rd6"
.	1.4	Brown fine sandy silt with roots					
.4	6.7	Brown fine sandy silt					
.	14.3	Damp dark brown fine very sandy silt					
.3	40.0	Wet brown medium sandy silt with gravel B.T. 40.0					
		Set 2" PVC screen (15') at 40.0 with 30' PVC riser 4 bags					
		sand, ½ bucket Bentonite 1 2" locking cap, 1 4"x5'					
		protective casing					

Water Level ______ at TOB

Water Level ______ at ______

Water Level ______ at 24 Hours

Losses ______

Casing, Size ______ Length ______

Note: (Record Methods of Drilling & Depths)

CME 450 ATV

4¼" ID hollow stem auger

0.0 - 40.0

Richardson Smith Gardner and Assoc
14 North Boylan Avenue, Raleigh NC 27603
(919) 828-0577

FIELD BOREHOLE LOG

BOREHOLE NUMBER **MW-17**

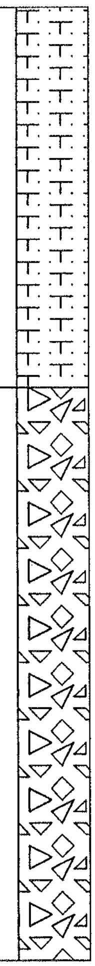
PROJECT NAME: **Halifax Landfill**
LOCATION: **Halifax Co.**
DRILLING CO: **McCall Bros.**
DRILLING METHOD: **HSA**
FIELD PARTY: **Ken McDonald**
GEOLOGIST: **J. Smyth**
DATE BEGUN: **10/03/07** DATE COMPLETED: **10/03/07**

TOTAL DEPTH: **25**
GROUND SURFACE ELEVATION:
TOP OF CASING ELEVATION:

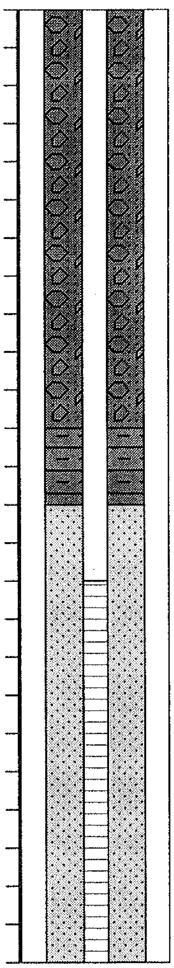
STATIC WATER LEVEL (TOC)		
Depth (ft)		
Time		
Date		

DEPTH	BLOW COUNT	SAMPLING METHOD	RECOVERY	DRILL METHOD	DESCRIPTION
0.0				HSA	SILTY CLAY: Wet, dark brown silty clay with organic matter.
5.0	2,2,4,6	SS	16"		
10.0	4,6,10,12	SS	14"		SAPROLITE: Wet, very weathered to weathered K-spar granitic saprolite. Boring terminated at 25' below grade.
15.0	11,16,22,27	SS	8"		
20.0	7,22,29,33	SS	6"		
25.0					

LITHOLOGY



DEPTH (0.0–25.0) / WELL INSTALLATION



Richardson Smith Gardner and Assoc

14 North Boylan Avenue, Raleigh NC 27603
(919) 828-0577

FIELD BOREHOLE LOG

BOREHOLE NUMBER **MW-18s** Page 1 of 1

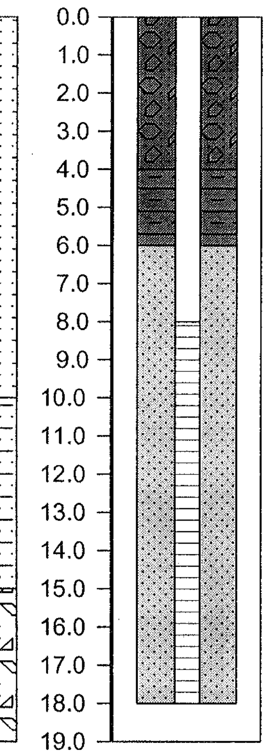
PROJECT NAME: **Halifax Landfill**
LOCATION: **Halifax Co.**
DRILLING CO: **McCall Bros.**
DRILLING METHOD: **HSA**
FIELD PARTY: **Ken McDonald**
GEOLOGIST: **J. Smyth**
DATE BEGUN: **10/16/07** DATE COMPLETED: **10/16/07**

TOTAL DEPTH: **19**
GROUND SURFACE ELEVATION:
TOP OF CASING ELEVATION:

STATIC WATER LEVEL (TOC)		
Depth (ft)		
Time		
Date		

DEPTH	BLOW COUNT	SAMPLING METHOD	RECOVERY	DRILL METHOD	DESCRIPTION	LITHOLOGY
0.0				HSA	SILTY CLAY: Moist to Wet gray green silty clay	
5.0	2,2,1,2	SS	6"			
10.0	3,2,3,11	SS	8"		CLAYEY SILTY SAND: Wet, dark gray, clayey silty sand with some partially weathered rock.	
15.0	18,26,27,26	SS	12"		SAPROLITE: Wet weathered potassium feldspar granite saprolite. Auger Refusal at 19 feet. Running sands backfilled hole to 18' where well was then set.	
19.0						

DEPTH / WELL INSTALLATION



Richardson Smith Gardner and Assoc
14 North Boylan Avenue, Raleigh NC 27603
(919) 828-0577

FIELD BOREHOLE LOG

BOREHOLE NUMBER **MW-18d**

PROJECT NAME:	**Halifax Landfill**
LOCATION:	**Halifax Co.**
DRILLING CO:	**McCall Bros.**
DRILLING METHOD:	**HSA**
FIELD PARTY:	**Ken McDonald**
GEOLOGIST:	**J. Smyth**
DATE BEGUN:	**10/16/07**
DATE COMPLETED:	**10/17/07**

TOTAL DEPTH: **52**
GROUND SURFACE ELEVATION:
TOP OF CASING ELEVATION:

STATIC WATER LEVEL (TOC)		
Depth (ft)		
Time		
Date		

DEPTH	BLOW COUNT	SAMPLING METHOD	RECOVERY	DRILL METHOD	DESCRIPTION	LITHOLOGY	DEPTH	WELL INSTALLATION
0.0				HSA	SILTY CLAY: Moist to Wet gray green silty clay		0.0	
5.0	2,2,1,2	SS	6"				5.0	
10.0	3,2,3,11	SS	8"		CLAYEY SILTY SAND: Wet, dark gray, clayey silty sand with some partially weathered rock.		10.0	
15.0	18,26,27,26	SS	12"		SAPROLITE: Wet weathered potassium feldspar granite saprolite. Auger Refusal at 32 feet.		15.0	
20.0		Grab					20.0	
25.0		Grab					25.0	
30.0		Grab					30.0	

Depth scale (ft): 0.0, 1.0, 2.0, 3.0, 4.0, 5.0, 6.0, 7.0, 8.0, 9.0, 10.0, 11.0, 12.0, 13.0, 14.0, 15.0, 16.0, 17.0, 18.0, 19.0, 20.0, 21.0, 22.0, 23.0, 24.0, 25.0, 26.0, 27.0, 28.0, 29.0, 30.0

Richardson Smith Gardner and Assoc
14 North Boylan Avenue, Raleigh NC 27603
(919) 828-0577

FIELD BOREHOLE LOG

BOREHOLE NUMBER **MW-18d**

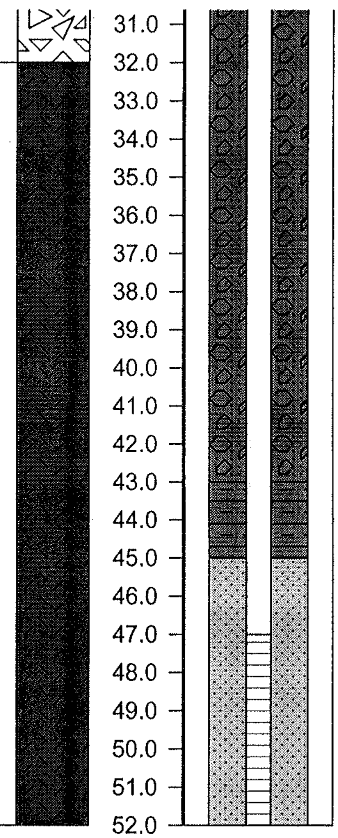
PROJECT NAME: **Halifax Landfill**
LOCATION: **Halifax Co.**
DRILLING CO: **McCall Bros.**
DRILLING METHOD: **HSA**
FIELD PARTY: **Ken McDonald**
GEOLOGIST: **J. Smyth**
DATE BEGUN: **10/16/07** DATE COMPLETED: **10/17/07**

TOTAL DEPTH: **52**
GROUND SURFACE ELEVATION:
TOP OF CASING ELEVATION:

STATIC WATER LEVEL (TOC)		
Depth (ft)		
Time		
Date		

DEPTH	BLOW COUNT	SAMPLING METHOD	RECOVERY	DRILL METHOD	DESCRIPTION
31.0					
32.0				AH	GRANITE: Wet Potassium Feldspar Granite (observed by cuttings). Boring terminated at 52'.
33.0					
34.0					
35.0		Grab			
36.0					
37.0					
38.0					
39.0					
40.0		Grab			
41.0					
42.0					
43.0					
44.0					
45.0		Grab			
46.0					
47.0					
48.0					
49.0					
50.0		Grab			
51.0					
52.0					

LITHOLOGY / DEPTH / WELL INSTALLATION



Sampling and Analysis Plan
Halifax County Unlined Landfill

Halifax, North Carolina

Prepared for:
Halifax County
Department of Public Works
Halifax, North Carolina

The water quality monitoring plan for this facility has been prepared by a qualified geologist who is licensed to practice in the state of North Carolina. The plan has been prepared based on knowledge of site conditions and familiarity with North Carolina solid waste rules and industry standard protocol. The water quality monitoring plan described herein should provide reasonably effective early detection of a chronic release of hazardous constituents into the ground or surface waters of the state, due to or caused by activities at the landfill. No other warranties, expressed or implied, are made.

Peter W. Schaer FOR

Joan A. Finkbeiner, P.G.
Project Hydrogeologist

NORTH CAROLINA LICENSED SEAL 983 GEOLOGIST G. DAVID GARRETT

G. David Garrett, P.G.
Principal, Senior Geologist

October, 1996

G.N. Richardson & Associates
Engineering and Geological Services
417 N. Boylan Avenue
Raleigh, North Carolina 27603

SAMPLING AND ANALYSIS PLAN
HALIFAX COUNTY LANDFILL
HALIFAX COUNTY, NORTH CAROLINA

Prepared For:

Halifax County Landfill
Halifax, North Carolina

Prepared By:

G. N. Richardson and Associates
417 North Boylan Avenue
Raleigh, North Carolina 27603
Phone: (919) 828-0577

October, 1996

TABLE OF CONTENTS

1.0 Introduction

1.1 Background

This site is an unlined facility located in Halifax, North Carolina. The facility was opened in 1981. The site originally was monitored with a total of nine monitoring wells. Several of these wells were located either within the waste boundary or along the edge of waste. Three of these monitoring wells (MW-2, MW-3, and MW-16) were replaced with wells relocated in August, 1995. Currently there are nine monitoring wells (MW-1, MW-2a, MW-3ad, MW-6s, MW-6d, MW-7s, MW-7d, MW-15, MW-16a) that are being monitored at the site. In addition, 3 surface water points exist, 2 of which are proposed for relocation. The site underwent baseline detection monitoring (Appendix I list) in 1994 - 1995, and assessment monitoring (Appendix I and II lists) was completed in 1995 - 1996. This revised Sampling and Analysis Plan (S.A.P.) is submitted due to updates in the site monitoring requirements (based on assessment sampling) and adjustment of monitoring locations.

The North Carolina Solid Waste Rules, Section 13B .1631 specify that the owner/operator must provide, as part of the site monitoring program, a ground water and surface water sampling and analysis plan (S.A.P.). This S.A.P. should be designed to provide accurate results of groundwater quality at the upgradient and downgradient sampling locations. The S.A.P. will address the following subjects:

- Groundwater sample collection
- Sample preservation and shipment
- Analytical procedures
- Chain-of-custody
- Quality assurance/quality control (QA/QC).

The methods and procedures described in the following sections are intended to gather true and representative samples and test data. Field procedures are presented in their general order of implementation. Equipment requirements are presented in each section, and quality assurance and record keeping requirements are presented in the latter sections. Strict adherence to these procedures is required.

2.0 Ground and Surface Water Sample Collection

Table 1 presents a summary description of ground water monitoring well (total of 9) and surface water sampling points (total of 5). A map depicting the monitoring well locations is included as Figure 1. Ground water samples will be collected from each of the monitor wells and from the surface water sampling locations. The proposed frequency of sampling events will be semi-annually (with the exception of monitoring wells MW-6d and MW-7d) in accordance with existing State regulations and is based on the landfill design and site hydrogeologic conditions. Due to their depth and historical lack of contaminants, monitoring wells MW-6d and MW-7d will be monitored on a bi-annual basis. Four baseline sampling events have been collected and the site is currently monitored on a semi-annual basis.

2.1 Static Water Level Measurements

Static water level elevations will be measured prior to any purging or sampling activities. These data will be used to monitor changes in site hydrogeologic conditions. The following measurements will be recorded in a dedicated field book prior to sample collection:

- Elevation of water level (to the nearest 0.01 foot)
- Total depth of well
- Height of water column in the riser
- Changes in condition of well and surroundings.

An electronic water level indicator will be used to accurately measure water elevations to within 0.01 foot. Each well will have a permanent, easily identified reference point from which all water level measurements will be taken. The reference point will be marked and the elevation surveyed by a Registered Land Surveyor. The static water level and total depth will be used to calculate the volume of water in the well.

The static water measuring device will be constructed of inert materials such as stainless steel and Teflon. Between well measurements the device will be thoroughly decontaminated by washing with non-phosphate soap and triple rinsing with deionized water to prevent cross contamination from one well to another.

2.2 Detection of Immiscible Layers

The screened portion of the well will intersect the water table, which will allow for the detection of light nonaqueous phase liquids (LNAPLS) prior to sampling. The following procedures will be used to detect immiscible layers on an annual basis.

Should impacted ground water be detected, an interface probe will be used to detect the existence of any light or dense phase immiscible fluids. The probe will be lowered into the well and will identify the presence of an immiscible layer. The depth of the light phase immiscible layer, if present, will then be recorded in a dedicated field logbook. The interface probe will continue to be lowered until it intersects the water table. The depth of the organic/water interface will also be recorded. From these two measurements, the thickness of the light phase immiscible layer can be determined. Dense phase immiscible layer will be detected by lowering the interface probe to the bottom of the well where it will indicate the presences of any dense organic liquid compounds. All immiscible phase liquids will be removed prior to sampling

The procedure for collecting light phase immiscibles will be dependent on the depth to the surface of the floating layer and the thickness of that layer. If the thickness of the light phase is two (2) feet or greater, a bottom valve bailer will be lowered slowly until contact is made with the surface of the immiscible/water interface depth as determined by preliminary measurements with the interface probe.

If the thickness of the light phase is less than two (2) feet, a bottom valve bailer will be modified to allow the sample to enter from the top. The bottom check valve will be disassembled and a piece of 2-inch diameter fluorocarbon resin sheet will be inserted between the ball and ball seat to seal off the bottom valve and the ball from the top check valve will be removed to allow the sample to enter from the top. The buoyancy that occurs when the bailer is lowered into the light immiscible phase will be overcome by placing a length of stainless steel pipe on the retrieval line above the bailer. The bailer will be lowered, carefully measuring the depth to the surface of the light immiscible phase, until the top of the bailer is level with the top of the light immiscible phase. The bailer will be lowered and additional one-half thickness of the light immiscible phase and the bailer removed.

The procedure to collecting dense phase immiscibles will be to use a double check valve bailer. The bailer will be lowered in a controlled manner, then slowly retrieved to retain the dense phase immiscible. The presence of immiscible layers at the proposed facility are not anticipated. Upon completion of one year of immiscible layer testing, initiated by the detection of impacted ground water, monitoring data will be reviewed, and the frequency and need of subsequent immiscible layer tests will be re-evaluated.

2.3 Monitor Well Evacuation

Following measurement of the static water elevation in all of the wells, individual wells will be purged of all stagnant water. The stagnant water, which is not representative of true aquifer conditions, must be removed to insure that fresh formation water can be sampled. A minimum of three well volumes will be removed prior to sampling the well. The well volume for 2-inch diameter wells will be calculated using the following equation:

$$V = (TD - SWL) \times C$$

Where:

V = One well volume

TD = Total depth of the well (in feet)

SWL = Static water level (in feet)

C = Volume constant for given well diameter (gallons/foot)

C = 0.163 gal/ft for two-inch diameter wells.

Well completion depth data are included in Table 2. Determining the well volume in gallons will allow the sampler to determine the amount of ground water to purge in order to remove a minimum of three to five well volumes (or until the well is purged dry). Wells will be purged at a rate which will not cause recharge water to be excessively agitated. Dry and low recharge rates, and the total purged volume will be noted in field observations. Should impacted ground water be detected purge water will be managed as to prevent possible soil contamination (either through containment, or treatment on-site).

Prior to purging, new latex or nitrile surgical gloves will be donned. Each well will be purged in such a way that water is removed from the bottom of the screened interval. During the well purging process, field measurements (i.e., pH, temperature, and specific conductance) will be collected at regular intervals, and reported in a tabular format. The well will be purged until field measurements stabilize (to within 10% of each other) or until the well is dry. Stabilization of these measurements will indicate that fresh formation water is present in the well. Field measurements of pH, temperature, and conductivity will be obtained by using a combination water quality meter. Data collected will be recorded in a field log book.

A new, disposable fluorocarbon resin (Teflon) or inert plastic bailer with bottom check valve will be used to evacuate each well. A new Teflon-coated stainless steel, inert monofilament line or new nylon rope will be used to retrieve the bailer. Clean, disposable latex or nitrile surgical gloves will be used at each well, and appropriate measures will be taken to prevent surface soils and other contaminant sources from contacting the purging equipment. Non-dedicated field equipment (field measuring devices) will be thoroughly decontaminated between wells by disassembling and washing with (non-phosphate) soapy, de-ionized water and triple rinsed using de-ionized water.

Should dedicated pumps be used, a minimum of three to five well volumes (or until the well is purged dry) will be purged from the well utilizing a dedicated pump. If the Micro-Purge and/or Purge Saver systems are used, less water may be purged based upon these field parameters analyzed by these systems. Pumping will be completed at a flowrate the aquifer can maintain, and so as to not agitate sediments. Only stainless steel and teflon pumps will be used.

2.4 Ground Water Sample Collection

After purging activities are complete, groundwater samples will be collected for laboratory analysis. Samples will only be collected after new latex or nitrile surgical gloves have been donned. The wells will be sampled using either disposable Teflon bailers with bottom check valve, bottom emptying devices and Teflon coated wire, inert monofilament line or new nylon rope, or by the use of dedicated pumps. Sampling will occur as soon after well recovery as possible. Wells which fail to produce an adequate sample volume within 24 hours of purging will not be sampled.

Temperature, pH, and specific conductance will be taken at the start and ending of sampling as a measure of purging efficiency and as a check on the stability of the water samples over time. Measurements of temperature, pH, and specific conductivity will be recorded for all water samples. The calibration of the pH, temperature, and conductivity meter will be completed at the beginning of each sampling event, according to the manufacturers' specifications and consistent with Test Methods for Evaluating Solid Waste - Physical/Chemical Methods (SW-846).

Ground water samples will be collected and contained in the order of volatilization sensitivity of the parameters as follows:

- Initial measurements of pH, temperature and conductivity
- Volatile Organics
- Total Metals
- Turbidity
- Final measurements of pH, temperature, and conductivity

All samples will be collected unfiltered. Samples for dissolved metal analysis, if subsequently required, will be prepared by field filtration using a decontaminated Nalgene hand-operated filtering pump, (or equivalent), or peristaltic pump and a disposable 0.45 micron filter cartridge specifically manufactured for this purpose.

All reusable sampling equipment including meter probes, and filtering pump (if used), which might contact aquifer water or samples, will be thoroughly decontaminated between wells by washing with non-phosphate soapy, de-ionized water and triple rinsing with deionized water.

Samples will be transferred directly from the Teflon bailer into a container that has been specifically prepared for the preservation and storage of compatible parameters. A bottom emptying device provided with the bailer will be used to transfer samples from bailer to sample container to assure minimum agitation.

Blanks and duplicate samples will be taken and analyzed for the same parameters as ground water samples to insure cross-contamination has not occurred. One set of trip blanks, as described later in this document, will be collected before leaving the laboratory to insure that the sample containers or handling processes have not affected the quality of the samples. One set of field (equipment) blanks will be collected in the field at the time of sampling to insure that the field conditions, equipment used, and handling during sampling collection have not affected the quality of the samples. A duplicate ground water sample may be collected from a single well as a check of laboratory accuracy. Blanks and duplicate containers, preservatives, handling, and transport procedures for surface water samples will be identical to those noted for ground water samples.

Sample containers shall be provided by the laboratory for each sampling event. Containers shall be cleaned by the laboratory based on the analyte of interest. Metal containers shall be thoroughly washed with non-phosphate detergent and tap water, and rinsed with (1:1) nitric acid, tap water, (1:1) hydrochloric acid, tap water, and deionized water, in that order. Organic sample containers shall be thoroughly washed with non-phosphate detergent in hot water and rinsed with tap water, distilled water, acetone, and pesticide quality hexane, in that order. Other sample containers shall be thoroughly washed with non-phosphate detergent and tap water, rinsed with tap water, and rinsed with deionized water. The laboratory shall provide proper preservatives in the sample containers prior to shipment.

2.5 Surface Water Sample Collection

Surface water samples will be obtained from areas of minimal turbulence and aeration. The following procedure will be implemented regarding sampling of surface waters:

1. Put on new latex or nitrile surgical gloves.
2. Hold the bottle at the bottom with one hand, and with the other, remove the cap.
3. Push the sample container slowly into the water and tilt up towards the current to fill. A depth of about 6 inches is satisfactory. Avoid breaching the surface while filling the container.
4. If there is little current movement, the container should be moved slowly, in a lateral direction.

2.6 Equipment Decontamination

All non-dedicated equipment that will come in contact with the well casing and water, i.e. water level indicator, will be decontaminated. The procedure for decontaminating non-dedicated equipment as follows:

1. Clean item with tap water and phosphate-free laboratory detergent (Liquinox or equivalent), using a brush if necessary to remove particulate matter and surface films.
2. Rinse thoroughly with tap water
3. Rinse thoroughly with deionized or distilled water and allow to air dry
4. Rinse thoroughly with high grade isopropanol and allow to air dry
5. Wrap with aluminum foil, if necessary, to prevent contamination of equipment during storage or transport.

3.0 Field QA/QC Program

Field Quality Assurance/Quality Control (QA/QC) requires the routine collection and analysis of two types of QC blanks, trip blanks and field blanks, to verify that the sample collection and handling process has not affected the quality of the samples. The laboratory and field crew will prepare the following sampling blanks and analyze them for all of the required monitoring parameters:

Trip Blank - Fill one of each type of sample bottle with distilled or deionized water, transport to the site, handle like a sample, and return to the laboratory for analysis. One set of trip blanks will be analyzed per sampling event. Trip blanks should be prepared by the laboratory and transported with the sample glassware prior to sampling.

Field blank - To insure that any non-dedicated sampling device has been effectively cleaned, fill the device with distilled or deionized water, while wearing clean latex or nitrile surgical gloves, transfer to sample bottles(s), and return to the laboratory for analysis. If the samples are collected with bailers, a minimum of one field blank for each day that samples are collected is required. If dedicated pumps are used for sample collection, field blank samples are not necessary.

Sampling blanks will be placed in bottles of the specific type required for the analyzed parameters and taken from a bottle pack specifically assembled by the laboratory for each ground water sampling event. Trip blanks will be taken prior to the sampling event and transported with the empty bottle packs. Field blanks will be placed in contact with field sampling equipment and returned to the laboratory in a manner identical to the handling procedure used for the samples. The blanks will be subjected to the same analyses as the ground water. Any contaminants found in the trip blanks could be attributed to: (1) interaction between the sample and the container, (2) contaminated source water, or (3) a handling procedure that alters the sample. Additionally, field blank contamination could be attributed to: (4) interaction with the sampling device, and (5) a field handling procedure which taints the retrieved sample.

The concentration levels of any contaminants found in the trip blank will be reported but will not be used to correct the ground water data. In the event that elevated parameter concentrations are found in any blank, the analysis will be flagged for future evaluation and possible resampling.

All field instruments utilized in the field to measure ground water characteristics will be calibrated prior to entering the field, and recalibrated in the field as required, to insure accurate measurement for each sample. The specific conductivity and pH meter shall be recalibrated utilizing two prepared solutions of known concentration in the range of anticipated values (between 4 and 10). A permanent thermometer, calibrated against a National Bureau of Standards Certified thermometer, will be used for temperature meter calibration.

4.0 Sample Preservation and Shipment

In order to insure sample integrity, preservation and shipment procedures will be carefully monitored. Generally, ice and chemical ice packs will be used as sample preservatives, as recommended by the commercial laboratory. Dry ice is not to be used. Proper storage and transport conditions must be maintained in order to preserve the integrity of the sample. For VOC analysis, hydrochloric acid will be used for sample preservation as well as by maintaining the samples at a temperature of 4°C. Nitric acid will be used as the preservative for samples needing metals analysis. Samples shall be delivered to the analytical laboratory within a 24-hour period using an overnight delivery service, if needed, to insure holding times are not exceeded. Shipment and receipt of samples will be coordinated with the laboratory.

Once collected, samples will be placed on ice and cooled to a temperature of 4°C. Samples are to be packed in high impact polystyrene coolers so as to inhibit breakage or accidental spills. Custody seals shall be placed on the outside of the cooler, in a manner to detect tampering of the samples. Chain-of-Custody control for all samples will consist of the following:

1. Labels will be placed on individual sample containers in the field, indicating the site, time of sampling, date of sampling, well number, and preservation method used for the sample.

2. Sample containers will be individually secured or placed in a secured area in iced coolers and will remain in the continuous possession of the field technician until transferral as provided by the Chain-of-Custody form has occurred.

3. Upon delivery to the laboratory, samples are given laboratory sample numbers and recorded into a logbook indicating client, well number, and date and time of delivery. The laboratory director or his designatee will sign the Chain-of-Custody control forms and formally receive the samples. The field technician, project manager and the laboratory director will work together to insure that proper refrigeration of the samples is maintained.

5.0 Field Logbook

The field technician will keep an up-to-date logbook documenting important information pertaining to the technician's field activities. The field logbook will document the following:

- Site Name and Location
- Date and Time of Sampling
- Climatic Conditions Immediately Before and After Sampling Event
- Well Identification Number
- Presence of Immiscible Layers and Detection Method
- Well Static Water Level

- Well Depth
- Height of Water Column in Well
- Volume of Three (3) Well Volumes
- Volume of Five (5) Well Volumes
- Purged Water Volume and Well Yield (High or Low)
- Pumping or Bailing Rate
- Time Well Purged
- Observations on Purging and Sampling Event
- Time of Sample Collection
- Temperature, pH, Turbidity, and Conductivity Readings (4x)
- Signature of Field Technician.

6.0 Laboratory Analysis

The ground water parameters to be analyzed will be those specified in the sanitary landfill permit, and/or North Carolina Solid Waste Management Rules. These will include field indicators of ground water quality (pH, conductivity, and temperature) and selected volatile organic and total metal constituents as listed in Appendix I of 40 CFR.258. All analytical methods are taken from Test Methods For Evaluating Solid Waste - Physical/Chemical Methods (SW-846) or Methods For the Chemical Analysis of Water and Wastes. Analysis will be performed by a laboratory certified by the North Carolina DEHNR for the analyzed parameters.

Quality Assurance/Quality Control (QA/QC) procedures are to be utilized at all times. The owner/operator of the landfill is responsible for selecting a laboratory and insuring that they are utilizing proper QA/QC procedures. The laboratory must have a QA/QC program based upon specific routine procedures outlined in a written laboratory Quality Assurance/Quality Control Manual. The QA/QC procedures listed in the manual provide the lab with the necessary assurances and documentation for accuracy and precision of analytical determinations. Internal quality control checks shall be undertaken, regularly by the lab, to assess the precision and accuracy of analytical procedures.

The internal quality control checks include the use of calibration standards, standard references, duplicate samples and spiked or fortified samples. Calibration standards shall be verified against a standard reference obtained from an outside source. Calibration curves shall be developed using at least one blank and three standards. Samples shall be diluted if necessary to insure that analytical measurements fall on the linear portion of the calibration curve. Duplicate samples shall be processed at an average frequency of 10 percent to assess the precision of testing methods, and standard references shall be processed monthly to assess accuracy of analytical procedures. Spiked or fortified samples shall be carried through all stages of sample preparation and measurement to validate the accuracy of the analysis.

During the course of the analyses, quality control data and sample data shall be reviewed by the laboratory manager to identify questionable data and determine if the necessary QA/QC requirements are being followed. If a portion of the lab work is subcontracted, it is the responsibility of the contracted laboratory to verify that all subcontracted work is completed by certified laboratories, using identical QA/QC procedures.

7.0 Statistical Evaluation

Copies of all laboratory results and water quality reports will be kept at the Halifax County Landfill office. Reports summarizing all ground water and statistical evaluation will be submitted to the DSWM for each sampling event. Methods to evaluate the data are taken from North Carolina Solid Waste Rules, 40 CFR 258.53g, the EPA RCRA Ground Water Monitoring Draft Technical Guidance Document and the EPA Statistical Analysis of Ground Water Monitoring Data at RCRA Facilities - Addendum to Interim Final Guidance. The North Carolina Solid Waste Rules requires that the owner or operator of the landfill specify a statistical method outlined in these rules to evaluate ground water monitoring data. The goal of the statistical analysis is to determine whether statistically significant evidence of contamination exists and to identify the point of contamination. Upon receipt of each monitoring event's data, the statistical database of analyses will be updated. The North Carolina Solid Waste Rules provide several methods for statistical analysis of ground water data. These methods are:

1. Parametric analysis of variance (ANOVA)
2. Rank-based (non-parametric) ANOVA with multiple comparisons
3. Tolerance prediction interval
4. Control chart
5. Test of Proportions
6. An alternative statistical test method that meets the performance standards of 40 CFR 258.53 (h)

Statistical evaluation of monitoring data will be performed for the duration of the monitoring program, including the post-closure care period. The choice of an appropriate statistical test depends on the type of monitoring, the nature of the data, and the proportion of values in the data set that are below detection limits. The statistical analysis will be conducted separately for each detected constituent in each well. The statistical method is based on the EPA's Statistical Analysis of Ground Water Monitoring Data at RCRA Facilities, Interim Final Guidance Document (1989) and the EPA's Statistical Analysis of Ground Water Monitoring Data at RCRA facilities - Addendum to Interim Final Guidance. All statistical analysis will be performed in accordance with North Carolina State Regulations 15A NCAC 13B.1632.

8.0 Record Keeping and Reporting

8.1 Notifications

Should a statistically significant increase in ground water concentrations as defined in North Carolina Solid Waste Rules be detected during monitoring, the owner/operator of the landfill

8.4 Implementation Schedule

The Ground Water Monitoring Program and sampling and analysis will be implemented upon approval of the Ground Water Monitoring Program. Analyses have been performed four times during the first semi-annual event, and will be performed once semi-annually (with the exception of MW-6d and MW-7d which will be sampled bi-annually) throughout the active life and post-closure monitoring period of the landfill, unless an alternate sampling schedule is accepted by the DSWM.

Table 2

Estimated Monitoring Well Completion Data

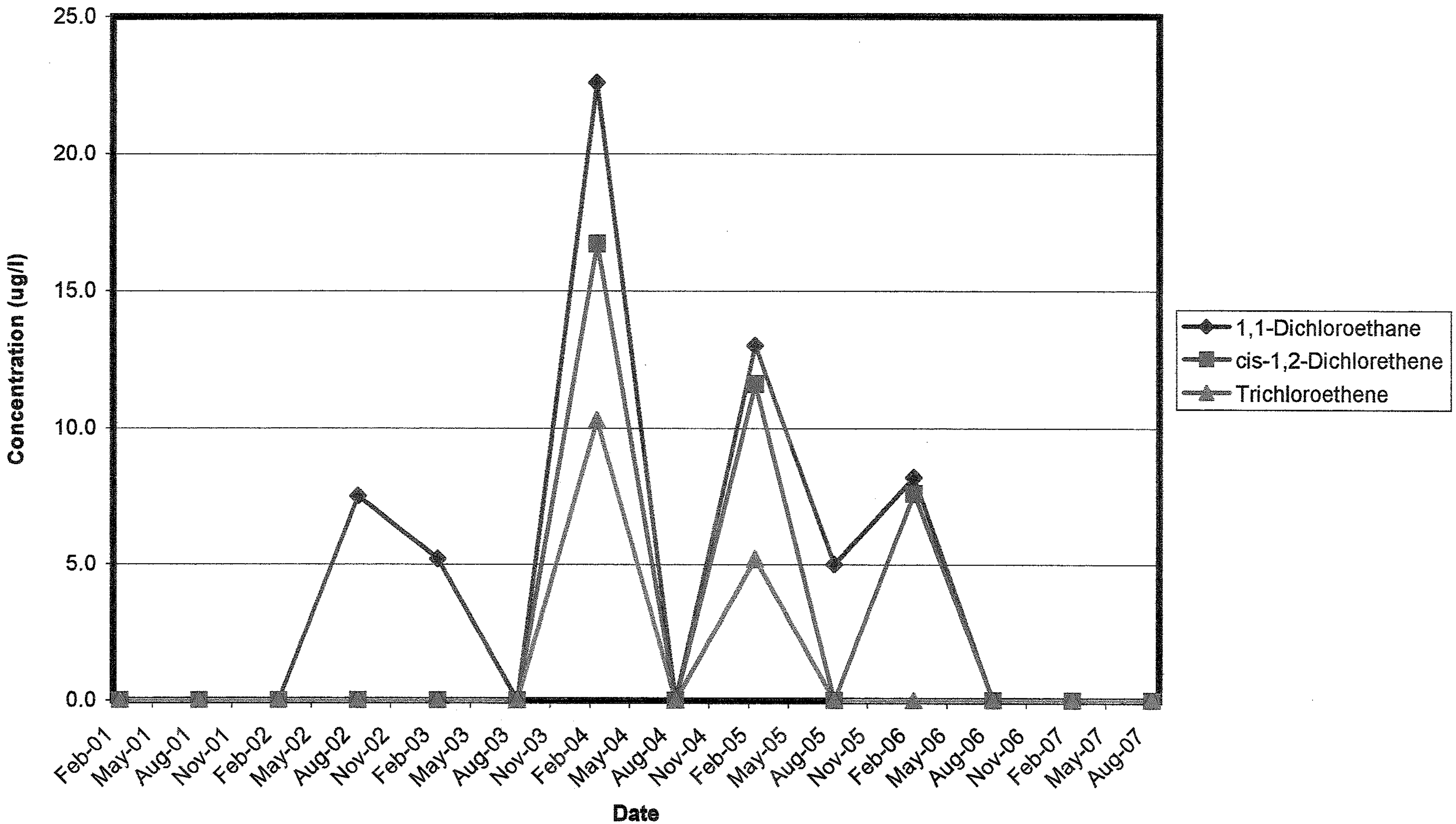
Halifax County Unlined Landfill

October, 1996

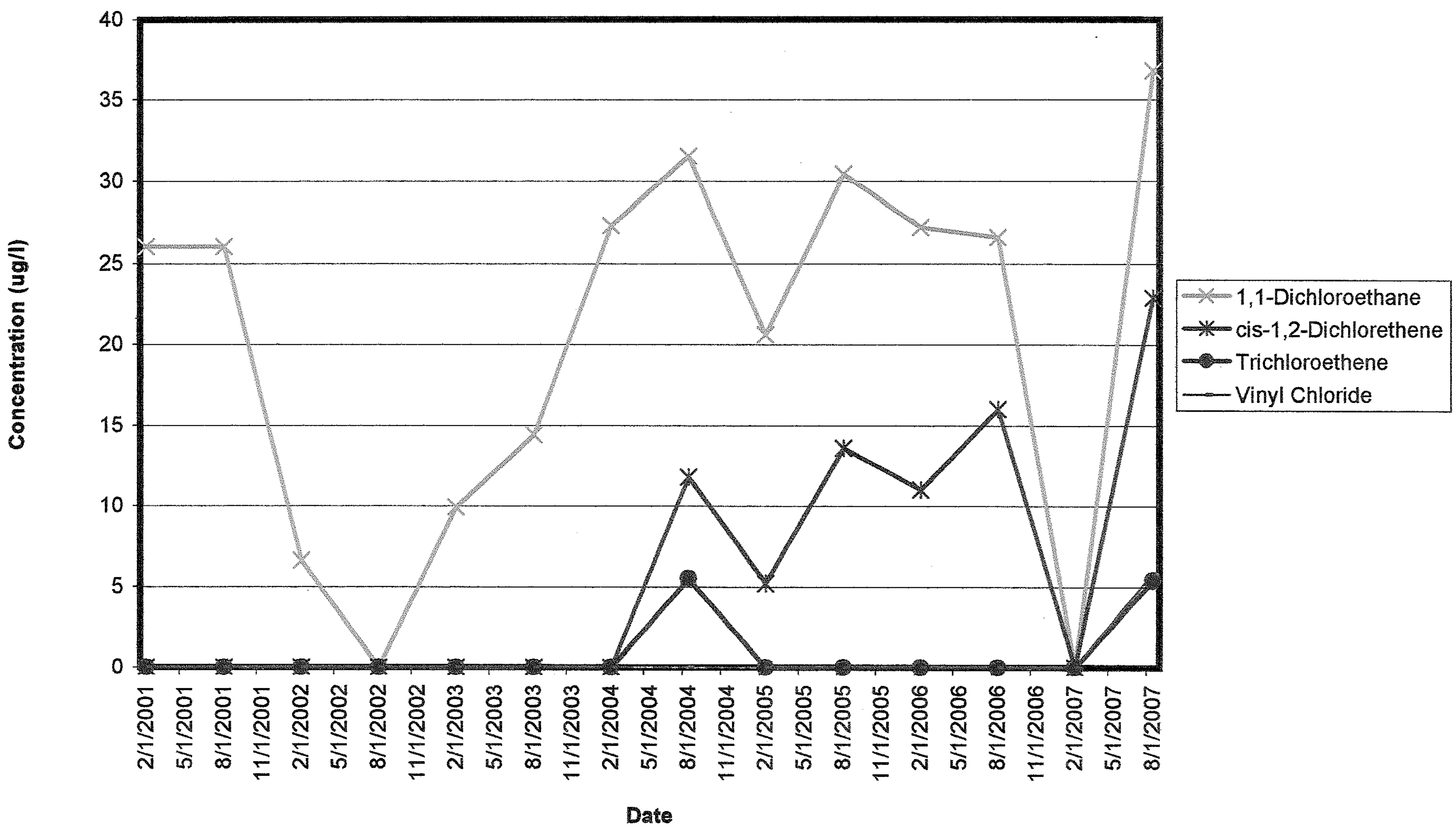
Monitoring Well	Top of Casing Elevation	Depth to Bottom, ft.	Screened Interval, ft.
MW-1	324.6	40	25.0 - 40.0
MW-2a	246.43	14	4.0 - 14.0
MW-3ad	252.68	19	9.0 - 19.0
MW-6s	255.26	23	8.0 - 23.0
MW-6d	253.20	40	25.0 - 40.0
MW-7s	250.44	17	2.5 - 17.5
MW-7d	249.10	40	25.0 - 40.0
MW-15	309.09	50	35.0 - 50.0
MW-16a	271.46	19	4.0 - 19.0

Notes: All measurements in feet.

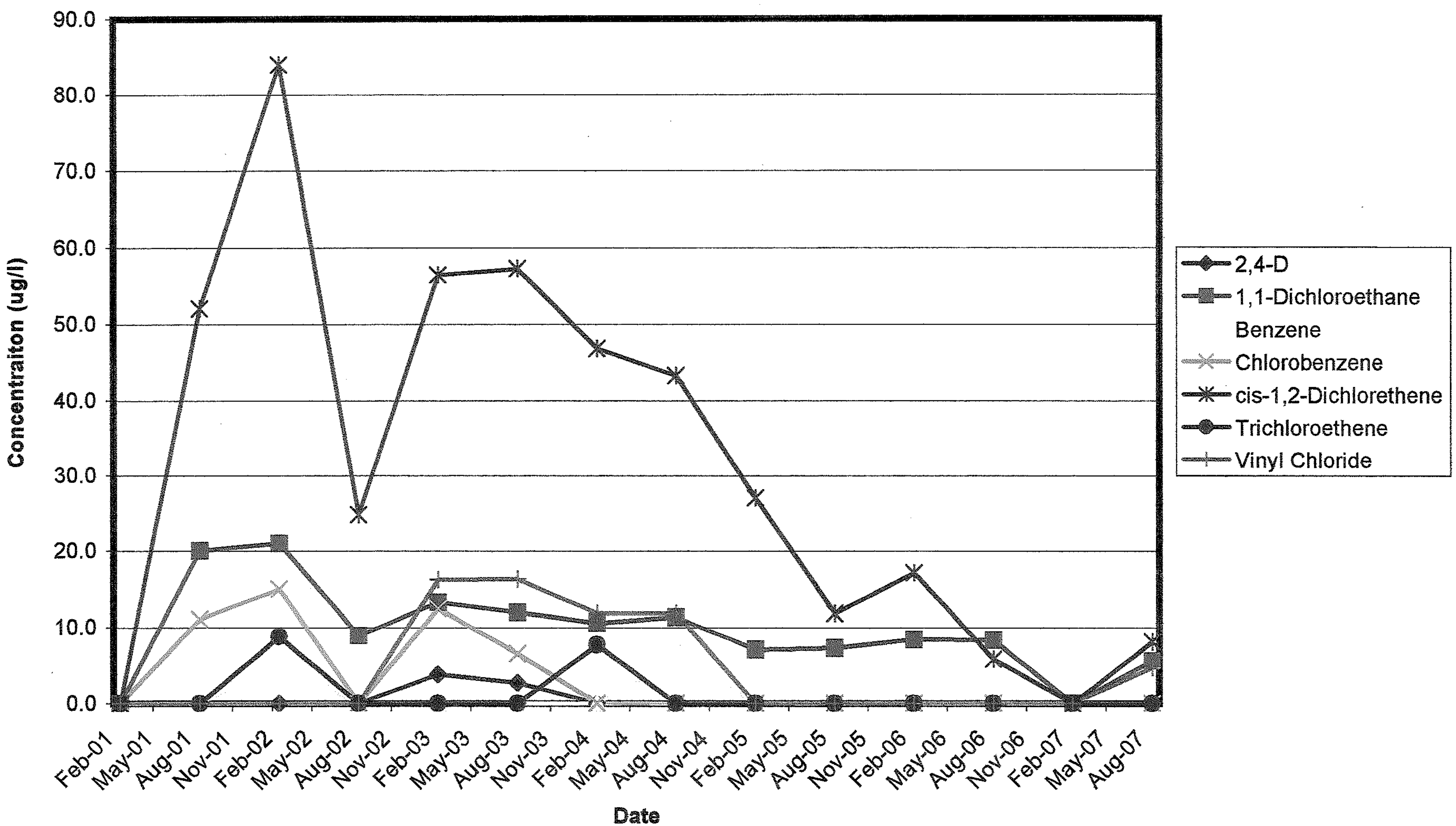
Halifax County Landfill
Time vs. Concentration Graphs
MW-2a



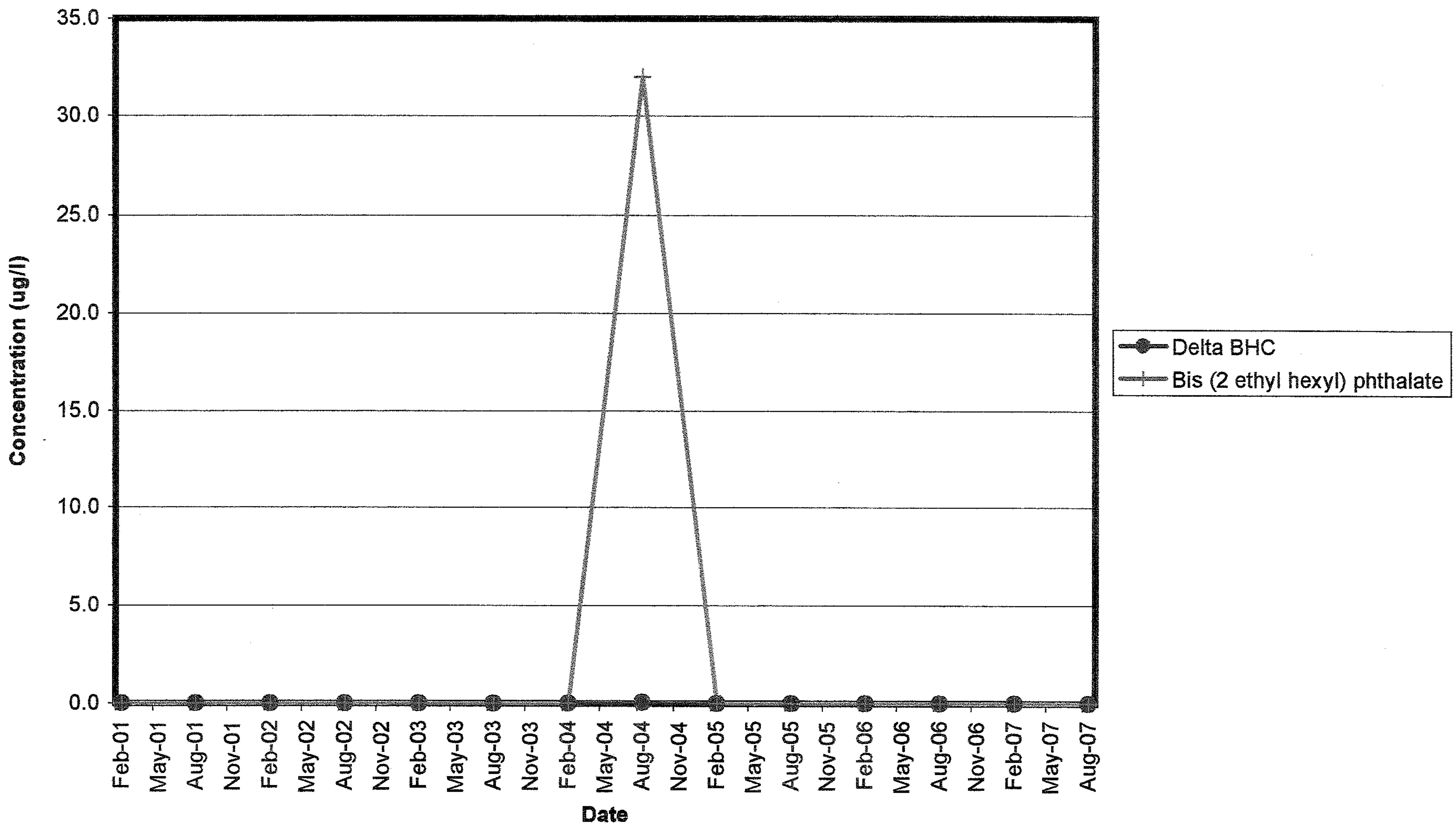
Halifax County Landfill
Time vs. Concentration Graphs
MW-2ad



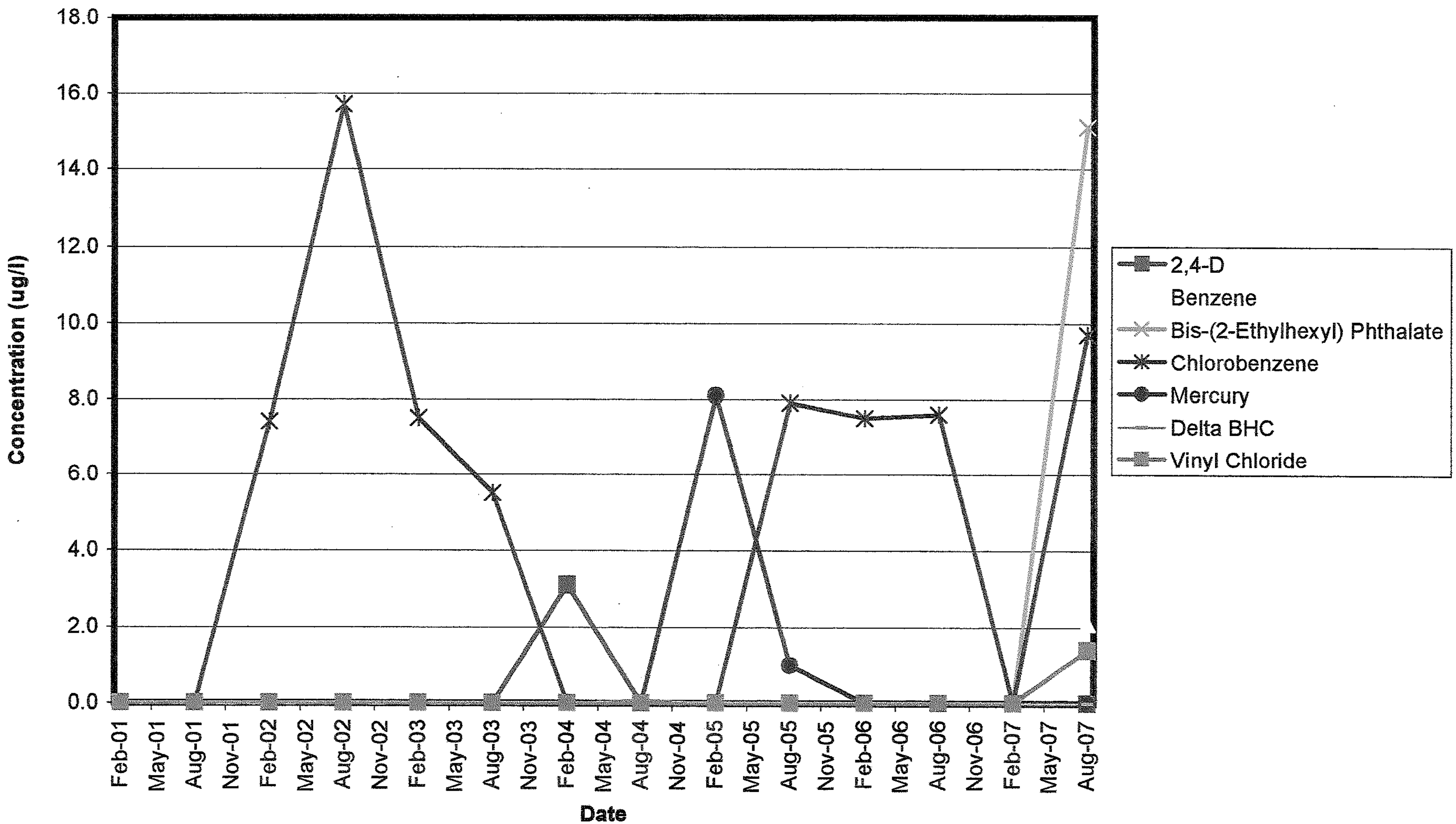
Halifax County Landfill
Time vs. Concentration Graphs
MW-3a



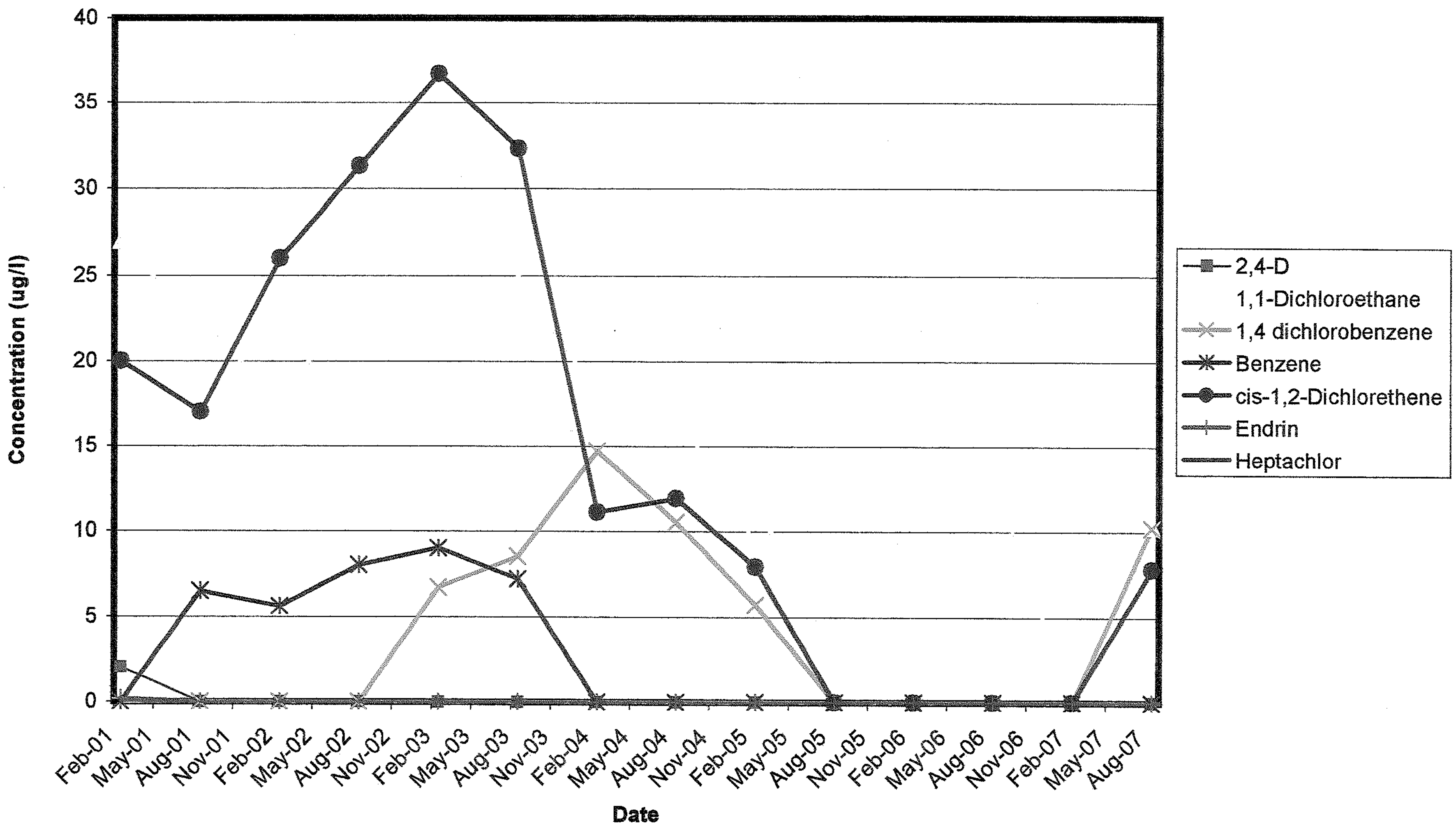
Halifax County Landfill
Time vs. Concentration Graphs
MW-3d



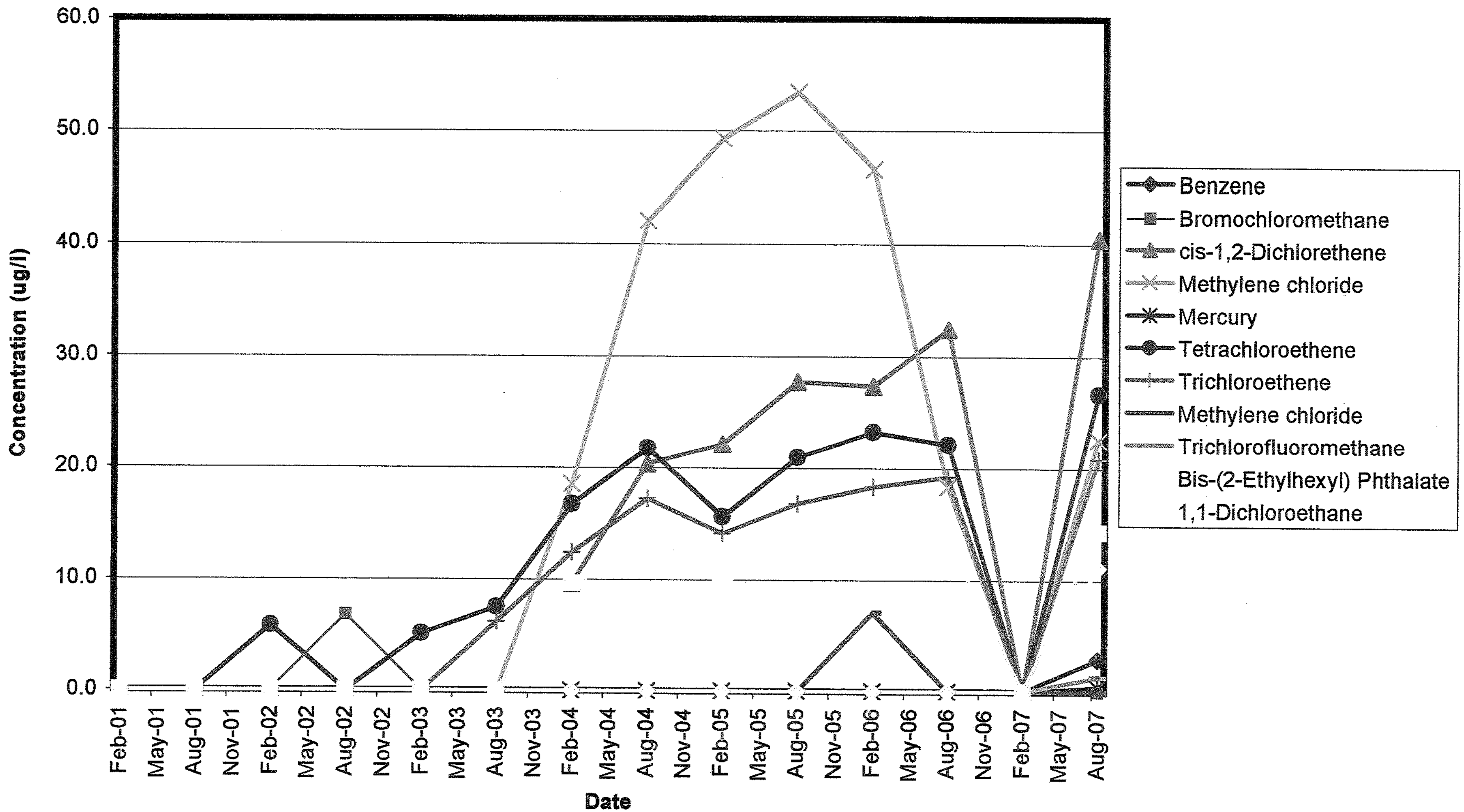
Halifax County Landfill
Time vs. Concentration Graphs
MW-6d



Halifax County Landfill
Time vs. Concentration Graphs
MW-15r



Halifax County Landfill
Time vs. Concentration Graph
MW-16a



Environment 1, Incorporated

REC'D AUG 31 2007

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HALIFAX CO. LANDFILL (CLOSED MSW)
MR. FRANK RALPH
P.O. BOX 70
HALIFAX ,NC 27839

DATE COLLECTED: 08/09/07
DATE REPORTED : 08/29/07

REVIEWED BY:

PARAMETERS	MDL	SWSL	Well #1	Well #2A	Well #3D	Well #7D	SW-1	Analysis Date	Analyst	Method Code
PH (field measurement), Units			5.2	6.4	6.0	6.0	6.7	08/09/07	RJH	SM4500HB
Antimony, ug/l	0.05	6.0	0.1 J	0.1 J	--- U	--- U	--- U	08/14/07	LFJ	EPA200.8
Arsenic, ug/l	0.47	10.0	--- U	1.7 J	--- U	--- U	1.6 J	08/14/07	LFJ	EPA200.8
Barium, ug/l	0.04	100.0	35.1 J	93.3 J	60.4 J	43.1 J	48.0 J	08/14/07	LFJ	EPA200.8
Beryllium, ug/l	0.08	1.0	0.1 J	0.4 J	0.3 J	0.2 J	--- U	08/14/07	LFJ	EPA200.8
Cadmium, ug/l	0.06	1.0	0.1 J	0.1 J	0.1 J	0.1 J	0.2 J	08/14/07	LFJ	EPA200.8
Cobalt, ug/l	0.41	10.0	0.6 J	5.9 J	--- U	--- U	1.8 J	08/14/07	LFJ	EPA200.8
Copper, ug/l	0.20	10.0	1.2 J	1.1 J	0.5 J	1.1 J	1.3 J	08/14/07	LFJ	EPA200.8
Total Chromium, ug/l	0.24	10.0	0.4 J	4.1 J	0.4 J	1.4 J	0.7 J	08/14/07	LFJ	EPA200.8
ead, ug/l	0.07	10.0	0.2 J	0.8 J	0.3 J	1.0 J	2.5 J	08/14/07	LFJ	EPA200.8
ercury, ug/l	0.04	0.20		--- U	0.15 J	--- U		08/14/07	LFJ	EPA200.8
Nickel, ug/l	0.66	50.0	--- U	2.5 J	0.7 J	1.1 J	--- U	08/14/07	LFJ	EPA200.8
Selenium, ug/l	0.35	10.0	0.8 J	--- U	--- U	--- U	--- U	08/14/07	LFJ	EPA200.8
Silver, ug/l	0.52	10.0	--- U	--- U	--- U	--- U	--- U	08/14/07	LFJ	EPA200.8
Thallium, ug/l	0.07	5.0	0.1 J	--- U	--- U	--- U	--- U	08/14/07	LFJ	EPA200.8
Tin, ug/l	0.12	100.0		0.9 J	0.6 J	0.7 J		08/14/07	LFJ	EPA200.8
Vanadium, ug/l	0.42	25.0	--- U	2.9 J	--- U	--- U	2.9 J	08/14/07	LFJ	EPA200.8
Zinc, ug/l	0.20	10.0	3.1 J	4.6 J	5.5 J	8.9 J	13	08/14/07	LFJ	EPA200.8
Conductivity (at 25c), uMhos	1.0	1.0	55	223	183	44	122	08/09/07	RJH	SM2510B
Temperature, °C			16	19	17	20	25	08/09/07	RJH	SM2550B
Static Water Level, feet			29.33	5.17	8.17	3.95		08/09/07	RJH	
Well Depth, feet			42.36	17.21	52.07	39.57		08/09/07	RJH	

J = Between MDL and SWSL, U = Below ALL Quanititation Limits.

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HALIFAX CO. LANDFILL (CLOSED MSW)
MR. FRANK RALPH
P.O. BOX 70
HALIFAX ,NC 27839

DATE COLLECTED: 08/09/07
DATE REPORTED : 08/29/07

REVIEWED BY:

PARAMETERS	MDL	SWSL	SW-2	SW-3	Well #2AD	Well #6D	Well #15R	Analysis Date	Analyst	Method Code
PH (field measurement), Units			6.7	6.7	6.6	6.1	5.0	08/09/07	RJH	SM4500HB
Antimony, ug/l	0.05	6.0	--- U	--- U	--- U	--- U	0.1 J	08/14/07	LFJ	EPA200.8
Arsenic, ug/l	0.47	10.0	1.9 J	1.6 J	0.9 J	--- U	--- U	08/14/07	LFJ	EPA200.8
Barium, ug/l	0.04	100.0	82.9 J	45.0 J	108	547	89.6 J	08/14/07	LFJ	EPA200.8
Beryllium, ug/l	0.08	1.0	--- U	0.8 J	--- U	0.4 J	0.2 J	08/14/07	LFJ	EPA200.8
Cadmium, ug/l	0.06	1.0	0.6 J	0.9 J	0.4 J	0.2 J	0.3 J	08/14/07	LFJ	EPA200.8
Cobalt, ug/l	0.41	10.0	1.3 J	2.5 J	4.5 J	4.4 J	0.5 J	08/14/07	LFJ	EPA200.8
Copper, ug/l	0.20	10.0	0.6 J	1.0 J	0.9 J	0.8 J	1.5 J	08/14/07	LFJ	EPA200.8
Total Chromium, ug/l	0.24	10.0	--- U	--- U	6.6 J	--- U	0.6 J	08/14/07	LFJ	EPA200.8
Lead, ug/l	0.07	10.0	0.1 J	0.1 J	0.2 J	0.3 J	0.1 J	08/14/07	LFJ	EPA200.8
Mercury, ug/l	0.04	0.20			0.06 J	0.08 J	6.65	08/14/07	LFJ	EPA200.8
Nickel, ug/l	0.66	50.0	1.2 J	3.3 J	5.7 J	2.3 J	--- U	08/14/07	LFJ	EPA200.8
Selenium, ug/l	0.35	10.0	2.5 J	7.5 J	--- U	0.8 J	--- U	08/14/07	LFJ	EPA200.8
Silver, ug/l	0.52	10.0	--- U	--- U	--- U	--- U	--- U	08/14/07	LFJ	EPA200.8
Thallium, ug/l	0.07	5.0	--- U	--- U	--- U	--- U	0.2 J	08/14/07	LFJ	EPA200.8
Tin, ug/l	0.12	100.0			0.8 J	1.0 J	1.3 J	08/14/07	LFJ	EPA200.8
Vanadium, ug/l	0.42	25.0	--- U	3.0 J	--- U	0.7 J	--- U	08/14/07	LFJ	EPA200.8
Zinc, ug/l	0.20	10.0	2.9 J	46	5.8 J	13	3.6 J	08/14/07	LFJ	EPA200.8
Conductivity (at 25c), uMhos	1.0	1.0	431	1053	541	576	88	08/09/07	RJH	SM2510B
Temperature, °C			26	22	18	17	18	08/09/07	RJH	SM2550B
Static Water Level, feet					4.75	12.23	29.54	08/09/07	RJH	
Well Depth, feet					41.75	43.55	46.41	08/09/07	RJH	

J = Between MDL and SWSL, U = Below ALL Quanititation Limits.

Environment 1, Incorporated

Wastewater ID: 10

.O. BOX 7085, 114 OAKMONT DRIVE
GREENVILLE, N.C. 27835-7085

PHONE (252) 756-6208
FAX (252) 756-0633

ID#: 6015

HALIFAX CO. LANDFILL (CLOSED MSW)
MR. FRANK RALPH
P.O. BOX 70
HALIFAX ,NC 27839

DATE COLLECTED: 08/09/07
DATE REPORTED : 08/29/07

REVIEWED BY:

PARAMETERS	MDL	SWSL	Well #3AD	Well #16A	BP-3	BP-9	Equipment Blank	Analysis Date	Analyst	Method Code
PH (field measurement), Units			6.4	5.8				08/09/07	RJH	SM4500HB
Antimony, ug/l	0.05	6.0	--- U	--- U				08/14/07	LFJ	EPA200.8
Arsenic, ug/l	0.47	10.0	1.4 J	--- U				08/14/07	LFJ	EPA200.8
Barium, ug/l	0.04	100.0	33.7 J	91.9 J				08/14/07	LFJ	EPA200.8
Beryllium, ug/l	0.08	1.0	0.1 J	0.5 J				08/14/07	LFJ	EPA200.8
Cadmium, ug/l	0.06	1.0	0.6 J	0.5 J				08/14/07	LFJ	EPA200.8
Cobalt, ug/l	0.41	10.0	2.7 J	--- U				08/14/07	LFJ	EPA200.8
Copper, ug/l	0.20	10.0	0.5 J	0.9 J				08/14/07	LFJ	EPA200.8
Total Chromium, ug/l	0.24	10.0	--- U	--- U				08/14/07	LFJ	EPA200.8
ead, ug/l	0.07	10.0	0.2 J	0.3 J				08/14/07	LFJ	EPA200.8
ercury, ug/l	0.04	0.20	0.04 J	0.44				08/14/07	LFJ	EPA200.8
Nickel, ug/l	0.66	50.0	--- U	--- U				08/14/07	LFJ	EPA200.8
Selenium, ug/l	0.35	10.0	--- U	--- U				08/14/07	LFJ	EPA200.8
Silver, ug/l	0.52	10.0	--- U	--- U				08/14/07	LFJ	EPA200.8
Thallium, ug/l	0.07	5.0	--- U	--- U				08/14/07	LFJ	EPA200.8
Tin, ug/l	0.12	100.0	0.6 J	0.6 J				08/14/07	LFJ	EPA200.8
Vanadium, ug/l	0.42	25.0	--- U	--- U				08/14/07	LFJ	EPA200.8
Zinc, ug/l	0.20	10.0	2.7 J	6.9 J				08/14/07	LFJ	EPA200.8
Conductivity (at 25c), uMhos	1.0	1.0	401	161				08/09/07	RJH	SM2510B
Temperature, °C			18	17				08/09/07	RJH	SM2550B
Static Water Level, feet			8.90	6.42	28.20	27.56		08/09/07	RJH	
Well Depth, feet			22.89	22.73				08/09/07	RJH	

J = Between MDL and SWSL, U = Below ALL Quanititation Limits.

Environment 1, Incorporated

Wastewater ...

.O. BOX 7085, 114 OAKMONT DRIVE
GREENVILLE, N.C. 27835-7085

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CLIENT: HALIFAX CO. LANDFILL (CLOSED MSW)
MR. FRANK RALPH
P.O. BOX 70
HALIFAX, NC 27839

CLIENT ID: 6015

ANALYST: CHS
DATE COLLECTED: 08/09/07
DATE EXTRACTED: 08/13/07
DATE ANALYZED: 08/16/07
DATE REPORTED: 08/29/07

REVIEWED BY:

PESTICIDES AND PCB'S
EPA METHOD 8081A

PARAMETERS, ug/l	MDL	SWSL	Well #2A	Well #3D	Well #7D	Well #2AD	Well #6D
1. Aldrin	0.029	0.05	--- U	--- U	--- U	--- U	--- U
2. Alpha-BHC	0.032	0.05	--- U	--- U	--- U	--- U	--- U
3. Beta-BHC	0.031	0.05	--- U	--- U	--- U	--- U	--- U
4. Delta-BHC	0.030	0.05	--- U	--- U	--- U	--- U	--- U
5. Gamma-BHC (Lindane)	0.032	0.05	--- U	--- U	--- U	--- U	--- U
6. Chlordane	0.320	0.50	--- U	--- U	--- U	--- U	--- U
7. 4,4-DDD	0.051	0.10	--- U	--- U	--- U	--- U	--- U
8. 4,4-DDE	0.049	0.10	--- U	--- U	--- U	--- U	--- U
9. 4,4-DDT	0.052	0.10	--- U	--- U	--- U	--- U	--- U
10. Dieldrin	0.042	0.07	--- U	--- U	--- U	--- U	--- U
11. Endosulfan I	0.056	0.10	--- U	--- U	--- U	--- U	--- U
12. Endosulfan II	0.046	0.10	--- U	--- U	--- U	--- U	--- U
13. Endosulfan Sulfate	0.072	0.10	--- U	--- U	--- U	--- U	--- U
14. Endrin	0.053	0.10	--- U	--- U	--- U	--- U	--- U
15. Endrin Aldehyde	0.068	0.10	--- U	--- U	--- U	--- U	--- U
16. Heptachlor	0.039	0.05	--- U	--- U	--- U	--- U	--- U
17. Hepthchlor Epoxide	0.042	0.07	--- U	--- U	--- U	--- U	--- U
18. Methoxychlor	0.530	1.00	--- U	--- U	--- U	--- U	--- U
19. Pcb's (Aroclors)	0.500	2.00	--- U	--- U	--- U	--- U	--- U
20. Toxaphene	0.690	1.00	--- U	--- U	--- U	--- U	--- U

J = Between MDL and SWSL, U = Below ALL Quanititation Limits.

Environment 1, Incorporated

Wastewater ID: 10

P.O. BOX 7085, 114 OAKMONT DRIVE
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CLIENT: HALIFAX CO. LANDFILL (CLOSED MSW)
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DATE ANALYZED: 08/16/07
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REVIEWED BY: ____________

PESTICIDES AND PCB'S
EPA METHOD 8081A

PARAMETERS, ug/l	MDL	SWSL	Well #15R	Well #3AD	Well #16A
1. Aldrin	0.029	0.05	--- U	--- U	--- U
2. Alpha-BHC	0.032	0.05	0.292	--- U	--- U
3. Beta-BHC	0.031	0.05	--- U	--- U	--- U
4. Delta-BHC	0.030	0.05	--- U	--- U	--- U
5. Gamma-BHC (Lindane)	0.032	0.05	--- U	--- U	--- U
6. Chlordane	0.320	0.50	--- U	--- U	--- U
7. 4,4-DDD	0.051	0.10	--- U	--- U	--- U
8. 4,4-DDE	0.049	0.10	--- U	--- U	--- U
9. 4,4-DDT	0.052	0.10	--- U	--- U	--- U
10. Dieldrin	0.042	0.07	--- U	--- U	--- U
11. Endosulfan I	0.056	0.10	--- U	--- U	--- U
12. Endosulfan II	0.046	0.10	--- U	--- U	--- U
13. Endosulfan Sulfate	0.072	0.10	--- U	--- U	--- U
14. Endrin	0.053	0.10	--- U	--- U	--- U
15. Endrin Aldehyde	0.068	0.10	--- U	--- U	--- U
16. Heptachlor	0.039	0.05	0.088	--- U	--- U
17. Hepthchlor Epoxide	0.042	0.07	--- U	--- U	--- U
18. Methoxychlor	0.530	1.00	--- U	--- U	--- U
19. Pcb's (Aroclors)	0.500	2.00	--- U	--- U	--- U
20. Toxaphene	0.690	1.00	--- U	--- U	--- U

NOTE: Well 3AD surrogate recovery
outside control limits

J = Between MDL and SWSL, U = Below ALL Quanititation Limits.

Environment 1, Incorporated

Wastewater ID: 10...

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CLIENT: HALIFAX CO. LANDFILL (CLOSED MSW)
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CLIENT ID: 6015

ANALYST: CHS
DATE COLLECTED: 08/09/07 Page: 1
DATE EXTRACTED: 08/14/07
DATE ANALYZED: 08/15/07
DATE REPORTED: 08/29/07

REVIEWED BY: [signature]

LANDFILL APPENDIX II
EPA METHOD 8151A

PARAMETERS, ug/l	MDL	SWSL	Well #2A	Well #3D	Well #7D	Well #2AD	Well #6D
1. 2,4-D	0.36	2.0	--- U	--- U	--- U	--- U	--- U
2. Dinoseb	0.54	1.0	--- U	--- U	--- U	--- U	--- U
3. 2,4,5-TP	0.42	2.0	--- U	--- U	--- U	--- U	--- U
4. 2,4,5-T	0.47	2.0	--- U	--- U	--- U	--- U	--- U

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Environment 1, Incorporated

Wastewater ID: 10

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CLIENT ID: 6015

ANALYST: CHS
DATE COLLECTED: 08/09/07
DATE EXTRACTED: 08/14/07
DATE ANALYZED: 08/15/07
DATE REPORTED: 08/29/07

REVIEWED BY:

LANDFILL APPENDIX II
EPA METHOD 8151A

PARAMETERS, ug/l	MDL	SWSL	Well #15R	Well #3AD	Well #16A
1. 2,4-D	0.36	2.0	--- U	--- U	--- U
2. Dinoseb	0.54	1.0	--- U	--- U	--- U
3. 2,4,5-TP	0.42	2.0	--- U	--- U	--- U
4. 2,4,5-T	0.47	2.0	--- U	--- U	--- U

J = Between MDL and SWSL, U = Below ALL Quanititation Limits.

Environment 1, Incorporated

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HALIFAX, NC 27839

CLIENT ID: 6015

ANALYST: MAO
DATE COLLECTED: 08/09/07
DATE REPORTED: 08/29/07

REVIEWED BY:

VOLATILE ORGANICS
EPA METHOD 8260B

PARAMETERS, ug/l	MDL	SWSL	08/13/07 Well #1	08/13/07 SW-1	08/16/07 SW-2	08/16/07 SW-3
1. Chloromethane	0.18	1.0	--- U	--- U	--- U	--- U
2. Vinyl Chloride	0.34	1.0	--- U	--- U	--- U	--- U
3. Bromomethane	0.26	10.0	--- U	--- U	--- U	--- U
4. Chloroethane	0.29	10.0	--- U	--- U	--- U	--- U
5. Trichlorofluoromethane	0.13	1.0	--- U	--- U	--- U	--- U
6. 1,1-Dichloroethene	0.14	5.0	--- U	--- U	--- U	--- U
7. Acetone	1.21	100.0	--- U	--- U	2.20 J	2.60 J
8. Iodomethane	0.12	10.0	--- U	--- U	--- U	--- U
9. Carbon Disulfide	0.14	100.0	--- U	--- U	--- U	--- U
10. Methylene Chloride	0.14	1.0	--- U	--- U	--- U	--- U
11. trans-1,2-Dichloroethene	0.13	5.0	--- U	--- U	--- U	--- U
12. 1,1-Dichloroethane	0.16	5.0	--- U	--- U	--- U	--- U
13. Vinyl Acetate	0.20	5.0	--- U	--- U	--- U	--- U
14. Cis-1,2-Dichloroethene	0.14	5.0	--- U	--- U	--- U	--- U
15. 2-Butanone	0.85	100.0	1.80 J	1.90 J	3.80 J	1.70 J
16. Bromochloromethane	0.11	3.0	--- U	--- U	--- U	--- U
17. Chloroform	0.13	5.0	--- U	--- U	--- U	--- U
18. 1,1,1-Trichloroethane	0.11	1.0	--- U	--- U	--- U	--- U
19. Carbon Tetrachloride	0.13	1.0	--- U	--- U	--- U	--- U
20. Benzene	0.16	1.0	--- U	--- U	--- U	--- U
21. 1,2-Dichloroethane	0.12	1.0	--- U	--- U	--- U	--- U
22. Trichloroethene	0.13	1.0	--- U	--- U	--- U	--- U
23. 1,2-Dichloropropane	0.17	1.0	--- U	--- U	--- U	--- U
24. Bromodichloromethane	0.13	1.0	--- U	--- U	--- U	--- U
25. Cis-1,3-Dichloropropene	0.17	1.0	--- U	--- U	--- U	--- U
26. 4-Methyl-2-Pentanone	0.68	100.0	--- U	--- U	--- U	--- U
27. Toluene	0.13	1.0	0.40 J	0.40 J	0.30 J	0.30 J
28. trans-1,3-Dichloropropene	0.14	1.0	--- U	--- U	--- U	--- U
29. 1,1,2-Trichloroethane	0.20	5.0	--- U	--- U	--- U	--- U
30. Tetrachloroethene	0.16	1.0	--- U	--- U	--- U	--- U
31. 2-Hexanone	1.00	50.0	--- U	--- U	--- U	--- U
32. Dibromochloromethane	0.14	1.0	--- U	--- U	--- U	--- U
33. 1,2-Dibromoethane	0.13	1.0	--- U	--- U	--- U	--- U
34. Chlorobenzene	0.13	3.0	--- U	--- U	--- U	--- U
35. 1,1,1,2-Tetrachloroethane	0.14	5.0	--- U	--- U	--- U	--- U
36. Ethylbenzene	0.16	1.0	--- U	--- U	--- U	--- U
37. Xylenes	0.48	4.0	--- U	--- U	--- U	--- U
38. Dibromomethane	0.17	10.0	--- U	--- U	--- U	--- U
39. Styrene	0.16	1.0	--- U	--- U	--- U	--- U
40. Bromoform	0.11	3.0	--- U	--- U	--- U	--- U
41. 1,1,2,2-Tetrachloroethane	0.16	1.0	--- U	--- U	--- U	--- U
42. 1,2,3-Trichloropropane	0.06	1.0	--- U	--- U	--- U	--- U
43. 1,4-Dichlorobenzene	0.21	1.0	--- U	--- U	--- U	--- U
44. 1,2-Dichlorobenzene	0.13	5.0	--- U	--- U	--- U	--- U
45. 1,2-Dibromo-3-Chloropropane	0.26	1.0	--- U	--- U	--- U	--- U
46. Acrylonitrile	1.49	200.0	--- U	--- U	--- U	--- U
47. trans-1,4-Dichloro-2-Butene	0.14	100.0	--- U	--- U	--- U	--- U

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Environment 1, Incorporated

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CLIENT: HALIFAX CO. LANDFILL (CLOSED MSW)
MR. FRANK RALPH
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HALIFAX, NC 27839

CLIENT ID: 6015

ANALYST: CHS
DATE COLLECTED: 08/09/07
DATE EXTRACTED: 08/13/07
DATE ANALYZED: 08/22/07
DATE REPORTED: 08/29/07

REVIEWED BY: ____________

SEMI-VOLATILE ORGANICS
EPA METHOD 8270C

PARAMETERS, ug/l	MDL	SWSL	Well #2A	Well #3D	Well #7D	Well #2AD	Well #6D
1. Acenaphthene	2.66	10.0	--- U	--- U	--- U	--- U	--- U
2. Acenaphthylene	2.60	10.0	--- U	--- U	--- U	--- U	--- U
3. Anthracene	2.97	10.0	--- U	--- U	--- U	--- U	--- U
4. Benzo[a]antrhacene	4.16	10.0	--- U	--- U	--- U	--- U	--- U
5. Benzo[b]fluoranthene	3.32	10.0	--- U	--- U	--- U	--- U	--- U
6. Benzo[k]fluoranthene	4.23	10.0	--- U	--- U	--- U	--- U	--- U
7. Benzo[g,h,i]perylene	2.61	10.0	--- U	--- U	--- U	--- U	--- U
8. Benzo[a]pyrene	3.27	10.0	--- U	--- U	--- U	--- U	--- U
9. 4-Bromophenyl Phenyl Ether	2.63	10.0	--- U	--- U	--- U	--- U	--- U
10. Butyl Benzyl Phthalate	5.78	10.0	--- U	--- U	--- U	--- U	--- U
11. Bis-(2-Chloroethoxy) Methane	3.14	10.0	--- U	--- U	--- U	--- U	--- U
12. Bis-(2-Chloroethyl) Ether	2.58	10.0	--- U	--- U	--- U	--- U	--- U
13. Bis-(2-Chloroisopropyl) Ether	2.58	10.0	--- U	--- U	--- U	--- U	--- U
14. 2-Chloronaphthalene	2.17	10.0	--- U	--- U	--- U	--- U	--- U
15. 4-Chlorophenyl Phenyl Ether	2.42	10.0	--- U	--- U	--- U	--- U	--- U
16. Chrysene	4.04	10.0	--- U	--- U	--- U	--- U	--- U
17. Dibenzo[a,h]anthracene	2.78	10.0	--- U	--- U	--- U	--- U	--- U
18. Di-N-Butyl Phthalate	3.09	10.0	--- U	--- U	--- U	--- U	--- U
19. Dimethyl Phthalate	3.78	10.0	--- U	--- U	--- U	--- U	--- U
20. Diethyl Phthalate	3.92	10.0	--- U	--- U	--- U	--- U	--- U
21. 2,4-Dinitrotoluene	3.95	10.0	--- U	--- U	--- U	--- U	--- U
22. 2,6-Dinitrotoluene	3.88	10.0	--- U	--- U	--- U	--- U	--- U
23. Di-N-Octyl Phthalate	2.81	10.0	--- U	--- U	--- U	--- U	--- U
24. Bis-(2-Ethylhexyl) Phthalate	9.97	15.0	--- U	--- U	--- U	--- U	15.10
25. Fluoranthene	3.92	10.0	--- U	--- U	--- U	--- U	--- U
26. Fluorene	2.95	10.0	--- U	--- U	--- U	--- U	--- U
27. Hexachlorobenzene	2.61	10.0	--- U	--- U	--- U	--- U	--- U
28. Hexachlorocyclopentadiene	4.16	10.0	--- U	--- U	--- U	--- U	--- U
29. Indeno[1,2,3-Cd]pyrene	2.91	10.0	--- U	--- U	--- U	--- U	--- U
30. Isophorone	3.74	10.0	--- U	--- U	--- U	--- U	--- U
31. Nitrobenzene	2.85	10.0	--- U	--- U	--- U	--- U	--- U
32. N-Nitrosodimethylamine	4.25	10.0	--- U	--- U	--- U	--- U	--- U
33. N-Nitrosodiphenylamine	3.95	10.0	--- U	--- U	--- U	--- U	--- U
34. N-Nitrosodi-N-Propylamine	4.06	10.0	--- U	--- U	--- U	--- U	--- U
35. Phenanthrene	3.24	10.0	--- U	--- U	--- U	--- U	--- U
36. Pyrene	3.63	10.0	--- U	--- U	--- U	--- U	--- U
37. 4-Chloro-3-Methylphenol	3.79	20.0	--- U	--- U	--- U	--- U	--- U
38. 2-Chlorophenol	2.75	10.0	--- U	--- U	--- U	--- U	--- U
39. O-Cresol	3.68	10.0	--- U	--- U	--- U	--- U	--- U
40. P-Cresol	4.12	10.0	--- U	--- U	--- U	--- U	--- U
41. 2,4-Dichlorophenol	5.19	10.0	--- U	--- U	--- U	--- U	--- U
42. 2,6-Dichlorophenol	4.89	10.0	--- U	--- U	--- U	--- U	--- U
43. 2,4-Dimethylphenol	3.21	10.0	--- U	--- U	--- U	--- U	--- U
44. 4,6-Dinitro-2-Methylphenol	4.77	50.0	--- U	--- U	--- U	--- U	--- U
45. 2,4-Dinitrophenol	4.37	50.0	--- U	--- U	--- U	--- U	--- U
46. Ethyl Methanesulfonate	5.26	10.0	--- U	--- U	--- U	--- U	--- U
47. Methyl Methanesulfonate	4.92	10.0	--- U	--- U	--- U	--- U	--- U
48. 2-Nitrophenol	3.64	10.0	--- U	--- U	--- U	--- U	--- U

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Environment 1, Incorporated

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DATE REPORTED: 08/29/07

REVIEWED BY:

SEMI-VOLATILE ORGANICS
EPA METHOD 8270C

PARAMETERS, ug/l	MDL	SWSL	Well #2A	Well #3D	Well #7D	Well #2AD	Well #6D
49. 4-Nitrophenol	3.17	50.0	--- U	--- U	--- U	--- U	--- U
50. Pentachlorophenol	5.33	25.0	--- U	--- U	--- U	--- U	--- U
51. Phenol	1.86	10.0	--- U	--- U	--- U	--- U	--- U
52. 2,3,4,6-Tetrachlorophenol	3.12	10.0	--- U	--- U	--- U	--- U	--- U
53. 2,4,5-Trichlorophenol	4.17	10.0	--- U	--- U	--- U	--- U	--- U
54. 2,4,6-Trichlorophenol	3.84	10.0	--- U	--- U	--- U	--- U	--- U
55. Acetophenone	2.89	10.0	--- U	--- U	--- U	--- U	--- U
56. 2-Acetylaminofluorene	3.98	20.0	--- U	--- U	--- U	--- U	--- U
57. 4-Aminobiphenyl	4.12	15.0	--- U	--- U	--- U	--- U	--- U
58. Benzyl Alcohol	4.47	20.0	--- U	--- U	--- U	--- U	--- U
59. 4-Chloroaniline	3.36	20.0	--- U	--- U	--- U	--- U	--- U
60. Chlorobenzilate	5.12	10.0	--- U	--- U	--- U	--- U	--- U
61. Diallate	2.98	10.0	--- U	--- U	--- U	--- U	--- U
62. Dibenzofuran	4.28	10.0	--- U	--- U	--- U	--- U	--- U
63. 3,3-Dichlorobenzidine	4.22	20.0	--- U	--- U	--- U	--- U	--- U
64. Dimethoate	3.98	20.0	--- U	--- U	--- U	--- U	--- U
65. P-Dimethylaminoazobenzene	2.89	10.0	--- U	--- U	--- U	--- U	--- U
66. 7,12-Dimethylbenz[a]anthracene	5.26	10.0	--- U	--- U	--- U	--- U	--- U
67. 3,3-Dimethylbenzadine	3.21	10.0	--- U	--- U	--- U	--- U	--- U
68. 1,3-Dinitrobenzene	2.89	20.0	--- U	--- U	--- U	--- U	--- U
69. Diphenylamine	5.10	10.0	--- U	--- U	--- U	--- U	--- U
70. Disulfoton	4.28	10.0	--- U	--- U	--- U	--- U	--- U
71. Famphur	3.98	20.0	--- U	--- U	--- U	--- U	--- U
72. Hexachloropropene	4.31	10.0	--- U	--- U	--- U	--- U	--- U
73. Isosafrole	2.88	10.0	--- U	--- U	--- U	--- U	--- U
74. Kepone	2.78	20.0	--- U	--- U	--- U	--- U	--- U
75. Methapyrilene	3.54	100.0	--- U	--- U	--- U	--- U	--- U
76. 3-Methylchloroanthrene	4.21	10.0	--- U	--- U	--- U	--- U	--- U
77. 2-Methylnaphthalene	3.79	10.0	--- U	--- U	--- U	--- U	--- U
78. Methyl Parathion	4.32	10.0	--- U	--- U	--- U	--- U	--- U
79. m-Cresol	3.81	10.0	--- U	--- U	--- U	--- U	--- U
80. 1,4-Naphthoquinone	4.00	10.0	--- U	--- U	--- U	--- U	--- U
81. 1-Naphthylamine	5.61	10.0	--- U	--- U	--- U	--- U	--- U
82. 2-Naphthylamine	4.62	10.0	--- U	--- U	--- U	--- U	--- U
83. 2-Nitroaniline	3.61	50.0	--- U	--- U	--- U	--- U	--- U
84. 3-Nitroaniline	4.81	50.0	--- U	--- U	--- U	--- U	--- U
85. 4-Nitroaniline	4.22	20.0	--- U	--- U	--- U	--- U	--- U
86. 5-Nitro-O-Toluidine	4.01	10.0	--- U	--- U	--- U	--- U	--- U
87. N-Nitrosodi-n-butylamine	3.63	10.0	--- U	--- U	--- U	--- U	--- U
88. N-Nitrosodiethylamine	3.83	20.0	--- U	--- U	--- U	--- U	--- U
89. N-Nitrosomethylethylamine	3.83	10.0	--- U	--- U	--- U	--- U	--- U
90. N-Nitrosopiperidine	5.19	20.0	--- U	--- U	--- U	--- U	--- U
91. N-Nitrosopyrrolidine	2.89	10.0	--- U	--- U	--- U	--- U	--- U
92. Parathion	3.12	10.0	--- U	--- U	--- U	--- U	--- U
93. Pentachlorobenzene	3.92	10.0	--- U	--- U	--- U	--- U	--- U
94. Pentachloronitrobenzene	3.71	20.0	--- U	--- U	--- U	--- U	--- U
95. Phenacetin	4.41	20.0	--- U	--- U	--- U	--- U	--- U
96. 1,4 Benzenediamine	2.99	10.0	--- U	--- U	--- U	--- U	--- U

J = Between MDL and SWSL, U = Below ALL Quanititation Limits.

.O. BOX 7085, 114 OAKMONT DRIVE
GREENVILLE, N.C. 27835-7085
PHONE (252) 756-6208
FAX (252) 756-0633

CLIENT: HALIFAX CO. LANDFILL (CLOSED MSW)
MR. FRANK RALPH
P.O. BOX 70
HALIFAX, NC 27839

REVIEWED BY:

CLIENT ID: 6015

ANALYST: CHS
DATE COLLECTED: 08/09/07 Page: 3
DATE EXTRACTED: 08/13/07
DATE ANALYZED: 08/22/07
DATE REPORTED: 08/29/07

SEMI-VOLATILE ORGANICS
EPA METHOD 8270C

PARAMETERS, ug/l	MDL	SWSL	Well #2A	Well #3D	Well #7D	Well #2AD	Well #6D
97. Phorate	3.86	10.0	--- U	--- U	--- U	--- U	--- U
98. Pronamide	3.69	10.0	--- U	--- U	--- U	--- U	--- U
99. Safrole	4.12	10.0	--- U	--- U	--- U	--- U	--- U
100. 1,2,4,5-Tetrachlorobenzene	5.01	10.0	--- U	--- U	--- U	--- U	--- U
101. Thionazin	4.62	20.0	--- U	--- U	--- U	--- U	--- U
102. O-Toluidine	4.11	10.0	--- U	--- U	--- U	--- U	--- U
103. 1,3,5-Trinitrobenzene	3.98	10.0	--- U	--- U	--- U	--- U	--- U
104. O,O,O-Triethyl Phosphorothioate	3.61	10.0	--- U	--- U	--- U	--- U	--- U
105. Hexachloroethane	1.49	10.0	--- U	--- U	--- U	--- U	--- U
106. Isodrin	3.11	20.0	--- U	--- U	--- U	--- U	--- U

J = Between MDL and SWSL, U = Below ALL Quanititation Limits.

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SEMI-VOLATILE ORGANICS
EPA METHOD 8270C

PARAMETERS, ug/l	MDL	SWSL	Well #15R	Well #3AD	Well #16A
1. Acenaphthene	2.66	10.0	--- U	--- U	--- U
2. Acenaphthylene	2.60	10.0	--- U	--- U	--- U
3. Anthracene	2.97	10.0	--- U	--- U	--- U
4. Benzo[a]antrhacene	4.16	10.0	--- U	--- U	--- U
5. Benzo[b]fluoranthene	3.32	10.0	--- U	--- U	--- U
6. Benzo[k]fluoranthene	4.23	10.0	--- U	--- U	--- U
7. Benzo[g,h,i]perylene	2.61	10.0	--- U	--- U	--- U
8. Benzo[a]pyrene	3.27	10.0	--- U	--- U	--- U
9. 4-Bromophenyl Phenyl Ether	2.63	10.0	--- U	--- U	--- U
10. Butyl Benzyl Phthalate	5.78	10.0	--- U	--- U	--- U
11. Bis-(2-Chloroethoxy) Methane	3.14	10.0	--- U	--- U	--- U
12. Bis-(2-Chloroethyl) Ether	2.58	10.0	--- U	--- U	--- U
13. Bis-(2-Chloroisopropyl) Ether	2.58	10.0	--- U	--- U	--- U
14. 2-Chloronaphthalene	2.17	10.0	--- U	--- U	--- U
15. 4-Chlorophenyl Phenyl Ether	2.42	10.0	--- U	--- U	--- U
16. Chrysene	4.04	10.0	--- U	--- U	--- U
17. Dibenzo[a,h]anthracene	2.78	10.0	--- U	--- U	--- U
18. Di-N-Butyl Phthalate	3.09	10.0	--- U	--- U	--- U
19. Dimethyl Phthalate	3.78	10.0	--- U	--- U	--- U
20. Diethyl Phthalate	3.92	10.0	--- U	--- U	--- U
21. 2,4-Dinitrotoluene	3.95	10.0	--- U	--- U	--- U
22. 2,6-Dinitrotoluene	3.88	10.0	--- U	--- U	--- U
23. Di-N-Octyl Phthalate	2.81	10.0	--- U	--- U	--- U
24. Bis-(2-Ethylhexyl) Phthalate	9.97	15.0	31.00	--- U	11.10 J
25. Fluoranthene	3.92	10.0	--- U	--- U	--- U
26. Fluorene	2.95	10.0	--- U	--- U	--- U
27. Hexachlorobenzene	2.61	10.0	--- U	--- U	--- U
28. Hexachlorocyclopentadiene	4.16	10.0	--- U	--- U	--- U
29. Indeno[1,2,3-Cd]pyrene	2.91	10.0	--- U	--- U	--- U
30. Isophorone	3.74	10.0	--- U	--- U	--- U
31. Nitrobenzene	2.85	10.0	--- U	--- U	--- U
32. N-Nitrosodimethylamine	4.25	10.0	--- U	--- U	--- U
33. N-Nitrosodiphenylamine	3.95	10.0	--- U	--- U	--- U
34. N-Nitrosodi-N-Propylamine	4.06	10.0	--- U	--- U	--- U
35. Phenanthrene	3.24	10.0	--- U	--- U	--- U
36. Pyrene	3.63	10.0	--- U	--- U	--- U
37. 4-Chloro-3-Methylphenol	3.79	20.0	--- U	--- U	--- U
38. 2-Chlorophenol	2.75	10.0	--- U	--- U	--- U
39. O-Cresol	3.68	10.0	--- U	--- U	--- U
40. P-Cresol	4.12	10.0	--- U	--- U	--- U
41. 2,4-Dichlorophenol	5.19	10.0	--- U	--- U	--- U
42. 2,6-Dichlorophenol	4.89	10.0	--- U	--- U	--- U
43. 2,4-Dimethylphenol	3.21	10.0	--- U	--- U	--- U
44. 4,6-Dinitro-2-Methylphenol	4.77	50.0	--- U	--- U	--- U
45. 2,4-Dinitrophenol	4.37	50.0	--- U	--- U	--- U
46. Ethyl Methanesulfonate	5.26	10.0	--- U	--- U	--- U
47. Methyl Methanesulfonate	4.92	10.0	--- U	--- U	--- U
48. 2-Nitrophenol	3.64	10.0	--- U	--- U	--- U

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Environment 1, Incorporated

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CLIENT ID: 6015

ANALYST: CHS
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REVIEWED BY:

SEMI-VOLATILE ORGANICS
EPA METHOD 8270C

PARAMETERS, ug/l	MDL	SWSL	Well #15R	Well #3AD	Well #16A
49. 4-Nitrophenol	3.17	50.0	--- U	--- U	--- U
50. Pentachlorophenol	5.33	25.0	--- U	--- U	--- U
51. Phenol	1.86	10.0	--- U	--- U	--- U
52. 2,3,4,6-Tetrachlorophenol	3.12	10.0	--- U	--- U	--- U
53. 2,4,5-Trichlorophenol	4.17	10.0	--- U	--- U	--- U
54. 2,4,6-Trichlorophenol	3.84	10.0	--- U	--- U	--- U
55. Acetophenone	2.89	10.0	--- U	--- U	--- U
56. 2-Acetylaminofluorene	3.98	20.0	--- U	--- U	--- U
57. 4-Aminobiphenyl	4.12	15.0	--- U	--- U	--- U
58. Benzyl Alcohol	4.47	20.0	--- U	--- U	--- U
59. 4-Chloroaniline	3.36	20.0	--- U	--- U	--- U
60. Chlorobenzilate	5.12	10.0	--- U	--- U	--- U
61. Diallate	2.98	10.0	--- U	--- U	--- U
62. Dibenzofuran	4.28	10.0	--- U	--- U	--- U
63. 3,3-Dichlorobenzidine	4.22	20.0	--- U	--- U	--- U
64. Dimethoate	3.98	20.0	--- U	--- U	--- U
65. P-Dimethylaminoazobenzene	2.89	10.0	--- U	--- U	--- U
66. 7,12-Dimethylbenz[a]anthracene	5.26	10.0	--- U	--- U	--- U
67. 3,3-Dimethylbenzadine	3.21	10.0	--- U	--- U	--- U
68. 1,3-Dinitrobenzene	2.89	20.0	--- U	--- U	--- U
69. Diphenylamine	5.10	10.0	--- U	--- U	--- U
70. Disulfoton	4.28	10.0	--- U	--- U	--- U
71. Famphur	3.98	20.0	--- U	--- U	--- U
72. Hexachloropropene	4.31	10.0	--- U	--- U	--- U
73. Isosafrole	2.88	10.0	--- U	--- U	--- U
74. Kepone	2.78	20.0	--- U	--- U	--- U
75. Methapyrilene	3.54	100.0	--- U	--- U	--- U
76. 3-Methylchloroanthrene	4.21	10.0	--- U	--- U	--- U
77. 2-Methylnaphthalene	3.79	10.0	--- U	--- U	--- U
78. Methyl Parathion	4.32	10.0	--- U	--- U	--- U
79. m-Cresol	3.81	10.0	--- U	--- U	--- U
80. 1,4-Naphthoquinone	4.00	10.0	--- U	--- U	--- U
81. 1-Naphthylamine	5.61	10.0	--- U	--- U	--- U
82. 2-Naphthylamine	4.62	10.0	--- U	--- U	--- U
83. 2-Nitroaniline	3.61	50.0	--- U	--- U	--- U
84. 3-Nitroaniline	4.81	50.0	--- U	--- U	--- U
85. 4-Nitroaniline	4.22	20.0	--- U	--- U	--- U
86. 5-Nitro-O-Toluidine	4.01	10.0	--- U	--- U	--- U
87. N-Nitrosodi-n-butylamine	3.63	10.0	--- U	--- U	--- U
88. N-Nitrosodiethylamine	3.83	20.0	--- U	--- U	--- U
89. N-Nitrosomethylethylamine	3.83	10.0	--- U	--- U	--- U
90. N-Nitrosopiperidine	5.19	20.0	--- U	--- U	--- U
91. N-Nitrosopyrrolidine	2.89	10.0	--- U	--- U	--- U
92. Parathion	3.12	10.0	--- U	--- U	--- U
93. Pentachlorobenzene	3.92	10.0	--- U	--- U	--- U
94. Pentachloronitrobenzene	3.71	20.0	--- U	--- U	--- U
95. Phenacetin	4.41	20.0	--- U	--- U	--- U
96. 1,4 Benzenediamine	2.99	10.0	--- U	--- U	--- U

J = Between MDL and SWSL, U = Below ALL Quanititation Limits.

Environment 1, Incorporated

Wastewater ID: [illegible]

.O. BOX 7085, 114 OAKMONT DRIVE
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CLIENT: HALIFAX CO. LANDFILL (CLOSED MSW)
MR. FRANK RALPH
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HALIFAX, NC 27839

CLIENT ID: 6015

ANALYST: CHS
DATE COLLECTED: 08/09/07
DATE EXTRACTED: 08/13/07
DATE ANALYZED: 08/22/07
DATE REPORTED: 08/29/07

REVIEWED BY:

SEMI-VOLATILE ORGANICS
EPA METHOD 8270C

PARAMETERS, ug/l	MDL	SWSL	Well #15R	Well #3AD	Well #16A
97. Phorate	3.86	10.0	--- U	--- U	--- U
98. Pronamide	3.69	10.0	--- U	--- U	--- U
99. Safrole	4.12	10.0	--- U	--- U	--- U
100. 1,2,4,5-Tetrachlorobenzene	5.01	10.0	--- U	--- U	--- U
101. Thionazin	4.62	20.0	--- U	--- U	--- U
102. O-Toluidine	4.11	10.0	--- U	--- U	--- U
103. 1,3,5-Trinitrobenzene	3.98	10.0	--- U	--- U	--- U
104. O,O,O-Triethyl Phosphorothioate	3.61	10.0	--- U	--- U	--- U
105. Hexachloroethane	1.49	10.0	--- U	--- U	--- U
106. Isodrin	3.11	20.0	--- U	--- U	--- U

J = Between MDL and SWSL, U = Below ALL Quanititation Limits.

Environment 1, Incorporated

Wastewater ID: 10
.O. BOX 7085, 114 OAKMONT DRIVE
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CLIENT: HALIFAX CO. LANDFILL (CLOSED MSW)
MR. FRANK RALPH
P.O. BOX 70
HALIFAX, NC 27839

CLIENT ID: 6015
ANALYST: MAO
DATE COLLECTED: 08/09/07
DATE ANALYZED: 08/16/07
DATE REPORTED: 08/29/07

REVIEWED BY:

LANDFILL APPENDIX II
EPA METHOD 8260B

PARAMETERS, ug/l	MDL	SWSL	Well #2A	Well #3D	Well #7D	Well #2AD	Well #6D
1. Chloromethane	0.18	1.0	--- U	--- U	--- U	--- U	--- U
2. Vinyl Chloride	0.34	1.0	1.80	--- U	--- U	5.80	1.40
3. Bromomethane	0.26	10.0	--- U	--- U	--- U	--- U	--- U
4. Chloroethane	0.29	10.0	--- U	--- U	--- U	2.50 J	0.60 J
5. Trichlorofluoromethane	0.13	1.0	--- U	--- U	--- U	--- U	--- U
6. 1,1-Dichloroethene	0.14	5.0	0.20 J	0.30 J	--- U	0.40 J	--- U
7. Acetone	1.21	100.0	1.40 J	--- U	1.30 J	--- U	1.30 J
8. Iodomethane	0.12	10.0	--- U	--- U	--- U	--- U	--- U
9. Carbon Disulfide	0.14	100.0	--- U	--- U	--- U	--- U	--- U
10. Methylene Chloride	0.14	1.0	--- U	0.70 J	--- U	0.20 J	0.20 J
11. trans-1,2-Dichloroethene	0.13	5.0	--- U	--- U	--- U	0.30 J	--- U
12. 1,1-Dichloroethane	0.16	5.0	4.40 J	4.30 J	--- U	36.80	1.00 J
13. Vinyl Acetate	0.20	5.0	--- U	--- U	--- U	--- U	--- U
14. Cis-1,2-Dichloroethene	0.14	5.0	2.70 J	1.20 J	--- U	22.90	--- U
15. 2-Butanone	0.85	100.0	2.10 J	1.00 J	1.90 J	1.70 J	1.80 J
16. Bromochloromethane	0.11	3.0	--- U	--- U	--- U	--- U	--- U
17. Chloroform	0.13	5.0	--- U	--- U	--- U	--- U	--- U
18. 1,1,1-Trichloroethane	0.11	1.0	--- U	--- U	--- U	--- U	--- U
19. Carbon Tetrachloride	0.13	1.0	--- U	--- U	--- U	--- U	--- U
20. Benzene	0.16	1.0	--- U	0.20 J	--- U	0.90 J	2.10
21. 1,2-Dichloroethane	0.12	1.0	--- U	--- U	--- U	0.40 J	0.20 J
22. Trichloroethene	0.13	1.0	0.60 J	1.90	--- U	5.40	--- U
23. 1,2-Dichloropropane	0.17	1.0	--- U	--- U	--- U	0.20 J	--- U
24. Bromodichloromethane	0.13	1.0	--- U	--- U	--- U	--- U	--- U
25. Cis-1,3-Dichloropropene	0.17	1.0	--- U	--- U	--- U	--- U	--- U
26. 4-Methyl-2-Pentanone	0.68	100.0	--- U	--- U	--- U	--- U	--- U
27. Toluene	0.13	1.0	0.40 J	0.60 J	0.40 J	0.50 J	0.50 J
28. trans-1,3-Dichloropropene	0.14	1.0	--- U	--- U	--- U	--- U	--- U
29. 1,1,2-Trichloroethane	0.20	5.0	--- U	--- U	--- U	--- U	--- U
30. Tetrachloroethene	0.16	1.0	--- U	1.90	--- U	--- U	--- U
31. 2-Hexanone	1.00	50.0	--- U	--- U	--- U	--- U	--- U
32. Dibromochloromethane	0.14	1.0	--- U	--- U	--- U	--- U	--- U
33. 1,2-Dibromoethane	0.13	1.0	--- U	--- U	--- U	--- U	--- U
34. Chlorobenzene	0.13	3.0	0.20 J	--- U	--- U	1.10 J	9.70
35. 1,1,1,2-Tetrachloroethane	0.14	5.0	--- U	--- U	--- U	--- U	--- U
36. Ethylbenzene	0.16	1.0	--- U	--- U	--- U	--- U	--- U
37. Xylenes	0.48	4.0	--- U	--- U	--- U	--- U	--- U
38. Dibromomethane	0.17	10.0	--- U	--- U	--- U	--- U	--- U
39. Styrene	0.16	1.0	--- U	--- U	--- U	--- U	--- U
40. Bromoform	0.11	3.0	--- U	--- U	--- U	--- U	--- U
41. 1,1,2,2-Tetrachloroethane	0.16	1.0	--- U	--- U	--- U	--- U	--- U
42. 1,2,3-Trichloropropane	0.06	1.0	--- U	--- U	--- U	--- U	--- U
43. 1,4-Dichlorobenzene	0.21	1.0	--- U	--- U	--- U	0.70 J	1.90
44. 1,2-Dichlorobenzene	0.13	5.0	--- U	--- U	--- U	--- U	0.30 J
45. 1,2-Dibromo-3-Chloropropane	0.26	1.0	--- U	--- U	--- U	--- U	--- U
46. Acrylonitrile	1.49	200.0	--- U	--- U	--- U	--- U	--- U
47. trans-1,4-Dichloro-2-Butene	0.14	100.0	--- U	--- U	--- U	--- U	--- U
48. Acrolein	5.46	50.0	--- U	--- U	--- U	--- U	--- U

J = Between MDL and SWSL, U = Below ALL Quanititation Limits.

Environment 1, Incorporated

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ANALYST: MAO
DATE COLLECTED: 08/09/07
DATE ANALYZED: 08/16/07
DATE REPORTED: 08/29/07

REVIEWED BY:

LANDFILL APPENDIX II
EPA METHOD 8260B

PARAMETERS, ug/l	MDL	SWSL	Well #2A	Well #3D	Well #7D	Well #2AD	Well #6D
49. Allyl Chloride	0.17	10.0	--- U	--- U	--- U	--- U	--- U
50. Chloroprene	0.16	20.0	--- U	--- U	--- U	--- U	--- U
51. 1,3-Dichlorobenzene	0.13	5.0	--- U	--- U	--- U	--- U	--- U
52. Dichlorodifluoromethane	0.16	5.0	0.30 J	1.80 J	--- U	0.30 J	0.20 J
53. 1,3-Dichloropropane	0.12	1.0	--- U	--- U	--- U	--- U	--- U
54. 2,2-Dichloropropane	0.18	15.0	--- U	--- U	--- U	--- U	--- U
55. 1,1-Dichloropropene	0.13	5.0	--- U	--- U	--- U	--- U	--- U
56. Ethyl Methacrylate	0.14	10.0	--- U	--- U	--- U	--- U	--- U
57. Hexachlorobutadiene	0.22	10.0	--- U	--- U	--- U	--- U	--- U
58. Isobutyl Alcohol	5.23	100.0	--- U	--- U	--- U	--- U	--- U
59. Methacrylonitrile	1.64	100.0	--- U	--- U	--- U	--- U	--- U
60. Methyl Methacrylate	0.10	30.0	--- U	--- U	--- U	--- U	--- U
61. Naphthalene	0.13	10.0	--- U	--- U	--- U	--- U	--- U
62. Propionitrile	1.60	150.0	--- U	--- U	--- U	--- U	--- U
63. 1,2,4-Trichlorobenzene	0.11	10.0	--- U	--- U	--- U	--- U	--- U
64. Acetonitrile	5.96	50.0	--- U	--- U	--- U	--- U	--- U

J = Between MDL and SWSL, U = Below ALL Quanititation Limits.

Environment 1, Incorporated

Wastewater ID: 10

.O. BOX 7085, 114 OAKMONT DRIVE
GREENVILLE, N.C. 27835-7085

PHONE (252) 756-6208
FAX (252) 756-0633

CLIENT: HALIFAX CO. LANDFILL (CLOSED MSW)
MR. FRANK RALPH
P.O. BOX 70
HALIFAX, NC 27839

CLIENT ID: 6015

ANALYST: MAO
DATE COLLECTED: 08/09/07
DATE ANALYZED: 08/16/07
DATE REPORTED: 08/29/07

REVIEWED BY:

LANDFILL APPENDIX II
EPA METHOD 8260B

PARAMETERS, ug/l	MDL	SWSL	Well #15R	Well #3AD	Well #16A	Equipment Blank	Trip Blank
1. Chloromethane	0.18	1.0	--- U	--- U	--- U	--- U	--- U
2. Vinyl Chloride	0.34	1.0	--- U	4.70	0.80 J	--- U	--- U
3. Bromomethane	0.26	10.0	--- U	--- U	--- U	--- U	--- U
4. Chloroethane	0.29	10.0	0.30 J	0.70 J	0.90 J	--- U	--- U
5. Trichlorofluoromethane	0.13	1.0	0.30 J	--- U	1.30	--- U	0.50 J
6. 1,1-Dichloroethene	0.14	5.0	--- U	0.30 J	0.40 J	--- U	--- U
7. Acetone	1.21	100.0	1.50 J	1.40 J	2.10 J	--- U	1.70 J
8. Iodomethane	0.12	10.0	--- U	--- U	--- U	--- U	--- U
9. Carbon Disulfide	0.14	100.0	--- U	--- U	--- U	--- U	--- U
10. Methylene Chloride	0.14	1.0	6.50	--- U	22.50	--- U	--- U
11. trans-1,2-Dichloroethene	0.13	5.0	--- U	--- U	0.40 J	--- U	--- U
.2. 1,1-Dichloroethane	0.16	5.0	10.30	5.60	14.30	--- U	--- U
13. Vinyl Acetate	0.20	5.0	--- U	--- U	--- U	--- U	--- U
14. Cis-1,2-Dichloroethene	0.14	5.0	7.80	8.10	40.50	--- U	--- U
15. 2-Butanone	0.85	100.0	1.80 J	2.20 J	2.10 J	--- U	--- U
16. Bromochloromethane	0.11	3.0	--- U	--- U	--- U	--- U	--- U
17. Chloroform	0.13	5.0	--- U	--- U	--- U	--- U	--- U
18. 1,1,1-Trichloroethane	0.11	1.0	0.20 J	--- U	0.30 J	--- U	--- U
19. Carbon Tetrachloride	0.13	1.0	--- U	--- U	--- U	--- U	--- U
20. Benzene	0.16	1.0	0.30 J	0.80 J	2.90	--- U	--- U
21. 1,2-Dichloroethane	0.12	1.0	0.60 J	--- U	0.30 J	--- U	--- U
22. Trichloroethene	0.13	1.0	4.40	2.00	20.80	--- U	--- U
23. 1,2-Dichloropropane	0.17	1.0	--- U	0.30 J	0.60 J	--- U	--- U
24. Bromodichloromethane	0.13	1.0	--- U	--- U	--- U	--- U	--- U
25. Cis-1,3-Dichloropropene	0.17	1.0	--- U	--- U	--- U	--- U	--- U
26. 4-Methyl-2-Pentanone	0.68	100.0	--- U	--- U	--- U	--- U	--- U
27. Toluene	0.13	1.0	0.40 J	0.50 J	0.60 J	2.20	6.20
28. trans-1,3-Dichloropropene	0.14	1.0	--- U	--- U	--- U	--- U	--- U
29. 1,1,2-Trichloroethane	0.20	5.0	--- U	--- U	--- U	--- U	--- U
30. Tetrachloroethene	0.16	1.0	3.30	0.40 J	26.60	--- U	--- U
31. 2-Hexanone	1.00	50.0	--- U	--- U	--- U	--- U	--- U
32. Dibromochloromethane	0.14	1.0	--- U	--- U	--- U	--- U	--- U
33. 1,2-Dibromoethane	0.13	1.0	--- U	--- U	--- U	--- U	--- U
34. Chlorobenzene	0.13	3.0	0.20 J	0.60 J	1.10 J	--- U	--- U
35. 1,1,1,2-Tetrachloroethane	0.14	5.0	--- U	--- U	--- U	--- U	--- U
36. Ethylbenzene	0.16	1.0	--- U	--- U	--- U	--- U	--- U
37. Xylenes	0.48	4.0	2.20 J	--- U	2.30 J	--- U	--- U
38. Dibromomethane	0.17	10.0	--- U	--- U	--- U	--- U	--- U
39. Styrene	0.16	1.0	--- U	--- U	--- U	--- U	--- U
40. Bromoform	0.11	3.0	--- U	--- U	--- U	--- U	--- U
41. 1,1,2,2-Tetrachloroethane	0.16	1.0	--- U	--- U	--- U	--- U	--- U
42. 1,2,3-Trichloropropane	0.06	1.0	--- U	--- U	--- U	--- U	--- U
43. 1,4-Dichlorobenzene	0.21	1.0	10.20	0.40 J	1.40	--- U	--- U
44. 1,2-Dichlorobenzene	0.13	5.0	--- U	--- U	0.90 J	--- U	--- U
45. 1,2-Dibromo-3-Chloropropane	0.26	1.0	--- U	--- U	--- U	--- U	--- U
6. Acrylonitrile	1.49	200.0	--- U	--- U	--- U	--- U	--- U
47. trans-1,4-Dichloro-2-Butene	0.14	100.0	--- U	--- U	--- U	--- U	--- U
48. Acrolein	5.46	50.0	--- U	--- U	--- U	--- U	--- U

J = Between MDL and SWSL, U = Below ALL Quanititation Limits.

Environment 1, Incorporated

Wastewater ID: 10

.O. BOX 7085, 114 OAKMONT DRIVE
GREENVILLE, N.C. 27835-7085

PHONE (252) 756-6208
FAX (252) 756-0633

CLIENT: HALIFAX CO. LANDFILL (CLOSED MSW)
MR. FRANK RALPH
P.O. BOX 70
HALIFAX, NC 27839

CLIENT ID: 6015

ANALYST: MAO
DATE COLLECTED: 08/09/07
DATE ANALYZED: 08/16/07
DATE REPORTED: 08/29/07

REVIEWED BY:

LANDFILL APPENDIX II
EPA METHOD 8260B

PARAMETERS, ug/l	MDL	SWSL	Well #15R	Well #3AD	Well #16A	Equipment Blank	Trip Blank
49. Allyl Chloride	0.17	10.0	--- U	--- U	--- U	--- U	--- U
50. Chloroprene	0.16	20.0	--- U	--- U	--- U	--- U	--- U
51. 1,3-Dichlorobenzene	0.13	5.0	--- U	--- U	--- U	--- U	--- U
52. Dichlorodifluoromethane	0.16	5.0	0.40 J	0.20 J	4.70 J	--- U	--- U
53. 1,3-Dichloropropane	0.12	1.0	--- U	--- U	--- U	--- U	--- U
54. 2,2-Dichloropropane	0.18	15.0	--- U	--- U	--- U	--- U	--- U
55. 1,1-Dichloropropene	0.13	5.0	--- U	--- U	--- U	--- U	--- U
56. Ethyl Methacrylate	0.14	10.0	--- U	--- U	--- U	--- U	--- U
57. Hexachlorobutadiene	0.22	10.0	--- U	--- U	--- U	--- U	--- U
58. Isobutyl Alcohol	5.23	100.0	--- U	--- U	--- U	--- U	--- U
59. Methacrylonitrile	1.64	100.0	--- U	--- U	--- U	--- U	--- U
60. Methyl Methacrylate	0.10	30.0	--- U	--- U	--- U	--- U	--- U
61. Naphthalene	0.13	10.0	--- U	--- U	--- U	--- U	--- U
62. Propionitrile	1.60	150.0	--- U	--- U	--- U	--- U	--- U
63. 1,2,4-Trichlorobenzene	0.11	10.0	--- U	--- U	--- U	--- U	--- U
64. Acetonitrile	5.96	50.0	--- U	--- U	--- U	--- U	--- U

J = Between MDL and SWSL, U = Below ALL Quanititation Limits.

Environment c.
P.O. Box 708, 114 Oakmont Dr.
Greenville, NC 27858

Phone (252) 756-6208 • Fax (252) 756-0633

CHAIN OF CUSTODY RECORD

CLIENT: 6015 **Week:** 33

HALIFAX CO. LANDFILL (CLOSED MSW)
MR. FRANK RALPH
P.O. BOX 70
HALIFAX NC 27839

(252) 583-1807

DISINFECTION
- [ ] CHLORINE
- [ ] UV
- [ ] NONE
- [ ] ______

						Field pH	Metals	Conductivity	Temperature	Field Parameter	EPA 8260B	8260 Dup. 1	EPA 8270C	8270C Dup. 1	EPA 8081A	8260B App. II	8260 App. II 1	8260 App. II 2	8260 App. II 3	8151A Landfill	PARAMETERS
																					CHLORINE NEUTRALIZED AT COLLECTION
							<2				<2	<2				<2	<2	<2	<2		pH CHECK (LAB)
						P	P	P	P		G	G	G	G	G	G	G	G	G	G	CONTAINER TYPE, P/G
						A	B	A	A		E	E	A	A	A	E	E	E	E	A	CHEMICAL PRESERVATION
SAMPLE LOCATION	COLLECTION DATE	COLLECTION TIME	TOTAL CHLORINE, mg/l AT COLLECTION	TEMPERATURE, °C AT COLLECTION	# OF CONTAINERS																
Well #1	08 09 07	0850		16	4	G	G	G	G	G	G	G									
Well #2A	08 09 07	1010		19	8	G	G	G	G	G			G	G	G	G	G			G	
Well #3D	08 09 07	1220		17	8	G	G	G	G	G			G	G	G	G	G	G		G	
Well #7D	08 09 07	1115		20	8	G	G	G	G	G			G	G	G	G	G			G	
SW-1	08 09 07	1030		25	4	G	G	G	G		G	G									
SW-2	08 09 07	1105		26	4	G	G	G	G		G	G									
SW-3	08 09 07	0950		22	4	G	G	G	G		G	G									
Well #2AD	08 09 07	1005		18	8	G	G	G	G	G			G	G	G	G	G			G	
Well #6D	08 09 07	1130		17	8	G	G	G	G	G			G	G	G	G	G			G	
Well #15R	08 09 07	1050		18	8	G	G	G	G	G			G	G	G	G	G			G	
Well #3AD	08 09 07	1015		18	10	G	G	G	G	G			G	G	G	G	G	G	G	G	

A - NONE D - NAOH
B - HNO_3 E - HCL
C - H_2SO_4 F - ZINC ACETATE
G - NA THIOSULFATE

CLASSIFICATION:
- [ ] WASTEWATER (NPDES)
- [ ] DRINKING WATER
- [ ] DWQ/GW
- [X] SOLID WASTE SECTION

CHAIN OF CUSTODY MAINTAINED DURING SHIPMENT/DELIVERY: Y (circled) N

SAMPLES COLLECTED BY: (Please Print) H Sage / Fot

SAMPLES RECEIVED IN LAB AT 6.0 °C

RELINQUISHED BY (SIG.) (SAMPLER)	DATE/TIME	RECEIVED BY (SIG.)	DATE/TIME
[signature]	080907	[signature]	8/9/07 2:20
RELINQUISHED BY (SIG.)	DATE/TIME	RECEIVED BY (SIG.)	DATE/TIME
RELINQUISHED BY (SIG.)	DATE/TIME	RECEIVED BY (SIG.)	DATE/TIME

COMMENTS:

Instructions for completing this form are on the reverse side.

Sampler must place a "C" for composite sample or a "G" for Grab sample in the blocks above for each parameter requested

FORM #5

No 147296

Environment . c.
P.O. Box 7085, 114 Oakmont Dr.
Greenville, NC 27858

Phone (252) 756-6208 • Fax (252) 756-0633

CHAIN OF CU..ODY RECORD

CLIENT: 6015 **Week: 33**

HALIFAX CO. LANDFILL (CLOSED MSW)
MR. FRANK RALPH
P.O. BOX 70
HALIFAX NC 27839

(252) 583-1807

DISINFECTION
- [ ] CHLORINE
- [ ] UV
- [ ] NONE
- [ ] ______

	Field pH	Metals	Conductivity	Temperature	Field Parameter	EPA 8260B	8260 Dup. 1	EPA 8270C	8270C Dup. 1	EPA 8081A	8260B App. II	8260 App. II 1	8260 App. II 2	8260 App. II 3	8151A Landfill	
CHLORINE NEUTRALIZED AT COLLECTION																
pH CHECK (LAB)		L2									L2	L2				
CONTAINER TYPE, P/G	P	P	P	P		G	G	G	G	G	G	G	G	G	G	
CHEMICAL PRESERVATION	A	B	A	A		E	E	A	A	A	E	E	E	E	A	

CHEMICAL PRESERVATION: A - NONE, B - HNO_3, C - H_2SO_4, D - NAOH, E - HCL, F - ZINC ACETATE, G - NA THIOSULFATE

SAMPLE LOCATION	COLLECTION DATE	COLLECTION TIME	TOTAL CHLORINE, mg/l AT COLLECTION	TEMPERATURE, °C AT COLLECTION	# OF CONTAINERS	Field pH	Metals	Conductivity	Temperature	Field Parameter	EPA 8260B	8260 Dup. 1	EPA 8270C	8270C Dup. 1	EPA 8081A	8260B App. II	8260 App. II 1	8260 App. II 2	8260 App. II 3	8151A Landfill	
Well #16A 08	0907	1035		17	8	G	G	G	G	G			G	G	G	G	G			G	
BP-3 08	0907				1					G											
BP-9 08	0907				1					G											
Equipment Blank 08	0907				2											G	G				
Trip Blank					2																

CLASSIFICATION:
- [ ] WASTEWATER (NPDES)
- [ ] DRINKING WATER
- [ ] DWQ/GW
- [X] SOLID WASTE SECTION

CHAIN OF CUSTODY MAINTAINED DURING SHIPMENT/DELIVERY: (Y) N

SAMPLES COLLECTED BY: (Please Print) Hope Fox

SAMPLES RECEIVED IN LAB AT 1.0 °C

RELINQUISHED BY (SIG.) (SAMPLER)	DATE/TIME	RECEIVED BY (SIG.)	DATE/TIME
Bob Hope 08	0907	[signature]	8/9/07 2:20
RELINQUISHED BY (SIG.)	DATE/TIME	RECEIVED BY (SIG.)	DATE/TIME
RELINQUISHED BY (SIG.)	DATE/TIME	RECEIVED BY (SIG.)	DATE/TIME

COMMENTS:

FORM #5

Instructions for completing this form are on the reverse side.

Sampler must place a "C" for composite sample or a "G" for Grab sample in the blocks above for each parameter requested.

№ 147295

Environment 1, Incorporated

REC'D NOV 08 2007

O. BOX 7085, 114 OAKMONT DRIVE
GREENVILLE, N.C. 27835-7085

PHONE (252) 756-6208
FAX (252) 756-0633

ID#: 6015 B

HALIFAX CO. LANDFILL (CLOSED MSW)
MR. FRANK RALPH
P.O. BOX 70
HALIFAX ,NC 27839

DATE COLLECTED: 10/22/07
DATE REPORTED : 11/05/07

REVIEWED BY:

PARAMETERS	MDL	SWSL	Well #17	Well #18 Shallow	Well #18 Deep	Analysis Date	Analyst	Method Code
Antimony, ug/l	0.05	6.0	--- U	--- U	--- U	10/30/07	CMF	EPA200.8
Arsenic, ug/l	0.47	10.0	0.6 J	1.4 J	--- U	10/30/07	CMF	EPA200.8
Barium, ug/l	0.04	100.0	110	139	77.5 J	10/30/07	CMF	EPA200.8
Beryllium, ug/l	0.08	1.0	2	0.9 J	--- U	10/30/07	CMF	EPA200.8
Cadmium, ug/l	0.06	1.0	0.2 J	0.2 J	--- U	10/30/07	CMF	EPA200.8
Cobalt, ug/l	0.41	10.0	2.5 J	5.3 J	--- U	10/30/07	CMF	EPA200.8
Copper, ug/l	0.20	10.0	3.6 J	3.6 J	--- U	10/30/07	CMF	EPA200.8
Total Chromium, ug/l	0.24	10.0	1.7 J	2.1 J	--- U	10/30/07	CMF	EPA200.8
Lead, ug/l	0.07	10.0	7.5 J	3.9 J	0.4 J	10/30/07	CMF	EPA200.8
Nickel, ug/l	0.66	50.0	2.7 J	3.0 J	0.9 J	10/30/07	CMF	EPA200.8
Selenium, ug/l	0.35	10.0	--- U	0.5 J	--- U	10/30/07	CMF	EPA200.8
Silver, ug/l	0.52	10.0	--- U	--- U	--- U	10/30/07	CMF	EPA200.8
Thallium, ug/l	0.07	5.0	0.1 J	0.2 J	--- U	03/05/07	CMF	EPA200.8
Vanadium, ug/l	0.42	25.0	9.6 J	15.3 J	2.0 J	03/05/07	CMF	EPA200.8
Zinc, ug/l	0.20	10.0	36	44	5.3 J	10/30/07	CMF	EPA200.8

J = Between MDL and SWSL, U = Below ALL Quanititation Limits.

Environment 1, Incorporated

.O. BOX 7085, 114 OAKMONT DRIVE
GREENVILLE, N.C. 27835-7085

PHONE (252) 756-6208
FAX (252) 756-0633

CLIENT: HALIFAX CO. LANDFILL (CLOSED MSW)
MR. FRANK RALPH
P.O. BOX 70
HALIFAX, NC 27839

CLIENT ID: 6015 B

ANALYST: MAO
DATE COLLECTED: 10/22/07
DATE ANALYZED: 10/30/07
DATE REPORTED: 11/05/07

REVIEWED BY:

VOLATILE ORGANICS
EPA METHOD 8260B

PARAMETERS, ug/l	MDL	SWSL	Well #17	Well #18 Shallow	Well #18 Deep
1. Chloromethane	0.18	1.0	--- U	--- U	--- U
2. Vinyl Chloride	0.34	1.0	--- U	0.70 J	--- U
3. Bromomethane	0.26	10.0	--- U	--- U	--- U
4. Chloroethane	0.29	10.0	--- U	--- U	--- U
5. Trichlorofluoromethane	0.13	1.0	0.30 J	--- U	--- U
6. 1,1-Dichloroethene	0.14	5.0	0.20 J	--- U	--- U
7. Acetone	1.21	100.0	--- U	9.10 J	--- U
8. Iodomethane	0.12	10.0	--- U	--- U	--- U
9. Carbon Disulfide	0.14	100.0	--- U	--- U	--- U
10. Methylene Chloride	0.14	1.0	0.20 J	--- U	--- U
11. trans-1,2-Dichloroethene	0.13	5.0	--- U	--- U	--- U
12. 1,1-Dichloroethane	0.16	5.0	3.10 J	1.20 J	1.50 J
13. Vinyl Acetate	0.20	5.0	--- U	--- U	--- U
14. Cis-1,2-Dichloroethene	0.14	5.0	1.40 J	0.20 J	0.80 J
15. 2-Butanone	0.85	100.0	--- U	1.40 J	--- U
16. Bromochloromethane	0.11	3.0	--- U	--- U	--- U
17. Chloroform	0.13	5.0	--- U	--- U	--- U
18. 1,1,1-Trichloroethane	0.11	1.0	--- U	--- U	--- U
19. Carbon Tetrachloride	0.13	1.0	--- U	--- U	--- U
20. Benzene	0.16	1.0	--- U	--- U	--- U
21. 1,2-Dichloroethane	0.12	1.0	--- U	--- U	--- U
22. Trichloroethene	0.13	1.0	1.80	--- U	0.30 J
23. 1,2-Dichloropropane	0.17	1.0	--- U	--- U	--- U
24. Bromodichloromethane	0.13	1.0	--- U	--- U	--- U
25. Cis-1,3-Dichloropropene	0.17	1.0	--- U	--- U	--- U
26. 4-Methyl-2-Pentanone	0.68	100.0	--- U	--- U	--- U
27. Toluene	0.13	1.0	--- U	0.30 J	--- U
28. trans-1,3-Dichloropropene	0.14	1.0	--- U	--- U	--- U
29. 1,1,2-Trichloroethane	0.20	1.0	--- U	--- U	--- U
30. Tetrachloroethene	0.16	1.0	1.10	--- U	--- U
31. 2-Hexanone	1.00	50.0	--- U	--- U	--- U
32. Dibromochloromethane	0.14	3.0	--- U	--- U	--- U
33. 1,2-Dibromoethane	0.13	1.0	--- U	--- U	--- U
34. Chlorobenzene	0.13	3.0	--- U	--- U	--- U
35. 1,1,1,2-Tetrachloroethane	0.14	5.0	--- U	--- U	--- U
36. Ethylbenzene	0.16	1.0	--- U	--- U	--- U
37. Xylenes	0.48	5.0	--- U	--- U	--- U
38. Dibromomethane	0.17	10.0	--- U	--- U	--- U
39. Styrene	0.16	1.0	--- U	--- U	--- U
40. Bromoform	0.11	3.0	--- U	--- U	--- U
41. 1,1,2,2-Tetrachloroethane	0.16	3.0	--- U	--- U	--- U
42. 1,2,3-Trichloropropane	0.06	1.0	--- U	--- U	--- U
43. 1,4-Dichlorobenzene	0.21	1.0	--- U	--- U	--- U
44. 1,2-Dichlorobenzene	0.13	5.0	--- U	--- U	--- U
45. 1,2-Dibromo-3-Chloropropane	0.26	13.0	--- U	--- U	--- U
46. Acrylonitrile	1.49	200.0	--- U	--- U	--- U
47. trans-1,4-Dichloro-2-Butene	0.14	100.0	--- U	--- U	--- U

J = Between MDL and SWSL, U = Below ALL Quanititation Limits.

Environment[illegible] ıc.
P.O. Box 7085, 114 Oakmont Dr.
Greenville, NC 27858

Phone (252) 756-6208 • Fax (252) 756-0633

CHAIN OF CU_TODY RECORD

CLIENT: 6015 B **Week: 1**

HALIFAX CO. LANDFILL (CLOSED MSW)
MR. FRANK RALPH
P.O. BOX 70
HALIFAX NC 27839

(252) 583-1807

DISINFECTION: ☐ CHLORINE ☐ UV ☐ NONE ☐ ______

						Metals	EPA 8260B	8260 Dup. 1	8260 Dup. 2
CHLORINE NEUTRALIZED AT COLLECTION									
pH CHECK (LAB)						<2	<2	<2	<2
CONTAINER TYPE, P/G						P	G	G	G
CHEMICAL PRESERVATION						A	E	E	E
SAMPLE LOCATION	COLLECTION DATE	COLLECTION TIME	TOTAL CHLORINE, mg/l AT COLLECTION	TEMPERATURE, °C AT COLLECTION	# OF CONTAINERS				
Well #17	10/22/07	1:36			4	■	■	■	■
Trip Blank	↓				2		■	■	
Well #18 Shallow	↓	1:14			3	■	■	■	
Well #18 Deep	↓	1:21			3	■	■	■	

PARAMETERS

A - NONE
B - HNO_3
C - H_2SO_4
D - NAOH
E - HCL
F - ZINC ACETATE
G - NA THIOSULFATE

CLASSIFICATION:
☐ WASTEWATER (NPDES)
☐ DRINKING WATER
☐ DWQ/GW
☒ SOLID WASTE SECTION

CHAIN OF CUSTODY MAINTAINED DURING SHIPMENT/DELIVERY (Y) N

SAMPLES COLLECTED BY: (Please Print) Joan Smyth

SAMPLES RECEIVED IN LAB AT 4.8 °C

RELINQUISHED BY (SIG.) (SAMPLER)	DATE/TIME	RECEIVED BY (SIG.)	DATE/TIME
Joan Smyth	10/22/07 4:15	[signature]	10/23/07 10:00
RELINQUISHED BY (SIG.)	DATE/TIME	RECEIVED BY (SIG.)	DATE/TIME
RELINQUISHED BY (SIG.)	DATE/TIME	RECEIVED BY (SIG.)	DATE/TIME

COMMENTS:

Instructions for completing this form are on the reverse side.

FORM #5

Sampler must place a "C" for composite sample or a "G" for Grab sample in the blocks above for each parameter requested.

№ 156190

Physical and Chemical Properties of Constituents of Concern
Halifax County Landfill

Heptachlor	
Chemical Abstract Number (CAS #)	76-44-8
Synonyms:	1,4,5,6,7,8,8-heptachloro-3a,4,7,7a-tetrahydro-4,7-methano-indene
	Heptachlorodicyclopentadiene
Molecular Formula:	$C_{10}H_5CL_7$
Apparent Color:	White to light tan waxy solid
Odor:	mildly camphorous
Melting Point:	95 deg C
Boiling Point:	175 deg C
Specific Gravity:	1.57 - 1.59
Molecular Weight:	373
Vapor Density:	3.14
Odor Threshold Concentration:	na
Flammability:	na
Solubility:	insoluble

Data from the Handbook of Environmental Data on Organic Chemicals, Second Edition by Verschueren, K., 1983; and the U.S. EPA website.