Wake County,
North Carolina

North Wake Unlined Landfill
Corrective Action Plan
Facility Permit # 9209

March 2010

Report

CDM

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March 22, 2010

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Subject: Corrective Action Plan
Wake County - North Wake Unlined Landfill
Facility Permit # - 9209

Dear Ms. Drummond:

CDM, on behalf of Wake County, is submitting one electronic version of the above referenced Corrective Action Plan. This report was prepared in accordance with Solid Waste Management Rule 15 NCAC 13B .1636 and identifies the corrective measures to meet the requirements set out in that rule at the Wake County North Wake Unlined Landfill. Following Solid Waste Section review and approval of the Corrective Action Plan, Wake County will initiate implementation of the remedy.

If you have any questions or require further explanation, do not hesitate to call me at 787-5620.

Very truly yours,

Mathew F. Colone, P.G.
Camp Dresser & McKee

NORTH CAROLINA
SEAL
1651
MATTHEW F. COLONE

22 MARCH 2010

cc: Tommy Esqueda, Wake County
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Signature Page

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Chapter 1
Introduction

1.1 Site Background

This report, required under the North Carolina Solid Waste Management Rule .1636 and .1637, presents the Corrective Action Plan for the North Wake Unlined Landfill, permit number 92-09.

Camp Dresser & McKee (CDM) submitted the *North Wake Unlined Landfill Groundwater Assessment Report (CDM, January 2000)* was submitted to the Solid Waste Section (SWS) in February 2000 in accordance with Rule .1634. This report detailed the installation and sampling of several compliance and assessment monitoring wells and discussed the history of groundwater monitoring and assessment at the site. The report also recommended the use of monitored natural attenuation (MNA) as a corrective action for the site. Since December 2000, MNA parameter samples have been collected from monitoring wells MW-5, -6, -8, -9, -10, -24, and TB-1a in addition to the required Appendix I and detected Appendix II constituents (dichlorodifluoromethane, bis(2-ethylhexyl)phthalate, mercury, and pesticides and herbicides).

Due to landfill gas migration beyond the limits of waste, a permanent gas migration control system was installed along the western, northern and eastern perimeter of the landfill on the inside of the landfill property boundary. The permanent gas migration control system was constructed and operational by November 2003. Continued monitoring and adjustments in applied vacuum on the system have resulted in the successful control of gas migration around the perimeter of the landfill. Temporary vacuum systems installed along the west and north sides of the landfill, starting in January 2002, were also used to control gas migration at known exceedence locations prior to installation of the permanent gas migration control system.

The permanent gas migration control system consists of a series of 78 gas extraction wells spaced at 25 to 50 feet apart along the western and northern perimeter of the landfill, together with a 1,000 foot long, high density polyethylene (HDPE) lined, vacuum cut-off trench along the eastern perimeter of the landfill. The wells and cut-off trench are connected to a buried 6-inch diameter HDPE vacuum header installed adjacent to each of the perimeter wells and cut-off trench along the west, north and east sides of the landfill. The vacuum gas recovery system in the waste, operated by DTE Biomass, serves as the vacuum source for the perimeter gas migration control system.

At the request of the SWS, additional groundwater assessment wells (MW-36/-36d) were installed to the north of MW-9 and MW-6/6d in order to assess offsite contaminant migration. Both wells were installed in November 2008. Subsequent sampling determined that several Volatile Organic Compound (VOC) constituents

were exceeding their respective North Carolina 2L Standards (NC2L). In addition to the groundwater monitoring wells, two additional surface water sampling locations (SW-7 and SW-8) were added at Abbot's Creek, north of the landfill.

Following installation and sampling of MW-36/36d, the *North Wake Unlined Landfill Assessment of Corrective Measures Report (CDM, June 2009)* was submitted to the SWS in June 2009 in accordance with Rule .1635. This report identified potential corrective measures to meet the requirements of Rule .1636. As part of the assessment of corrective measures, several remedies to groundwater contamination and migration were discussed. These remedies included: No action, MNA, groundwater pump and treat, and in situ groundwater treatment. Each option was considered for effectiveness, implementability, and relative cost. By comparing all of these factors and using the information collected during the groundwater assessments and data collected during the semi-annual groundwater sampling events, the most cost-effective and easily implementable remedy to protect human health and the environment was identified. Due to the low-level of contamination and nature of contaminants, it was recommended that Wake County pursue MNA and institutional controls paired with in situ remediation by air sparging as the preferred remedy.

A public meeting was held on October 2, 2009 as directed by Rule .1635(d) to review the results of the corrective measures assessment and receive public comment prior to the selection of remedy. No public comments were received during this process. Following the public meeting, a *Selection of Remedy Letter (CDM, November 2009*) was sent to the SWS in November 2009 recommending MNA coupled with institutional controls paired with in situ remediation by air sparging as the preferred remedial selection. As a contingency plan, the recommended alternatives were in situ chemical remediation or groundwater extraction.

A *North Carolina Solid Waste Groundwater Corrective Action Permit Modification Application (CDM, December 2009)* with accompanying documentation was forwarded to the SWS in December 2009.

1.2 Aquifer Characteristics

The Wake County Unlined Landfill is located off of Deponie Road in Raleigh, Wake County, North Carolina. A site map is provided on **Figure 1-1**.

In November 1996, Wake County began disposal of municipal solid waste in the lined portion of the North Wake Landfill. A low permeability cap was installed during the closure of the unlined landfill. This cap included the installation of a geosynthetic liner on the top of the landfill to further reduce infiltration. A methane gas recovery system was installed in the waste, and has been operational since November 1997.

In accordance with Rule .1633(b)(2), Wake County initiated an assessment monitoring program for the compliance monitoring wells around the existing landfill. The Appendix II sampling results indicated the presence of bis (2-ethylhexyl) phthalate, dichlorodifluoromethane, mercury, pesticides and herbicides. Consequently,

additional samples were collected to establish background concentrations for these new recently detected constituents. Samples have continued to be collected from select compliance and assessment wells on a semi-annual basis and submitted for laboratory analysis of the Appendix I constituents plus the detected Appendix II constituents. The analytical results, groundwater data, and statistical analysis have been submitted to the SWS in the semi-annual sampling reports.

1.2.1 Geologic and Hydrogeologic Setting

The North Wake Landfill is located in the Raleigh Belt of the Piedmont Physiographic Province. The Piedmont Physiographic Province in North Carolina is characterized by gentle to steep, hilly terrain with small quantities of alluvium. Bedrock outcroppings are rare and typically consist of soil and saprolite. Saprolite is a clay-rich residual material that is the product of in-place chemical weathering and leaching of bedrock. Saprolite is often characterized by bright colors, preserved structures and mineral fabric present in the rock before weathering. Soil is present as a thin mantle on top of saprolite or alluvium with a thickness usually on the order of 3 to 8 feet (Daniel, 1990). Beneath the saprolite is a transition zone of weathered bedrock. The thickness of regolith above unweathered bedrock averages about 52 feet, and in some cases may exceed depths of 100 feet (Daniel, 1990).

1.2.2 Regional Geology

The geology of Wake County is made up of three different rock assemblages. The eastern portion of the county is underlain by a complex group of metamorphic rocks (gneiss, schists, and phyllites) of Late Precambrian or Paleozoic age, with mafic and granitic intrusions. Rocks of this group belong to the Raleigh Belt and the Carolina Slate Belt. The second group consists of stratified sedimentary rocks of Triassic age separated from the older rocks (Carolina Slate/Raleigh Belts) by the Jonesboro Fault. The third group consists of coastal plain sediments located primarily in the southeastern portion of the county (Parker, 1979). The North Wake Unlined Landfill is located within the Raleigh Belt of the metamorphic rock group.

The North Wake Unlined Landfill is situated over the Raleigh Gneiss. West of the site and corresponding with the highest elevations in the vicinity, is the Falls Leucogneiss. Both of these rock occurrences demonstrate a southwest to northeast trend in outcrop. Immediately east of the site is the Gresham Lake Pluton. During a January 1998 site reconnaissance, the Raleigh Gneiss was observed to consist primarily of biotite gneiss and to a lesser degree hornblende gneiss. The gneiss demonstrates strong flow banding of compositional layers consisting of white, feldspar rich layers and quartz biotite layers. Granitoid orthogneiss was also observed within the north and south stream channels west of the site.

Although somewhat variable, the general strike of foliation in the Raleigh Gneiss in the site vicinity is from southwest to northeast, as mapped by Horton and others (1992). The foliation dips to the east from approximately 35° to 80°.

Relatively small diabase dikes, several feet wide, have also been identified south of the site during construction of the North Wake Lined landfill. These dikes have been

mapped and generally trend from south to north. Should these dikes extend into the proximity of the site, they would be approximately parallel to the west boundary of the unlined landfill at a distance of approximately 400 feet.

Also noted during previous site reconnaissance was an extremely quartz rich gneiss in both the north and south streams. This rock appeared to be resistant to erosion/weathering relative to the surrounding rock and formed the creek channels into a series of small waterfalls for distances of approximately 75 feet. These two outcrops may potentially represent a continuous, resistant rock layer that forms a subsurface bedrock ridge aligned with the regional structure.

1.2.3 Regional Hydrogeology

Groundwater in the vicinity of the site occurs in the saprolite horizon and within fractures of the crystalline bedrock. The transition zone between saprolite and unweathered rock is generally the zone in which most lateral groundwater flow occurs. This zone typically contains a lower percentage of clay, derived from the complete weathering of micaceous minerals and feldspar, and is made more permeable by cracking associated with shrinking and swelling of minerals by hydration.

Groundwater in saprolite is derived directly from infiltrating precipitation. Welby (1994), reports that an estimated 10 to 15 percent of the annual average precipitation of about 45 inches reaches the water table. Groundwater reaching the water table then flows laterally, primarily in the transition zone above crystalline rock, until it ultimately discharges at springs or as diffuse flow into surface water features. Alternately, groundwater may encounter fractures in the crystalline rock and serve to recharge these fracture systems.

Groundwater flow directions in saprolite and the transition zone are controlled primarily by topography with groundwater flow mirroring surface drainage patterns. However, the topography of the subsurface crystalline rock surface can cause deviations in the presumed groundwater flow directions as valleys and ridges on the rock surface can direct groundwater flow. Mineralogical heterogeneities in the saprolite/transition zone may result in contrasting permeability and influence groundwater flow directions. As seen at the North Wake lined landfill, diabase dikes can be less permeable than the surrounding materials and form groundwater flow barriers. Alternately, relic fractures in the saprolite/transition zones may represent preferential groundwater flow paths.

The occurrence and movement of groundwater in the unweathered bedrock is generally restricted to fractures as these materials have little primary porosity. The fractures are typically most numerous and have the largest openings near the top of the unweathered rock. The amount and location of groundwater in the crystalline rock varies greatly dependant on the depth, openness, and degree of connection between fractures. Large open fractures were not observed during the site reconnaissance. Upon inspection of fracture systems in the Benchmark quarry, all fractures in the crystalline bedrock were either mineralized or intruded. Although the

quarry is currently being mined to elevations well below the elevation of the Neuse River, quarry representatives indicated that groundwater flow into the quarry has not been observed and during dry weather the excavation remains dry.

1.2.4 Regional Hydrology

Stream channels in the Piedmont are often aligned along zones of more easily weathered and eroded rocks, such as weaker lithologies or along fault or fracture traces (Daniel, 1990). Linear stream segments may be an indication of fracture zones. Streams may be expected to be both losing and gaining, depending on seasonal water table fluctuations and local topography.

1.2.5 Site Geology

Site geology is based on previous well installation activities from the original groundwater assessment and the landfill gas perimeter recovery well installations. The subsurface geology at the site is highly variable. Generally, the site is covered by 4 to 6 inches of detritus, topsoil and rootmat. Underlying the topsoil is a layer of reddish brown silt/clay. This silt/clay is typically encountered up to depths of 7 to 17 feet below land surface (bls). The silt/clay is often underlain by a light brown, fine sandy silt saprolite with varying amounts of mica. Occasionally, zones of silty sand saprolite as pegmatite or granite are encountered below the silt/clay. Generally, the saprolite grades into partially weathered rock, with depth, to the top of bedrock. The depth to bedrock ranges from 15 to greater than 65 feet bls.

In some areas, a 4 to 6-inch cover of topsoil and rootmat is underlain by light to medium brown sandy silt alluvial deposits. This overburden varies from 5 to 15 feet in thickness. Below the alluvial layer, a layer of light brown sandy silt saprolite with varying amounts of mica is encountered.

Cuttings obtained during air-rotary drilling of some bedrock wells revealed bedrock which varied from schistose to granitic. Generally, the bedrock was highly weathered and fractured for the first 20 to 30 feet below auger refusal, however, one boring revealed highly fractured bedrock to depths of 90 feet bls.

1.2.6 Site Hydrogeology

The groundwater monitoring wells installed around the Unlined Landfill are generally completed to depths corresponding with the top of rock and are considered representative of the saprolite/transition zone. The surficial aquifer across the site is located within the saprolite/transition zone. Several monitoring wells have been installed in the deeper bedrock aquifer across the site as part of the groundwater assessment.

Figure 1-1 provides groundwater potentiometric surface contours in the saprolite/transition zone based on water level data obtained from the monitoring wells during the March 2009 semi-annual sampling event. The potentiometric surface data are provided in **Appendix A** on **Table 1**. The potentiometric surface contours indicate an easterly groundwater flow direction with localized flow towards the small creeks to the north and south, coincident with the site topography prior to landfill

activities. The small perennial streams to the north and south appear to act as groundwater discharge features.

It is probable that groundwater elevations beneath the landfill are higher than those indicated by the figure because of a mounding effect almost invariably occurring beneath unlined landfills. As a result, radial groundwater flow away from the landfill has occurred. Typically, such radial flow patterns dissipate within relatively short distances, beyond which the groundwater assumes a more typical flow direction. Installation of the impermeable cap, which occurred in late 1997, has likely caused a reduction in the mounding of groundwater beneath the landfill.

In situ slug tests were performed on monitoring wells MW-5, -6, -7, -8, -9, -10, -22, -23, and -24 to measure transmissivity and horizontal hydraulic conductivity based on an assumed surficial aquifer thickness of 25 feet. Horizontal hydraulic conductivity ranges from 10.58 feet/day (ft/day) (3.73×10^{-3} centimeters/second (cm/sec)) in MW-6 to 0.07 ft/day (2.47×10^{-5} cm/sec) in MW-22. The average horizontal hydraulic conductivity for the surficial aquifer wells across the site is approximately 2.38 ft/day (8.74×10^{-4} cm/sec). Based on the average horizontal hydraulic conductivity and an assumed aquifer thickness of 25 feet, the transmissivity of the surficial aquifer is approximately 60ft^2/day.

Average linear velocity values are calculated for these wells based on assumed surficial aquifer thicknesses for the slug tests during each semi-annual sampling event. Average linear velocity values for these wells from November 2005 to March 2009 are provided in **Appendix A** on **Table 2**. During the last groundwater sampling event in March 2009, linear velocity values ranged from 1.65 ft/day in MW-6 to 7.04×10^{-3} ft/day in MW-22.

1.3 Contaminant Distribution

1.3.1 Groundwater Quality

A summary of the site groundwater quality analytical results for Appendix II VOC and metal constituents and other detected Appendix II constituents (bis(2-ethylhexyl)phthalate, pesticides, herbicides) is provided in Appendix A on **Table 3**. In general, the occurrences of detected VOCs above respective NC2L Standards have been decreasing since beginning sampling activities.

Monitoring wells MW-5, -6, -7, -8, -9, and -10 have been sampled on a semi-annual basis since 1994. Monitoring wells MW-22, -23, and -24 have been sampled semi-annually since June 1997. Monitoring wells MW-23d, -27, -28, -28d, -29d, -30, -31, -31d, -32, -33, -34, -34d, -35, and TB-1a were installed as part of the groundwater assessment and have been sampled since May 1998. Some of these wells are sampled annually (MW-27, -28, -28d, -33, -34, -34d, and -35), while the remaining wells are sampled semi-annually. Monitoring wells MW-6d, -8d, -10d, and TB-1a deep were installed in response to comments from the groundwater assessment and have been sampled semi-annually since June 2001.

Monitoring well MW-27 was abandoned in November 2008. MW-27 had not been sampled since April 2004. Wells MW-36 and -36d were installed in November 2008 and will be sampled semi-annually. Well locations are provided on **Figure 1-1**. An isocontour map for total VOCs from the April 2009 sampling event is presented on **Figure 1-2**.

In almost all cases, groundwater quality has been improving since samples were first collected in 1994. VOCs in nearly all of the assessment monitoring wells have been below laboratory method detection limits (MDLs). Only samples from TB-1a, MW-34, MW-34d, MW-36 and MW-36d have had detections above SWS limits of VOCs other than chloroform since 1998. Recent sampling events have indicated that 1,4-dichlorobenzene, methylene chloride, tetrachloroethene, trichloroethene, and vinyl chloride have been detected in assessment wells MW-34, MW-36, and MW-36d at concentrations exceeding respective NC2L Standards.

The monitoring wells in the south-west buffer area (MW-31, -31d, TB-1a, and TB-1a deep) have all had detections of chloroform above the NC2L Standard. It is likely that the detections of chloroform are attributed to a release from a municipal water line in the Falls River development and are not related to a release from the landfill.

Historical total VOC concentrations for select wells along the western and northern portions of the landfill are presented in **Appendix B** on **Figure 1** through **Figure 7**. **Figures 1** through **7** show the historic VOC trends for MW-6, MW-9, MW-10, MW-23, MW-24, TB-1a, and MW-34 respectively. In some figures, there appears to be a decreasing trend in total detected VOC concentrations. However, these figures include the recent J flag detections which were not reported before 2007. The recent increase of total detected VOC concentrations in TB-1a is due to chloroform detections, which are likely related to a release from a municipal water line as opposed to the landfill, that have been declining in the most recent sampling events.

In addition to VOC and metal analyses, samples from the site shallow background monitoring well (MW-11) and monitoring wells MW-5, -6, -8, -9, -10, -24, and TB-1a are also analyzed for MNA parameters, which include: dissolved oxygen, biological oxygen demand, chemical oxygen demand, chloride, nitrate, sulfate, sulfide, total organic carbon, carbon dioxide, ferrous iron, methane/ethane/ethane, volatile fatty acids, and dissolved hydrogen. A summary of the MNA parameter analytical results since inception of the program in December 2000 is presented in **Appendix A** on **Table 4**.

Detected concentrations of MNA parameters have varied from event to event, but occurrences of key parameters from certain wells are fairly consistent. In general, it appears that based on the concentrations of geochemical parameters from the select wells, environments are present which favor reductive dechlorination; notably, the concentrations of nitrate, ferrous iron, sulfate, and carbon dioxide. The following evidence indicates that one or more mechanisms of natural attenuation and/or reductive dechlorination may be occurring at the site:

- VOC concentrations in groundwater continue to decline (**Figures 1** through **7** of **Appendix B**).
- The ratio of parent /daughter compounds continues to decrease over time.
- Nitrate, ferrous iron, sulfate, and carbon dioxide continue to be detected at concentrations indicating reductive dechlorination.

1.3.2 Surface Water Quality

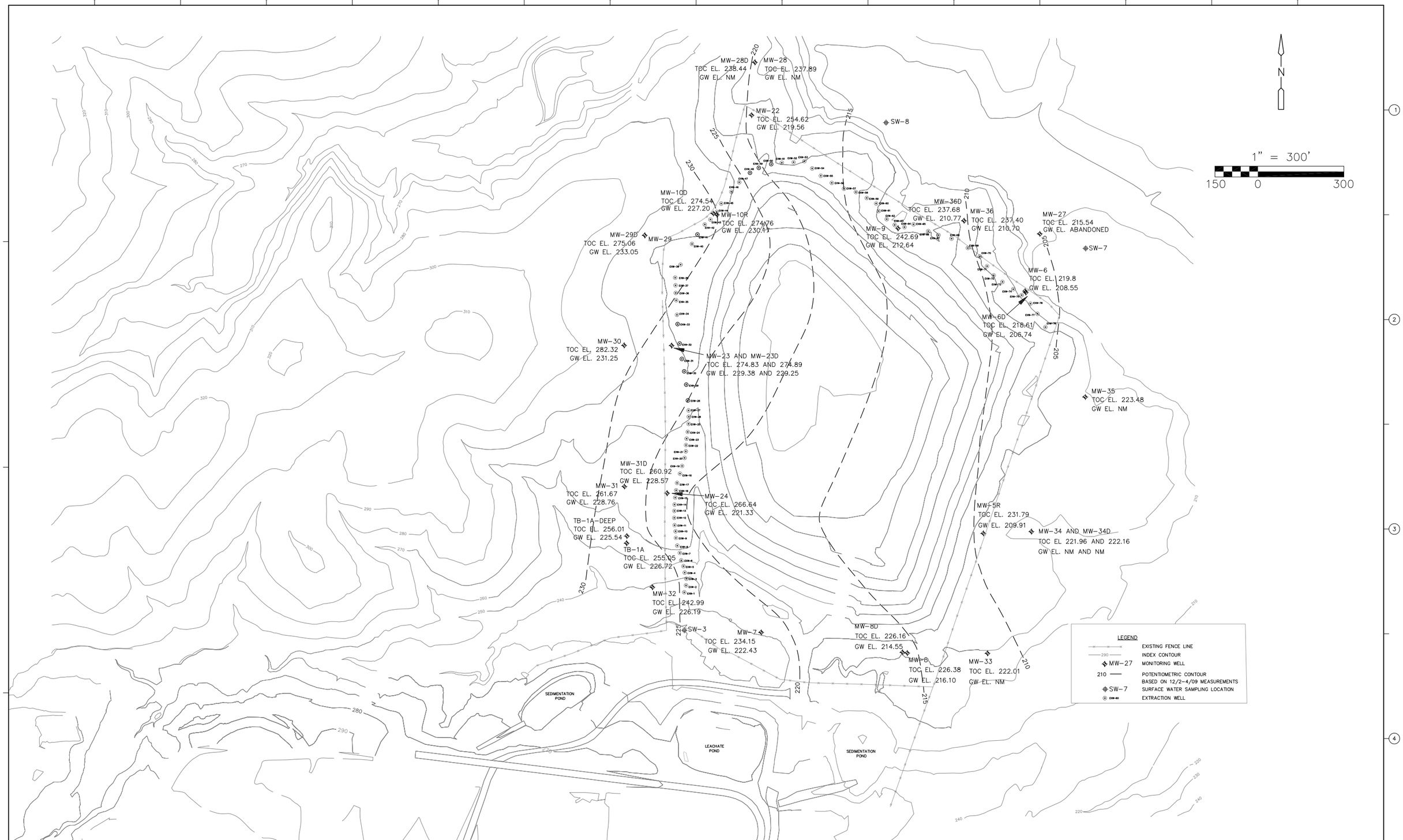
Surface water samples for metal and VOC analysis have been collected from sample locations SW-2 and SW-3 since 1995. Locations SW-7 and SW-8 were added in November 2009. These locations are monitored as part of the semi-annual sampling performed at the landfill. Several estimated concentrations of VOCs have been reported in samples from each location, but generally appear to be random and infrequent. Several metals including barium, chromium, copper, lead, silver, vanadium and zinc have been detected at low levels in the surface water samples, and are most likely attributed to naturally occurring conditions. A summary of the surface water sampling data is provided in **Appendix A** on **Table 3**.

1.4 Site Conceptual Model

All available data and historical investigations at the site confirm that the Unlined Landfill is the source of VOCS observed in groundwater. Groundwater flows in an easterly direction consistent with the site topography. The surficial aquifer discharges to the small streams to the north and south and ultimately to the Neuse River to the east. Historic surface water sampling indicates that contamination is not present.

1.5 Regulatory Status

The North Wake Unlined Landfill has been closed since 1998.



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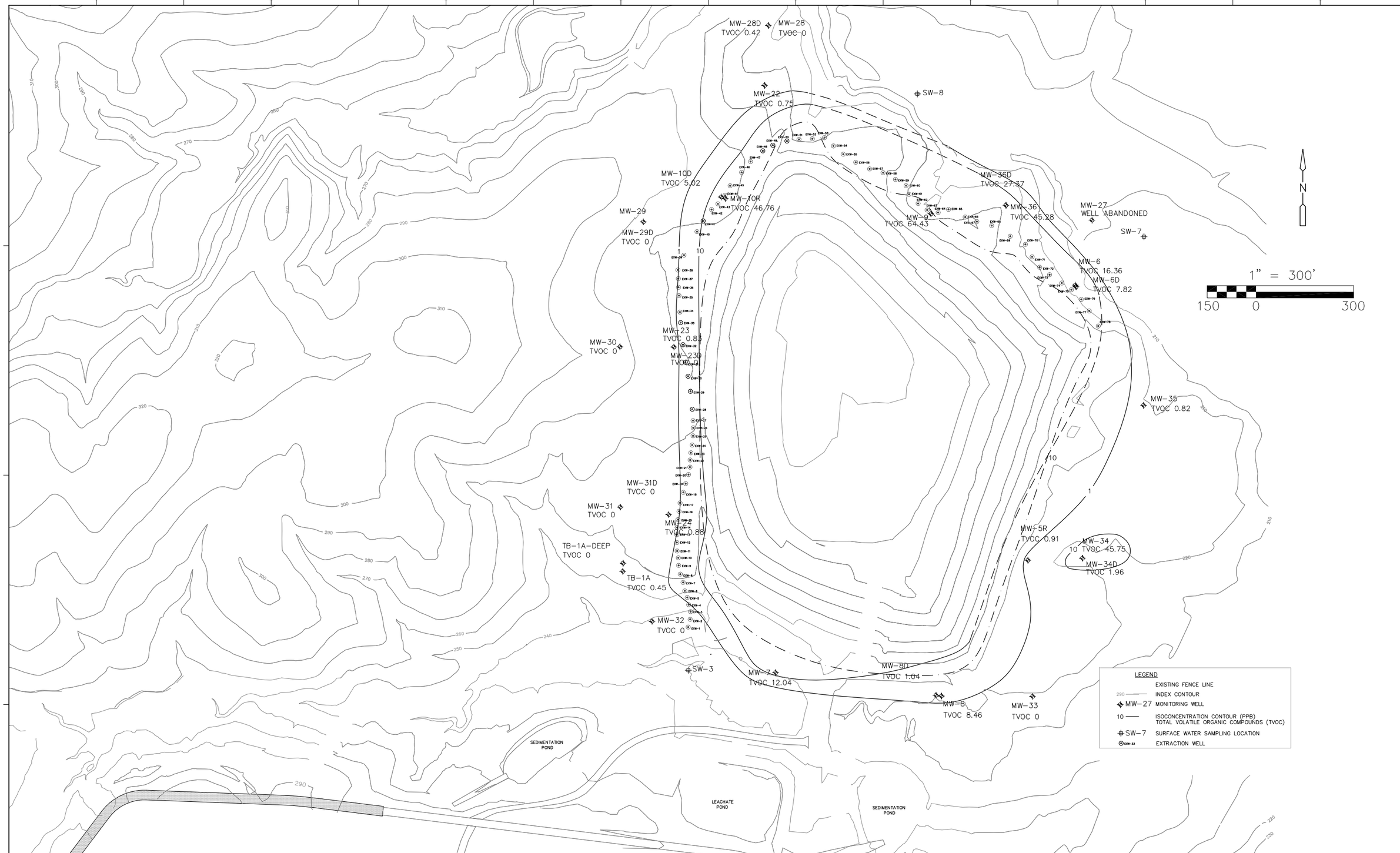
WAKE COUNTY
NORTH CAROLINA

NORTH WAKE UNLINED LANDFILL
CORRECTIVE ACTION PLAN

GROUNDWATER POTENTIOMETRIC SURFACE MAP
WITH WELL AND SURFACE WATER LOCATIONS

PROJECT NO. 6172-71371
FILE NAME: CAP 1-1.dwg

FIGURE
1-1



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NORTH WAKE UNLINED LANDFILL
ASSESSMENT OF CORRECTIVE MEASURES

ISOCONCENTRATION CONTOUR MAP

PROJECT NO. 6172-71371
FILE NAME: CAP 1-2.dwg

FIGURE
1-2

Chapter 2
Contaminant Characterization

2.1 Contaminants of Concern

Contaminants of concern are compounds that pose a threat to human health and the environment based on concentrations above regulatory limits. A summary of the site groundwater quality analytical results for VOC and metal constituents is provided in **Appendix A** on **Table 3**. In general, the occurrences of detected VOCs above NC2L Standards have been decreasing since beginning sampling activities.

In almost all cases, groundwater quality has been improving since samples were first collected in 1994. Typically, VOCs in all of the assessment monitoring wells (MW-28/28d, -29d, -30, -31/31d, -32, -33, -34/34d, -35, -TB-1a, TB-1a deep) have been below detection limits. However, newly installed assessment wells MW-36/36d have had detections of 1-4-dichlorobenzene, methylene chloride, tetrachloroethene, trichloroethene, and vinyl chloride above NC2L Standards. Since the SWS changed the reporting and analytical requirements for groundwater samples starting in 2007, several estimated VOC concentrations have been identified in the assessment wells. Estimated detections, as qualified by a "J" flag, are those that are above the MDLs but below SWS limits.

The following VOCs in groundwater are the contaminants of concern for the site based on NC2L exceedances: Benzene, 1,4-dichlorobenzene, 1,1-dichloroethane, cis-1,2-dichloroethene, methylene chloride, tetrachloroethene, trichloroethene, and vinyl chloride.

Numerous Appendix I metals and mercury are routinely detected in all wells at the site. The detected levels are typically similar across the site and the background well. Beryllium, cobalt, thallium, cobalt and vanadium are routinely detected in the compliance and assessment wells above the NC2L Standards. All of these metals have also been detected in either the shallow or deep background well at similar concentrations. It is likely that the detected metals at the site, including those above the NC2L Standards, are naturally occurring and not related to a release from the landfill. Because of this, no metals are listed in the contaminants of concern for the site.

2.2 Contaminant Source Confirmation

All available data and historical investigations at the site confirm that the Unlined Landfill is the source of the groundwater contamination.

2.3 Source Control Measures

Source control is currently accomplished by capping and gas recovery, including perimeter gas recovery.

2.3.1 Capping

Capping is performed to reduce infiltration of precipitation, thereby reducing leachate generation which may impact groundwater. In addition, capping enhances landfill gas recovery. A low permeability cap has already been installed, and is maintained, as part of the landfill closure.

2.3.2 Gas Recovery System

The generation of landfill gas within a capped, unvented landfill may speed up groundwater migration by increasing the pressure inside the landfill. Gas recovery, either active (removed by a vacuum) or passive (vented to the air) reduces pressure by allowing gas to escape. Gas recovery also removes VOC contaminant mass from the source material. The Unlined Landfill currently utilizes an active landfill gas recovery system within the waste limits, in addition to a perimeter gas system designed to recover and mitigate landfill gas migration beyond the limits of waste. The active recovery system reduces the pressure induced migration of contaminants in groundwater and helps to remove VOC contaminant mass from both the source material and the impacted groundwater.

2.4 Groundwater End Use

There are no groundwater users within 1,000 feet of the entire landfill facility. The surficial aquifer discharges locally to the small streams to the north and south of the landfill. All adjacent property owners are serviced by the City of Raleigh water supply.

2.5 Sensitive Receptor Pathways - Risks

Potential exposure pathways for the site include the following:

- Uptake of contaminated groundwater through plants, and
- Plant / animal exposure to groundwater discharging to surface water.

Uptake of groundwater by plants is minimal as groundwater is generally greater than 10 feet below land surface. In the areas near the streams where groundwater levels are less than 5 feet plant uptake would pose minimal risk to animals and reduce contaminant levels through phytoremediation. The surficial aquifer discharges locally to the small streams to the north and south of the site. As discussed previously, historic surface water sampling indicates that contamination is not present.

2.6 Exposure Pathways - Risks

A conceptual site exposure model is provided on **Figure 2-1.** Potential exposure pathways for the site include the following:

- Direct human contact with waste,
- Human exposure to contaminated surficial groundwater,

- Human/ecological exposure to contaminated groundwater discharging to surface water
- Human exposure to landfill gas vapors migrating in soil or surficial groundwater, and
- Human exposure to groundwater in deeper aquifers.

Site access controls (fences and locked gates) and the landfill cap prevents direct human contact with buried waste by onsite workers and offsite residents, therefore exposure through this pathway is controlled.

The depth to surficial groundwater at the site is typically greater than 10 feet below land surface and averages greater than 25 feet. As there are no groundwater users at or adjacent to the site, exposure of onsite or offsite workers and the public to potentially contaminated groundwater is not likely.

The surficial aquifer discharges locally to the small streams to the north and south of the site. As discussed previously, historic surface water sampling indicates that contamination is not present in surface water.

All potable water adjacent to the landfill area is provided by the City of Raleigh. Based on information collected during previous investigations in the area, there are no private wells within a 1,000 foot radius of the landfill. Direct contact with potentially impacted extracted groundwater from either the surficial or deeper bedrock aquifer is not likely in the adjacent residential area.

The permanent gas migration control system around the inside perimeter of the Unlined Landfill controls the migration of landfill gas and reduces the likelihood of exposure to vapors migrating in the soil or surficial groundwater. Historical groundwater data indicates the gas migration control system has been effective in reducing VOC contaminant mass from impacted groundwater. In addition, the low permeability cap on the Unlined Landfill reduces the potential exposure to landfill gas migrating in the soil.

2.7 Background Concentrations

MW-11 and MW-11d serve as the background monitoring wells for the North Wake Landfill facility. There are several “J” flag detections of metals in both wells with beryllium, thallium, and vanadium being the only metals that sometimes exceed the NC2L Standard. Historically, cadmium, cobalt, lead, and mercury have also been detected at concentrations above the NC2L Standards. “J” flag concentrations of chloroform, toluene, and bis (2-ethylhexyl) phthalate have also been detected in the background wells at the North Wake facility.

2.8 Exceedances of Groundwater Quality Standards

Benzene, 1,4-dichlorobenzene, methylene chloride, tetrachloroethene, trichloroethene, and vinyl chloride are the only routinely detected VOCs in groundwater that exceed their respective NC2L Standards. Historically, 1,1-dichloroethane, 1,2-dichloroethane, 1,1-dichloroethene, cis-1,2-dichloroethene, and methylene chloride have also been detected above NC2L Standards in some of the site compliance wells.

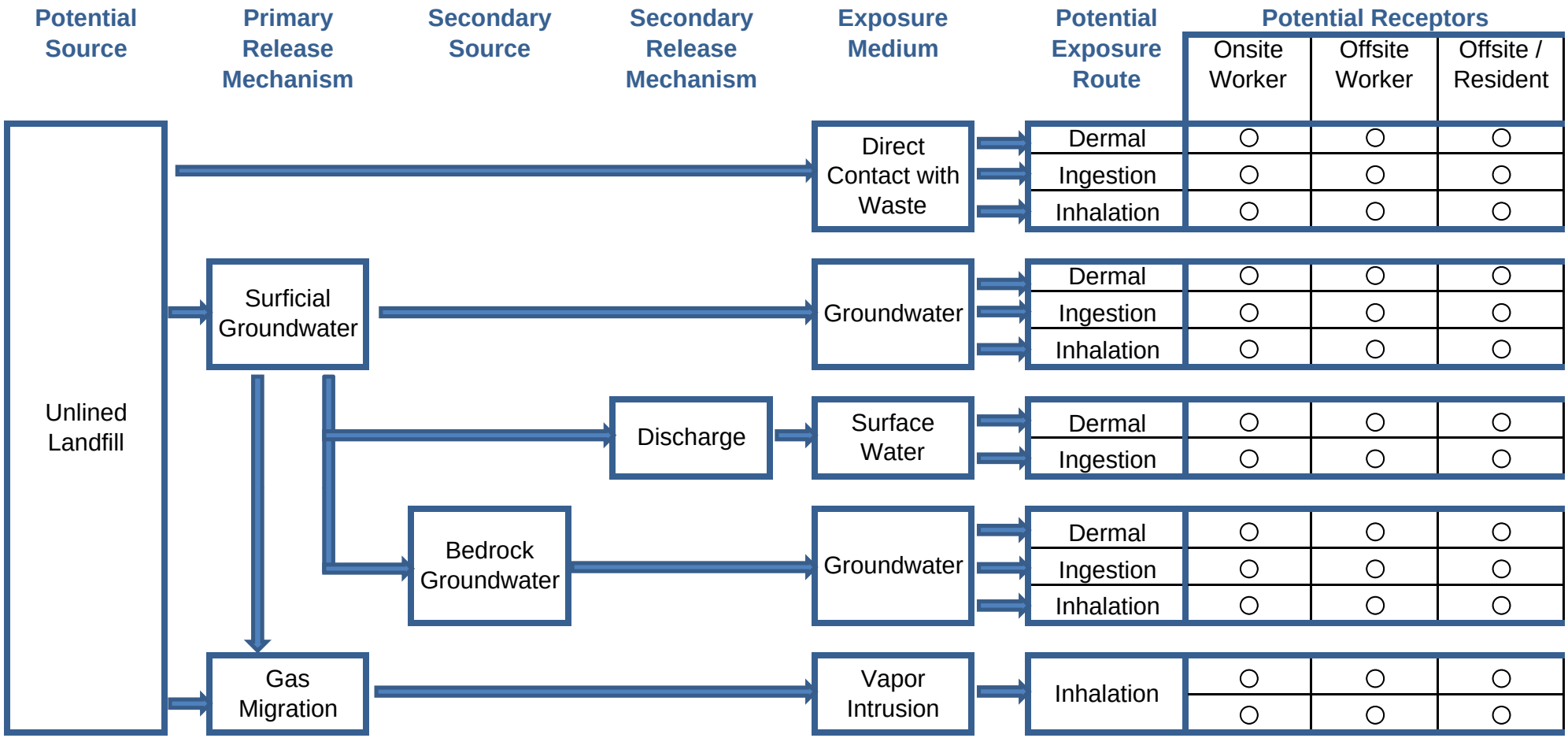
The NC2L Standards were revised in January 2010. Because of some of the changes, 1,4-dichlorobenzene concentrations no longer exceed the NC2L Standards, however, concentrations of 1,1-dichloroethane are now exceeding the NC2L Standards.

2.9 Exceedances of Surface Water Quality Standards

Surface water contamination has not been identified, however, low-level "J" flag concentrations of cis-1,2-dichloroethene and 1,1-dichloroethane have been reported. In addition, several "J" flag metals concentrations are consistent with background and naturally occurring groundwater concentrations at the site. Site soils and surface water downgradient of the closed landfill do not appear to have been impacted by a release from the Unlined Landfill.

2.10 Media of Concern

Groundwater is the media of concern. Based on all available data, CDM concludes that the exceedances are limited to groundwater.



○	Exposure pathway incomplete
●	Exposure pathway complete

Figure 2-1: Conceptual Site Exposure Model

North Wake Unlined Landfill

Assessment of Corrective Measures

Wake County, North Carolina

CDM

Chapter 3
Selected and Approved Remedy/Technical Approach

3.1 Selected Remedy

Pursuant of the NCDENR Solid Waste rule .1636, MNA paired with in situ groundwater remediation by air sparging was selected as the remedy for the site based on its ability to meet a number of criteria and the objectives identified below.

- *Performance* - Long-term and short-term effectiveness and protectiveness of the potential remedy(s), along with the degree of certainty that the remedy will prove successful;
- *Reliability* - The effectiveness of the remedy in controlling the source to reduce further releases;
- *Implementation* - Ease or difficulty of implementing a potential remedy;
- *Time/Costs* - Practical capability of the owner or operator, including a consideration of the technical and economic capability;
- *Safety, Cross-Media Impacts, Control of Exposure to Residual Contamination, and Community Factors* - The degree to which community concerns are addressed.

3.2 Technical Approach

The following discussion presents an evaluation and technical approach of the selected remedy: MNA (with institutional controls, gas recovery and capping) paired with in situ groundwater remediation by air sparging.

The MNA remedy is already in place and includes MNA coupled with institutional controls, gas recovery, and capping. Institutional controls consist of periodic (as-needed) fence maintenance and warning signs to restrict site access. Additional sampling parameters for MNA monitoring have been collected at the site since 2001. Semi-annual groundwater monitoring and reporting will continue and additional natural attenuation monitoring parameters (dissolved hydrogen, carbon dioxide, alkalinity, biochemical oxygen demand, chemical oxygen demand, chloride, ferrous iron, methane/ethane/ethene, nitrate, sulfate, sulfide, total organic carbon, volatile fatty acids, oxidation/reduction potential, and dissolved oxygen) have been added to the required groundwater analysis for select wells at the site (performance wells). The list of additional parameters may be reduced after further evaluation. The table below outlines the wells by type (compliance, performance, background, and sentinel) and location.

Table 3-1
Groundwater Monitoring Well Summary
North Wake Unlined Landfill

ID	Location	Type
MW-5R	Downgradient	Performance
MW-6	Downgradient	Performance
MW-6d	Downgradient	Compliance
MW-7	Downgradient	Compliance
MW-8	Downgradient	Performance
MW-8d	Downgradient	Compliance
MW-9	Downgradient	Performance
MW-10	Upgradient	Performance
MW-10d	Upgradient	Compliance
MW-11/11d	Background	Compliance
MW-22	Upgradient	Compliance
MW-23/23d	Upgradient	Compliance
MW-24	Upgradient	Compliance
MW-28/28d	Side Gradient	Sentinel
MW-29d	Upgradient	Sentinel
MW-30	Upgradient	Sentinel
MW-31/31d	Upgradient	Sentinel
MW-32	Upgradient	Sentinel
MW-33	Downgradient	Sentinel
MW-34	Downgradient	Sentinel
MW-34d	Downgradient	Sentinel
MW-35	Downgradient	Sentinel
MW-36	Downgradient	Performance
MW-36d	Downgradient	Sentinel
TB-1a	Upgradient	Sentinel
TB-1a deep	Upgradient	Sentinel

All performance wells with be sampled for Appendix I Metals, VOCs, and MNA parameters semi-annually. As the MNA program continues, select parameters may be removed from the list, if justified.

Reduction of total VOC concentrations in groundwater will be enhanced with in situ air sparging up gradient of MW-6 and MW-9 within the partially weathered rock and shallow fractured bedrock. The air sparging system will facilitate the volatilization of the low-level VOCs in the groundwater.

In order to properly design the air sparging system with regard to well spacing, a preliminary set of wells will be installed upgradient of existing wells MW-6 and 6d. The pilot test wells will be spaced at approximately 7-foot intervals in order to determine the total radius of influence. The preliminary injection wells (PT-1 through

PT-5) will be installed into the partially weathered rock and shallow fractured bedrock with air-rotary methods to anticipated total depths of 70 feet.

In order to maximize air sparging effectiveness and minimize contaminant migration, two 1-inch diameter, schedule 40 PVC air sparging wells will be installed at each location: a shallow point will be installed in the partially weathered rock and a deeper point will be installed to target the first water-bearing fracture in bedrock. The points will be installed in the same boring, but will be installed as two separate points. A well construction diagram for the air sparging wells is provided on **Figure 3-1**.

Well screen intervals will be determined based on groundwater elevations and bedrock fracture frequency. It is assumed that the shallow partially weathered rock wells will have up to 10-foot of 0.010-inch slotted screen and the deeper bedrock wells will have up to 5-feet of 0.010-inch slotted screen. Following installation, one well (PT-1) the wells will be fitted with a well head which will include a flow control valve and a flow meter. The remaining wells, PT-2, -3, -4, and -5 will be fitted with pressure gauges.

In order to determine the radius of influence of the wells during the pilot test, only well PT-1 will utilized as an injection point. The remaining pilot test wells and wells 6 and 6d will be monitored to determine the radius of influence and effectiveness of the injection. Wells PT-2 through PT-6 will be monitored weekly for pressure and dissolved oxygen. Well 6 and 6d will be monitored weekly for dissolved oxygen and VOC.

The pilot test results will be evaluated to determine the radius of influence for configuration of the well spacing for the air sparging system and will also serve to evaluate effectiveness, based on the results of the weekly VOC sampling at MW-6 and MW-6d.

Once the pilot test has been completed and the final well spacing has been determined, the wells will be installed similar to the pilot test wells. All wells will be fitted with a flow control valve and a flow meter. The wells will be supplied compressed air through ½-inch compressed air hose coming from a 120V or 230V, oil-less, 5 HP air compressor. Based on CDM's calculations, the total pressure requirement for the compressor is approximately 37 pounds per square inch. The compressor will be fitted with a dryer, particulate filter, and a pressure regulator. Flow from the compressor to the wells will be kept below the applied vacuum flow of the adjacent perimeter gas migration system so that vapors generated by air sparging will be captured by the perimeter system.

The compressor will be housed in a pre-fabricated structure located on the north-eastern side of the closed landfill. The air supply header lines will be run through PVC conduit and buried in a trench to minimize the potential for damage and minimize aesthetic impact to the nearby greenway. In addition, all air sparging wells will be completed with flush-mounted protective covers and concrete pads. The proposed air sparging system layout is provided on **Figure 3-2**.

Performance
MNA sampling and analysis has been conducted at the site since 2001. All analytical data indicates that conditions are favorable for natural attenuation and reductive dechlorination is occurring. BIOCHLOR, an Environmental Protection Agency (EPA) screening model used to evaluate remediation by natural attenuation of chlorinated solvents, was used to assess if biodegradation is occurring. Monitoring wells MW-11 (background), TB-1a, MW-5r, MW-6, MW-8, MW-9, MW-10 were evaluated and results indicated there is strong to adequate evidence that anaerobic biodegradation is occurring. BIOCHLOR screening results for each of these wells from the Fall 2009 sampling event are provided in **Appendix C**. After remedy implementation, BIOCHLOR will be used annually to ensure biodegradation is still occurring. Chemical, biological, and physical characteristics such as dispersion, dilution, diffusion, volatilization, sorption, transformation, and advection will be assessed and included in semi-annual reports per reporting guidelines.

The success of the MNA remedy is considered to be probable since existing data has shown that contaminant levels are effectively attenuating and the cap and gas recovery system are already in place. Performance of the in situ groundwater remedy is considered moderate to high due to the hydrogeology of the site and the relatively low-level contamination. The levels of contaminant are low enough that minimal air flow will be required to remediate to acceptable levels. Performance of this remedy will be regularly monitored semi-annually through water quality data from MW-6/6d and MW-36/36d.

Reliability
Reliability of the MNA remedy is considered high since there are no active components and existing data indicates that conditions are favorable for natural attenuation. The reliability of the air sparging remedy is considered moderate to high since there are active components of the system that could potentially fail or need repair. In addition, there is an inherent uncertainty with remediation in fractured bedrock.

The life span of the gas recovery system is not infinite, as gas production will decrease over time and the recovery system will no longer be needed. Controls are already in place regarding operation and maintenance procedures for the perimeter landfill gas recovery system as part of the landfill post-closure program.

Ease of Implementation
The MNA remedy is considered easy to implement, and has essentially been in place since April 1998. Additional groundwater sampling parameters are already being collected during required semi-annual sampling. The in situ component is considered moderate to implement due to well installation, construction, and equipment installation requirements.

Safety, Cross-Media Impacts, Control of Exposure to Residual Contamination, and Community Factors

No safety, cross-media impacts or exposure control concerns are expected for the selected remedy. The volume of air to be injected will be less than the flow capacity of the perimeter gas recovery system such that any vapor created will be captured by the perimeter gas recovery system.

All air sparging wells and associated piping will be below ground in order to minimize visual impact from the proposed greenway. The compressor will be housed in a pre-fabricated building that will be placed on the eastern side of the landfill to decrease any potential noise impacts.

Time

Because the MNA remedy is already in place, no implementation time is required. Semi-annual sampling throughout the post-closure period would be required to monitor the contaminant's natural attenuation. Regular maintenance of the air sparging and perimeter gas recovery systems may be required. It is likely that the air sparging system will not have to be operational for the entire post-closure.

See **Section 7.1** for a summary of the timeline of events.

Costs

Costs associated with the MNA remedy include additional semi-annual sampling and analysis for additional MNA parameters in select wells and any required maintenance to the air sparging and gas venting system. In addition, costs associated with institutional controls include as-needed fence and sign maintenance. Regular semi-annual sampling costs, institutional control maintenance, and perimeter gas recovery system operation and maintenance (O&M) are covered under the existing post-closure costs for the facility.

O&M costs for corrective action assume continued sampling and analysis of MNA parameters for the select wells and do not include required sampling for Appendix I constituents as part of the post-closure requirements. No additional operation costs are involved with this alternative. All cap and gas recovery system maintenance is covered under the existing post-closure costs for the landfill.

Capital costs for the in situ remediation by air sparging are moderate and include installation of the injection well points, equipment purchase, and construction of the system. O&M costs associated with this remedy include electricity costs, monthly system inspection and calibration, periodic maintenance and equipment repair or replacement. It is anticipated that the system will only need to be used intermittently for no more than 10 years.

Table 3-2 includes a summary of all costs for the selected remedy. Costs are broken down into capital and O&M and assumed over a 30-year post-closure period. The financial source for the remedy will come from the County's Enterprise Fund or through the County's Capital Improvements Project budgets. Financial assurance was

provided in the *North Carolina Solid Waste Groundwater Corrective Action Permit Modification Application (CDM, December 2009)*.

Ability to Meet the Corrective Measure Objectives

This remedy is protective of human health and the environment due to the institutional controls currently in place and the fact that all existing monitoring wells will continue to be monitored semi-annually. MNA alone will not immediately attain the groundwater protection standard as specified in .1636(b)(2). However, conditions are favorable for natural attenuation and will be supplemented in the areas of MW-6/6d and MW-36/36d with air sparging to reduce contaminant concentrations above the NC2L Standard in shallow fractured bedrock and beyond the property line. MNA paired with air sparging should eventually result in attainment of the groundwater protection standards across the site.

Neither MNA nor air sparging control the source but should prevent migration of VOCs in the fractured bedrock and beyond the landfill perimeter. The existing landfill cap reduces the amount of leachate generated and the gas recovery system decreases the rate of plume migration and reduces the amount of VOCs in the waste.

Table 3-2
Estimated Corrective Measures Costs

Selected Remedy Capital Costs Estimate
Insitutional Controls, Monitored Natural Attenuation, Gas Recovery with Air Sparging

Item	unit cost	quantity	cost
None - System Already Operational	$0	lump sum	$0
Air Sparging Pilot Testing	$45,000	lump sum	$45,000
Install Final Air Sparging Injection Wells (assume 20 ft ROI)	$2,500	20 wells	$50,000
Piping	$35	700 feet	$24,500
5 hp compressor and housing	$10,000	lump sum	$10,000
Fittings/Gauges/Metering	$4,500	lump sum	$4,500
Air Hose	$8	800 LF	$6,400
PVC pipe in trench	$20	800 LF	$16,000
Power supply	$5,000	lump sum	$10,000
Subtotal			*$166,400*
Engineering Costs (15%)		lump sum	$24,960
Total Direct Capital Costs (2010 Estimate)			**$191,400**

Selected Remedy - Operations and Maintanence Costs Estimate
Insitutional Controls, Monitored Natural Attenuation, Gas Recovery with Air Sparging

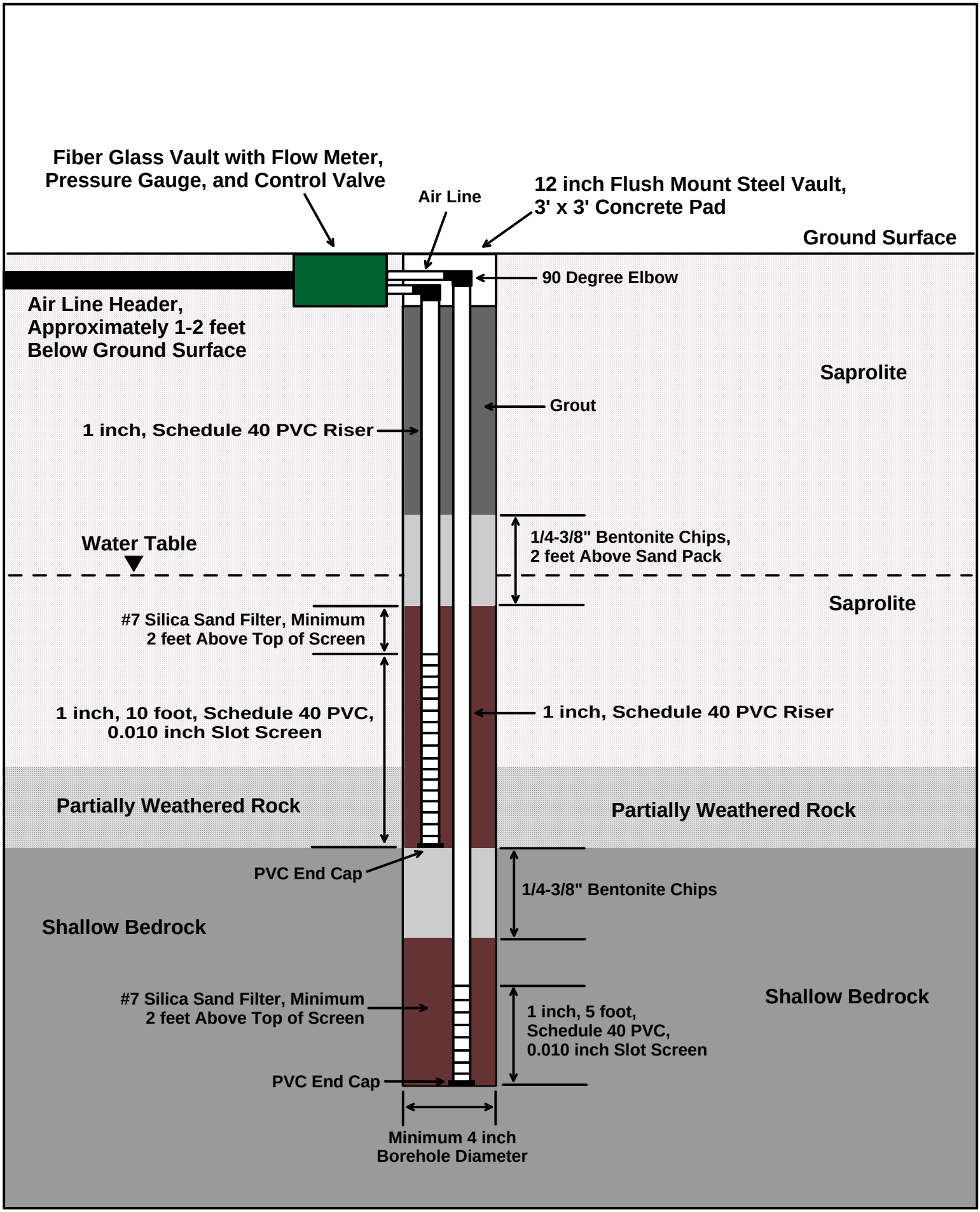
Item	unit cost	quantity	cost
Lab Analysis for MNA Constituents[1]	$660	14 samples[2]	$9,240
Annual Effectiveness Report	$2,000	lump sum	$2,000
Periodic Monitoring and Adjustment of Gas Recovery System	$3,000	monthly	$36,000
Monthly Air Sparging System O&M	$1,500	monthly	$18,000
Electrical costs	$10,000	lump sum	$10,000
Air sparging system parts	$5,000	lump sum	$5,000
Replacement of Access Restricting Signs	$50	5 per year	$250
Annual Total (2010 Estimate)			**$80,500**
Present Worth (year 2010 Dollars)[3]			**$998,925**

[1] Semi-annual analysis to include: alkalinity, BOD, COD, CO2, chloride/nitrate/sulfate, dissolved hydrogen, ferrous iron, methane/ethane/ethene, sulfide, TOC, volatile fatty acids.

[2] Based on 7 wells per event (MW-5R, -6, -8, -9, -10, -11, 36), 2 events per year

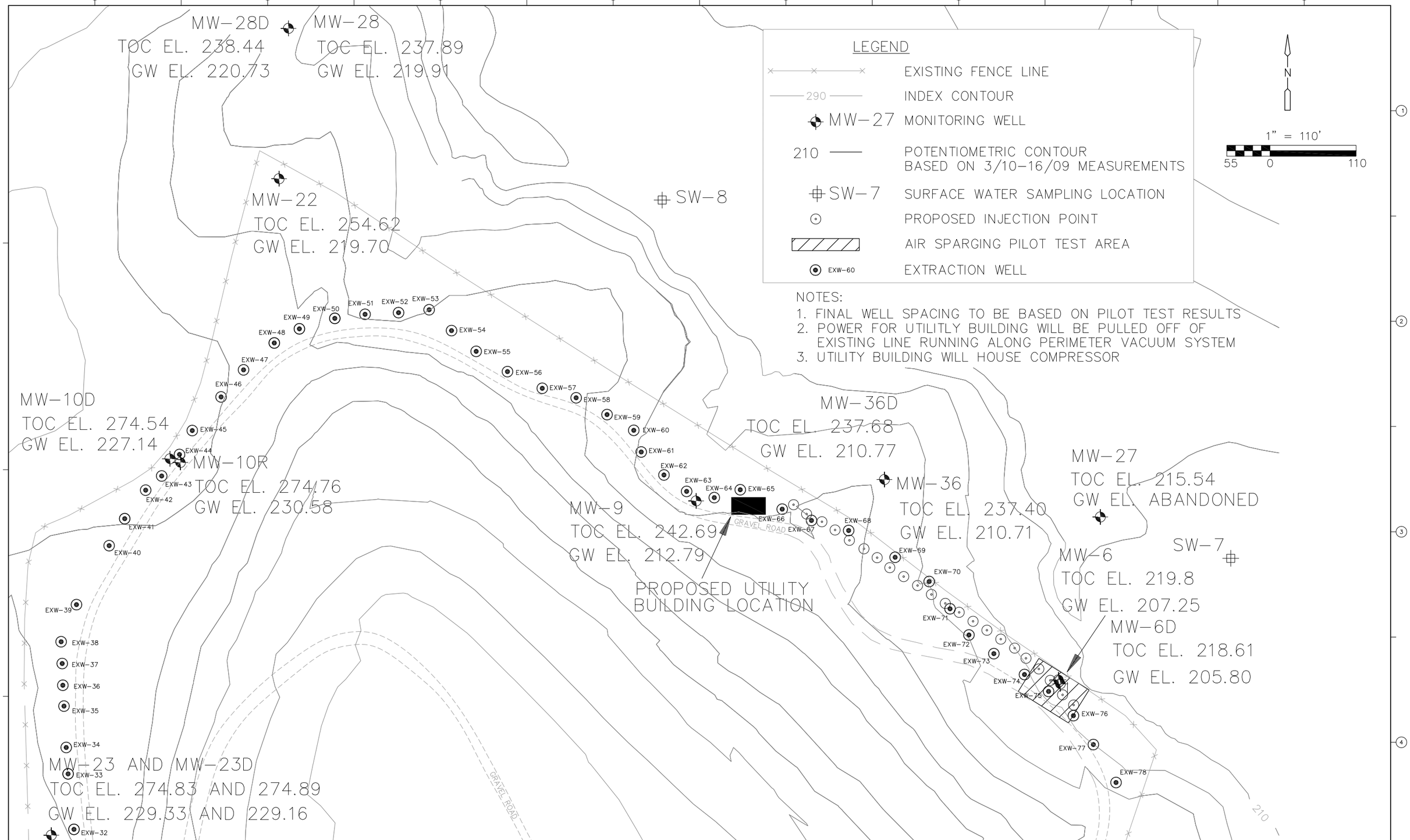
[3] 30 years at 7.00%

The calculation of present worth does not account for inflation.



CDM

Figure 3-1
Air Sparge Well Construction Diagram



NOTES:
1. FINAL WELL SPACING TO BE BASED ON PILOT TEST RESULTS
2. POWER FOR UTILITLY BUILDING WILL BE PULLED OFF OF EXISTING LINE RUNNING ALONG PERIMETER VACUUM SYSTEM
3. UTILITY BUILDING WILL HOUSE COMPRESSOR

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: A. WEISPFENNING
DRAWN BY: J. KILLINGSWORTH
SHEET CHK'D BY: M. COLONE
CROSS CHK'D BY:
APPROVED BY:
DATE: MARCH 2010

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WAKE COUNTY
NORTH CAROLINA
NORTH WAKE UNLINED LANDFILL
CORRECTIVE ACTION PLAN

PROPOSED AIR SPARGING SYSTEM LAYOUT

PROJECT NO. 6172-71371
FILE NAME: CAP 3-2.dwg

FIGURE
3-2

Chapter 4
Groundwater and Surface Water Monitoring

4.1 Purpose

The purpose of this Water Quality Monitoring Plan is to address the requirements in Rule .1623(b)(3)(B), and to present a plan for groundwater and surface water monitoring for the North Wake Unlined Landfill. The Water Quality Monitoring Plan includes information on the existing groundwater monitoring network, surface water monitoring plan, sampling and analysis requirements, and monitoring requirements. The groundwater monitoring network was designed based on information obtained from previous subsurface investigations and a review of literature pertaining to regional geology and groundwater resources.

4.2 Scope

The Water Quality Monitoring Plan includes the following elements, in accordance with Rules .1630 through .1637 of the North Carolina Administrative Code:

- Design and installation of a groundwater monitoring system, based on site-specific information, to yield groundwater samples from the uppermost aquifer that represents the quality of the background groundwater that has not been affected by landfill activities or other man-made activities.
- Design and installation of groundwater monitoring system, based on site-specific information, to yield groundwater samples from the uppermost aquifer that represent the quality of groundwater passing the relevant point of compliance.
- Monitor wells designed and constructed in accordance with the applicable North Carolina Well Construction Standards as found in 15A NCAC 2C.
- A Sampling and Analysis Plan that includes procedures and techniques for sample collection, sample preservation and shipment, analytical procedures, chain-of-custody procedures, and quality assurance and quality control.
- A statistical analysis methodology to be applied to the groundwater monitoring data in order to evaluate and demonstrate compliance with the groundwater performance standards, once sufficient analytical data is collected.

4.3 Geologic Setting

The North Wake Landfill is located in the Raleigh Belt of the Piedmont Physiographic Province. The Piedmont Physiographic Province in North Carolina is characterized by gentle to steep, hilly terrain with small quantities of alluvium. Bedrock outcroppings are rare and typically consist of soil and saprolite. Saprolite is a clay-rich residual

material that is the product of in-place chemical weathering and leaching of bedrock. Saprolite is often characterized by bright colors, preserved structures and mineral fabric present in the rock before weathering. Soil is present as a thin mantle on top of saprolite or alluvium with a thickness usually on the order of 3 to 8 feet (Daniel, 1990). Beneath the saprolite is a transition zone of weathered bedrock. The thickness of regolith above unweathered bedrock averages about 52 feet, and in some cases may exceed depths of 100 feet (Daniel, 1990).

4.3.1 Regional Geology

The geology of Wake County is made up of three different rock assemblages. The eastern portion of the county is underlain by a complex group of metamorphic rocks (gneiss, schists, and phyllites) of Late Precambrian or Paleozoic age, with mafic and granitic intrusions. Rocks of this group belong to the Raleigh Belt and the Carolina Slate Belt. The second group consists of stratified sedimentary rocks of Triassic age separated from the older rocks (Carolina Slate/Raleigh Belts) by the Jonesboro Fault. The third group consists of coastal plain sediments located primarily in the southeastern portion of the county (Parker, 1979). The North Wake Unlined Landfill is located within the Raleigh Belt of the metamorphic rock group.

The North Wake Unlined Landfill is situated over the Raleigh Gneiss. West of the site and corresponding with the highest elevations in the vicinity, is the Falls Leucogneiss. Both of these rock occurrences demonstrate a southwest to northeast trend in outcrop. Immediately east of the site is the Gresham Lake Pluton. During a January 1998 site reconnaissance, the Raleigh Gneiss was observed to consist primarily of biotite gneiss and to a lesser degree hornblende gneiss. The gneiss demonstrates strong flow banding of compositional layers consisting of white, feldspar rich layers and quartz biotite layers. Granitoid orthogneiss was also observed within the north and south stream channels west of the site.

Although somewhat variable, the general strike of foliation in the Raleigh Gneiss in the site vicinity is from southwest to northeast, as mapped by Horton and others (1992). The foliation dips to the east from approximately 35° to 80°.

Relatively small diabase dikes, several feet wide, have also been identified south of the site during construction of the North Wake Lined landfill. These dikes have been mapped and generally trend from south to north. Should these dikes extend into the proximity of the site, they would be approximately parallel to the west boundary of the unlined landfill at a distance of approximately 400 feet.

Also noted during previous site reconnaissance was an extremely quartz rich gneiss in both the north and south streams. This rock appeared to be resistant to erosion/weathering relative to the surrounding rock and formed the creek channels into a series of small waterfalls for distances of approximately 75 feet. These two outcrops may potentially represent a continuous, resistant rock layer that forms a subsurface bedrock ridge aligned with the regional structure.

4.3.2 Site Geology

Site geology is based on previous well installation activities from the original groundwater assessment and the landfill gas perimeter recovery well installations. The subsurface geology at the site is highly variable. Generally, the site is covered by 4 to 6 inches of detritus, topsoil and rootmat. Underlying the topsoil is a layer of reddish brown silt/clay. This silt/clay is typically encountered up to depths of 7 to 17 feet below land surface (bls). The silt/clay is often underlain by a light brown, fine sandy silt saprolite with varying amounts of mica. Occasionally, zones of silty sand saprolite as pegmatite or granite are encountered below the silt/clay. Generally, the saprolite grades into partially weathered rock, with depth, to the top of bedrock. The depth to bedrock ranges from 15 to greater than 65 feet bls.

In some areas, a 4 to 6-inch cover of topsoil and rootmat is underlain by light to medium brown sandy silt alluvial deposits. This overburden varies from 5 to 15 feet in thickness. Below the alluvial layer, a layer of light brown sandy silt saprolite with varying amounts of mica is encountered.

Cuttings obtained during air-rotary drilling of some bedrock wells revealed bedrock which varied from schistose to granitic. Generally, the bedrock was highly weathered and fractured for the first 20 to 30 feet below auger refusal, however, one boring revealed highly fractured bedrock to depths of 90 feet bls.

4.3.3 Site Hydrogeology

The groundwater monitoring wells installed around the Unlined Landfill are generally completed to depths corresponding with the top of rock and are considered representative of the saprolite/transition zone. The surficial aquifer across the site is located within the saprolite/transition zone. Several monitoring wells have been installed in the deeper bedrock aquifer across the site as part of the groundwater assessment.

Figure 1-1 provides groundwater potentiometric surface contours in the saprolite/transition zone based on water level data obtained from the monitoring wells during the March 2009 semi-annual sampling event. The potentiometric surface data are provided in **Appendix A** on **Table 1**. The potentiometric surface contours indicate an easterly groundwater flow direction with localized flow towards the small creeks to the north and south, coincident with the site topography prior to landfill activities. The small perennial streams to the north and south appear to act as groundwater discharge features.

It is probable that groundwater elevations beneath the landfill are higher than those indicated by the figure because of a mounding effect almost invariably occurring beneath unlined landfills. As a result, radial groundwater flow away from the landfill has occurred. Typically, such radial flow patterns dissipate within relatively short distances, beyond which the groundwater assumes a more typical flow direction. Installation of the impermeable cap, which occurred in late 1997, has likely caused a reduction in the mounding of groundwater beneath the landfill.

In situ slug tests were performed on monitoring wells MW-5, -6, -7, -8, -9, -10, -22, -23, and -24 to measure transmissivity and horizontal hydraulic conductivity based on an assumed surficial aquifer thickness of 25 feet. Horizontal hydraulic conductivity ranges from 10.58 feet/day (ft/day) (3.73×10^{-3} centimeters/second (cm/sec)) in MW-6 to 0.07 ft/day (2.47×10^{-5} cm/sec) in MW-22. The average horizontal hydraulic conductivity for the surficial aquifer wells across the site is approximately 2.38 ft/day (8.74×10^{-4} cm/sec). Based on the average horizontal hydraulic conductivity of the surficial aquifer and an assumed aquifer thickness of 25 feet, the transmissivity of the surficial aquifer is approximately 60ft^2/day.

Average linear velocity values are calculated for these wells based on assumed surficial aquifer thicknesses for the slug tests during each semi-annual sampling event. Average linear velocity values for these wells from November 2005 to March 2009 are provided in **Appendix A** on **Table 2**. During the last groundwater sampling event in March 2009, linear velocity values ranged from 1.65 ft/day in MW-6 to 7.04×10^{-3} ft/day in MW-22.

4.4 Groundwater Monitoring Network

This section discusses the current groundwater monitoring network for the Closed Landfill. Section 4.4.1 discusses monitoring well locations, Section 4.4.2 discusses monitoring well installation and construction specifications, Section 4.4.3 discusses hydraulic conductivity testing of the monitoring wells, and Section 4.4.4 is the surface water quality monitoring plan.

4.4.1 Monitoring Well Locations

The SWS regulations require that upgradient monitoring well(s) be located so that groundwater samples collected from the uppermost aquifer provide an indication of background groundwater quality. Upgradient wells MW-11/11d were installed in April 1994 and monitor background water quality for the entire North Wake facility. The downgradient monitoring wells must represent groundwater quality at the relevant point of compliance. The wells must be located in similar geologic units so that upgradient and downgradient groundwater quality data can be compared.

Compliance monitoring wells MW-5, MW-6, MW-7, MW-8, and MW-9 were installed in March 1994. Additional compliance well MW-10 was installed in October 1995. Compliance wells MW-22, MW-23, and MW-24 were installed in June 2007. Assessment monitoring wells MW-23d, MW-27, MW-28, MW-28d, MW-29d, MW-30, MW-31, MW-31d, MW-32, MW-33, MW-34, MW-34d, MW-35, and TB-1a were installed between May and August 1998. Assessment monitoring wells MW-6d, MW-8d, MW-10d, and TB-1a deep were installed in June 2001. Assessment monitoring wells MW-36 and MW-36d were installed in November 2008.

No additional monitoring wells are proposed at this time. Existing well locations are provided on **Figure 1-1**.

4.4.2 Monitoring Well Installation and Construction

The monitoring wells are constructed in accordance with standard industry procedures and meet the requirements of 15A NCAC 2C. Monitoring well locations are provided on **Figure 1-1**.

4.4.3 Hydraulic Conductivity Testing

Following installation and development of the monitor wells, the hydraulic conductivity of the aquifer material surrounding each well was determined by conducting slug falling head and/or recovery tests on each well. During drilling operations, where possible, saturated soil samples were collected for laboratory testing of porosity.

4.4.4 Surface Water Quality Monitoring Plan

The current surface water monitoring plan consists of locations SW-2, SW-3, SW-7, and SW-8. No additional surface water sampling locations are recommended at this time. Surface water sampling locations are provided on **Figure 1-1**.

4.5 Sampling and Analysis Plan

Rule .1632 (a) specifies that the owner/operator must provide, as part of the groundwater monitoring program, a groundwater and surface water sampling and analysis (S&A) plan. The S&A plan should be designed to provide accurate results of groundwater quality at the upgradient and downgradient sampling locations. The S&A plan addresses the following subjects:

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

4.5.1 Groundwater and Surface Water Sample Collection

Groundwater samples will be collected from the background wells MW-11/11d, compliance wells MW-5R, MW-6, MW-6d, MW-7, MW-8, MW-8d, MW-9, MW-10, MW-10d, MW-22, MW-23, MW-23d, and MW-24, and assessment wells MW-29d, MW-30, MW-31, MW-31d, MW-32, TB-1a, and TB-1a deep on a semi-annual basis. In addition, assessment monitoring wells MW-28, MW-28d, MW-33, MW-34, MW-34d, MW-35, MW-36, and MW-36d will be sampled on an annual basis during the Spring events. Surface water samples will be collected from SW-2, SW-3, SW-7 and SW-8 on a semi-annual basis. Sample locations are provided on **Figure 1-1**.

4.5.1.1 Static Water Level Measurements

Static water level elevations will be measured from the upgradient wells, or least contaminated wells, to the downgradient or wells with the highest contaminant levels prior to any purging or sampling activities. Static water level 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:

- Height of the well measuring point above ground surface
- Depth of water in the well from the TOC measuring point (to the nearest 0.01 foot)
- Total depth of the well
- Height of the water column in the well casing

An electronic water level indicator will be used to accurately measure water elevations to within 0.01 foot within the same day in as short a period of time as possible. The water level indicator will be decontaminated between each reading using a phosphate-free rinse. 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 North Carolina Registered Land Surveyor.

4.5.1.2 Detection of Immiscible Layers

EPA's Technical Manual for Solid Waste Disposal Facility Criteria (U.S. EPA, 1993) outlines specifications for groundwater sampling and analysis. One of these specifications outlines the establishment of provisions for detecting immiscible fluids, if applicable. Typically, immiscible fluids are categorized as either, (1) light, non-aqueous phase liquids (L-NAPLs), or (2) dense, non-aqueous phase liquids (D-NAPLs). L-NAPLs are more commonly referred to as "floaters" due to their relatively lighter specific gravity, while D-NAPLs are typically referred to as "sinkers" due to their relatively denser specific gravity.

The following procedure is proposed to address these concerns in the event that the SWS ever requires this test to be performed. In those instances where the monitoring well's screened interval encompasses the water table surface, the ability to detect and sample NAPLs prior to implementation of routine groundwater sampling activities may exist. To accomplish this objective, a transparent teflon bailer will be lowered into the well to just below the water table surface. The bailer will then be removed from the well and the contents examined to identify if any immiscible fluids are present. If any immiscible fluids are determined to be potentially present, an interface probe is proposed to be used. The depth of the light phase immiscible layer, as determined by the interface probe, will then be recorded in a field logbook. The interface probe will continue to be lowered until it intersects the groundwater table surface. The depth of the organic/water interface zone also will be recorded. From these two measurements, the thickness of the light phase immiscible layer can be readily determined.

The potential presence of dense phase immiscible layer will be determined by the examination of laboratory analytical results. Analytical results above a percentage of a given chemicals solubility limit can indicate the potential presence of NAPLs.

Monitoring for immiscible phase fluids is not envisioned to be performed during typical sampling events, but is provided here to document how the test will be performed if the SWS requires it at a future date.

4.5.1.3 Monitoring Well Evacuation

Following measurement of the static water level 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, will be removed to ensure that fresh formation water can be sampled. A minimum of three well casing volumes will be removed prior to sampling the well. The well volume for 2-inch diameter wells will be calculated using the following equation: one well volume in gallons equals the height of the water column (in feet) times 0.1632 (slightly less than 0.5 gallons per foot water for 3 casing volumes). During the well purging process, field measurements (pH, temperature, specific conductance, dissolved oxygen, and oxidation/reduction potential) will be collected at regular intervals, and reported in a tabular format. The well will be purged until field measurements stabilize within approximately 10 percent between subsequent readings 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, conductivity, dissolved oxygen, and oxidation/reduction potential will be obtained by using a YSI 556 multi-parameter water quality meter or equivalent.

If the well is purged to dryness, the samples will be collected after a sufficient volume of water has entered the well to allow collection of the sample. Wells will be purged using a new, manufacturer decontaminated teflon bailer with new nylon rope or an acceptable pumping device approved by the SWS. Field measurements collected during purging activities will be recorded in the field logbook.

4.5.1.4 Sample Collection

After purging activities are complete, groundwater samples will be collected for laboratory analysis. The wells will be sampled using manufacturer teflon bailers equipped with new nylon rope. Bailers will be used for one well only. Field decontamination of bailers will not be permitted. Disposable bailers will only be used if laboratory decontaminated standard teflon bailers or peristaltic pumps are not available. The bailers will be lowered slowly into the well to minimize sample agitation. Sample water will be placed directly into sample bottles provided by the analytical laboratory, using the following method:

1. Retrieve bailer and slowly transfer sample water to the appropriate sample container. The bailer should not be allowed to touch the sample container. If dedicated pumps are used, the pump discharge rate will be lowered to a rate that will not agitate or volatize the samples.

2. The sample container for the volatile organic compounds should be filled first, leaving no headspace or air bubbles. The container should then be tightly sealed. The sample container will come with preservative already added by the laboratory.

3. The sample containers for bis(2-ethylhexyl)phthalate, pesticides, and herbicides should then be filled. There are no preservatives for these bottles. The containers should be filled to the bottle shoulder. Samples to be analyzed for bis(2-ethylhexyl)phthalate, pesticides, and herbicides shall only be analyzed in the Spring.

4. The sample container for the metals should then be filled. This container will also come with preservative added by the laboratory. This container should be filled to the bottle shoulder.

5. Samples for MNA indicator parameters will be filled last for wells MW-11, MW-5R, MW-6, MW-8, MW-9, MW-10, and MW-36. Where applicable, all containers will come pre-preserved.

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. Hold the bottle near the bottom with one hand, and with the other, remove the cap.

2. Push the sample container slowly into the water and tilt up towards the current to fill. A depth of about six inches is satisfactory. Avoid breaching the surface while filling the container.

3. The container should be moved slowly, in a lateral direction, if there is little current movement.

4. If the stream depths are too shallow to allow submersion of the sample container, a pool may be scooped out of the channel bottom and allowed to clear prior to sampling.

5. Lift the container from the water and place the uncontaminated cap on the container.

The wells and surface water stations will be sampled in the order of potential for increasing contamination levels beginning with the upgradient (background) sampling location MW-11 and concluding with the downgradient well MW-9. The individual water samples will be collected and bottled in the order of parameter volatility. The collection order for the samples will be as follows:

- VOCs,

- Semi-volatile organic compounds (SVOCs), pesticides, and herbicides,
- Total metals,
- MNA indicator parameters (wells MW-11, MW-5R, MW-6, MW-8, MW-9, MW-10, and MW-36 only).

The samples will be transferred from the sampling equipment directly into a prepared sample container provided by the laboratory. Field filtering of samples is not permitted. There will be a specific size and type of container provided for each constituent to be analyzed. Containers and preservatives for each analysis are provided below:

Table 4-1
Analytical Analysis Sample Container Summary
North Wake Unlined Landfill

Analysis	Container Size	Preservative
VOC	40 ml Glass Vial (3)	HCl
SVOC	1 Liter Amber Glass	None
Metals	500 ml HDPE (1)	HNO_3
Pesticides	1 Liter Amber Glass (2)	None
Herbicides	1 Liter Amber Glass (2)	None
Alkalinity	125 ml HDPE (1)	None
Biochemical Oxygen Demand	1000 ml HDPE (1)	None
Chemical Oxygen Demand	500 ml HDPE (1)	H_2SO_4
Carbon Dioxide	500 ml HDPE (1)	None
Chloride/Nitrate/Sulfate	125 ml HDPE (1)	None
Dissolved Hydrogen	MicroSeeps Vial	None
Ferrous Iron	125 ml HDPE (1)	HCl
Methane/Ethane/Ethene	40 ml Glass Vial (2)	None
Sulfide	500 ml HDPE (1)	NaOH/ZnAc

Total Organic Carbon	40 ml Glass Vial (2)	HCl
Volatile Fatty Acids	2 40 ml Glass Vial (2)	None

Appendix II constituents (bis(2-ethylhexyl)phthalate, pesticides, and herbicides) are only collected from select wells during the Spring sampling events. Bis(2-ethylhexyl)phthalate samples are to be collected from MW-11, MW-11d, MW-6, MW-7, MW-9, MW-10, MW-10d, MW-22, MW-23, MW-23d, MW-24, MW-28d, MW-29d, MW-31d, MW-34d, MW-36, MW-36d. Pesticides are to be collected from MW-11, MW-11d, MW-5R, MW-6, MW-9, MW-22, MW-28, MW-29d, MW-30, MW-31, MW-33, MW-36, MW-36d, and TB-1a. Herbicides are to be collected from MW-11 and MW-11d, MW-5R, MW-6, MW-9, MW-22, MW-28, MW-29d, MW-30, MW-31, MW-33, MW-36, MW-36d, and TB-1a.

Extra containers will be provided in case of accidental breakage. All field personnel will wear protective latex or nitrile disposable gloves in order to prevent extrinsic contamination from clothing, body oils, dirt, and other various contaminants. Sample documentation requirements to ensure sample integrity, will included sample locations, date and time of sample collection, proper analysis, and preservative (if applicable).

4.5.1.5 Decontamination Procedures

All sampling and purging equipment that will come in contact with the well casing and water will be decontaminated per specifications in the North Carolina Water Quality Guidance Document for Solid Waste Facilities (SWS, 2008). All sampling equipment will be laboratory cleaned. If necessary, the following decontamination procedures will be used for sampling equipment as outlined in the North Carolina Water Quality Monitoring Guidance Document for Solid Waste Facilities:

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 with 10% nitric or 10% hydrochloric acid.

4. Rinse thoroughly with deionized or distilled water and allow to air dry

5. Rinse thoroughly with high grade isopropanol and allow to air dry

6. Wrap with aluminum foil, if necessary, to prevent contamination of equipment during storage or transport.

4.5.2 Sample Preservation and Shipment

In order to ensure sample integrity, preservation and shipment procedures will be carefully monitored. Generally, ice and chemical additives will be used as sample preservatives, as recommended by the commercial laboratory. For VOC analysis, hydrochloric acid will be used as the preservation method as well as maintaining the samples at a temperature of 4°C. Nitric acid will be used as the preservative for samples needing metals analysis. If the analytical laboratory is located some distance from the site, samples shall be shipped via a 24-hour delivery service to ensure holding times are not exceeded. Shipment of samples will be coordinated with the laboratory.

Proper storage and transport conditions must be maintained in order to preserve the integrity of the sample. Once taken, samples will be placed on ice and cooled to a temperature of 4°C. Samples are to be packed in iced coolers so as to inhibit breakage or accidental spills. Custody seals will be placed on the outside of the cooler, in a manner to detect tampering of the samples. The laboratory shall immediately notify the owner/operator of any samples that arrive with custody seals broken.

4.5.3 Analytical Procedures

The samples taken from each well and from the surface water sampling locations will be analyzed for the constituents listed in 40 CFR Part 258, Appendix 1. The analytical procedures for the indicated parameters will be conducted using the following methods:

Analysis	EPA Method Number
VOCs	8260
Bis(2-ethylhexyl)Phthalate	8270
Pesticides	8081
Herbicides	8151
Total metals	6010/6020/7470
Alkalinity	SM 2320B
BOD	SM 5210B
COD	SM 5220D
Carbon Dioxide	SM 4500
Chloride/Sulfate/Nitrate	IC 300
Dissolved Hydrogen	AM20GAX

Ferrous Iron	SM 3500
Methane/Ethane/Ethene	RSK-175
Sulfide	SM 4500
Total Organic Carbon	9060
Volatile Fatty Acids	AM21G

4.5.4 Chain-of-Custody

It is imperative that an accurate record of sample collection, transport, analysis, and disposal be maintained and documented. Therefore, chain-of-custody procedures will be instituted and followed throughout the sampling program. It is necessary to establish documentation to trace sample possession from the time of collection until disposal. The chain-of-custody program shall include the following requirements:

- Samples shall be accompanied by a chain-of-custody record that notes the date and time of collection as well as sampling personnel.
- All samples shall be properly labeled to prevent misidentification of samples.
- Field notes shall be included to provide pertinent information about each sample.
- A sample analysis sheet shall accompany all samples to the laboratory.
- Sample custody seals shall be used to indicate any tampering of samples.
- All records pertaining to the shipment of a sample shall be retained (freight bills, post office receipts, and bills of lading).

The laboratory shall not accept samples for analysis without a correctly prepared chain-of-custody form. The laboratory shall be responsible for maintaining chain-of-custody of the sample(s) from time of receipt to disposal. The chain-of-custody form shall be signed by each individual who possesses the samples.

To prevent sample misidentification, a label will be affixed to each sample container in a manner as to prevent the label from becoming dislodged during transport which will contain the following information:

- Sample identification number,
- Name and signature of sample collector,
- Date and time of collection,
- Place of collection,

- Parameters requested,
- Type of preservative.

In addition the container itself should be labeled with the sample identification number (at a minimum) to allow for identification should the label fall off.

4.5.5 Quality Assurance/Quality Control

The reliability and validity of the field and analytical laboratory data will be monitored as part of the QA/QC program used in the laboratory. Field duplicates and sample blanks will be collected to check sampling protocol and to account for any changes that occur after sampling. The QA/QC program will stipulate the use of standards, laboratory blanks, and duplicates for identification of matrix interferences.

Field Duplicates
Field duplicates provide a measure of field and laboratory precision. Field duplicates will be collected from identical locations using proper sampling procedures. The duplicate samples will be collected at a frequency of one per day per sampling event.

Equipment Rinsate Blanks
To evaluate the effectiveness of the decontamination procedures, equipment rinsate blanks will be collected. The sample will be collected by passing distilled water through the sampling equipment after decontamination has been completed. Equipment blanks will be collected at a minimum of one per day of groundwater sampling activities.

Trip/Travel Blanks
A trip/ travel blank shall be prepared to account for any sample contamination that may occur during transport to and from the site. The trip/travel blank will be placed in the sample cooler whenever samples are being analyzed for VOCs. The sample will be prepared in the laboratory with deionized or distilled water and shall accompany the sample shipping container to the field. The trip/travel blank shall remain unopened until receipt by the lab for analysis. One trip blank per shipping container will be collected.

4.5.6 Health & Safety

A Health & Safety plan that conforms to local, state, and federal regulations will be followed during groundwater and surface water sampling activities. Personal Protective Equipment required for sampling activities will consist of weather appropriate clothing, steel-toed boots, eye protection, and clean, disposable, powder-free gloves. New gloves will be worn for each well or surface water sampled. An example of a Health & Safety plan is provided in **Appendix D**.

Decontamination procedures will be used for sampling equipment as outlined in the North Carolina Water Quality Monitoring Guidance Document for Solid Waste Facilities (SWS, 2008). A summary of the procedures is provided in Section 4.5.1.5.

In accordance with the Division of Water Quality guidelines, purge and decon water generated during sampling activities will be discharged adjacent to the monitoring well. Spent PPE will be placed in large plastic trash bags, segregated to prevent cross contamination, and disposed in an onsite receptacle.

4.6 Statistical Evaluation

The North Carolina SWS requires that the owner or operator of a landfill specify a statistical method outlined in .1632(g) to evaluate groundwater 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. The North Carolina Solid Waste Management Rules provide several methods for statistical analysis of groundwater 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. An alternative statistical test method that meets the performance standards of Rule .1632(g).

Statistical evaluation of monitoring data will be performed for the duration of the monitoring program, including the post-closure care period. This section proposes a valid statistical approach to meet the SWS requirements. 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 constituent in each well. The statistical method is based on the EPA's Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Interim Final Guidance Document (1989).

4.6.1 Method of Analysis

The statistical evaluation of the groundwater analytical data will involve comparisons of analytical data obtained from the background (upgradient) wells and analytical data obtained from the compliance (downgradient) wells. The EPA recommends the ANOVA method for statistical evaluation when the amount of analytical data is limited. If at any time during monitoring activities, more than 50 percent of the data values are below the detection limit, comparison analysis will be conducted using a test of proportions.

4.6.2 Background Well to Compliance Well Comparisons

For this monitoring plan, the relevant data comparison will be between background well data (MW-11 or MW-11d) and the downgradient compliance or assessment well data. The data from the downgradient wells will be statistically analyzed against the

background well to determine any statistical evidence of exceedences of the groundwater standards. In some instances, an intra-well comparison may be used.

Since the ANOVA method has been chosen for the initial statistical data analysis, the assumption of equal variance and normality within the data must be confirmed. Normality of the concentration data will be checked by calculating the coefficient of variation of the data. Bartlett's test will be used to determine the variance equality. Data sets that do not follow a normal distribution will be transformed to a log normal distribution.

Once more data becomes available, a tolerance level approach may be used. The tolerance level method uses background well data to define tolerance limits for comparison with compliance well data.

4.6.3 Analysis of Variance

Contaminant concentrations in individual wells vary based on several factors, including proximity to the source, groundwater velocity, and lithology. Contamination from a landfill can be compared as differences in average concentration at each well. These differences can be accurately detected by the ANOVA method. For the parametric one-way analysis of variance to yield reliable results, a minimum number of observations are required. It is recommended that data sets from at least two or more wells be used in the comparisons. It is also required that each well have a minimum of three data sets. The analysis will be performed for a 5 percent significance level.

4.6.4 Tolerance Intervals

The tolerance interval will be developed based on background well data. The compliance well data will be compared to the tolerance interval. Compliance well data that fails to fall within the tolerance interval indicates statistically significant evidence of contamination. A sample size of eight or more results will be used to define the tolerance interval. Tolerance levels will be developed assuming that the data or the transformed data are normally distributed. The tolerance interval will include a coverage percentage of 95. A confidence level of 95 percent will also be used during the tolerance level analysis.

4.6.5 Results/Reporting Requirements

In accordance with Rule .1632(j), within 14 days of completing the statistical analysis for the analytical data from groundwater samples, a report shall be submitted to the SWS which includes the following information:

- Field observations related to the condition of the monitoring wells,
- Field data,
- Laboratory data,

- Statistical analysis,
- Sampling methodologies,
- Quality assurance/quality control data,
- Information on groundwater flow,
- Wells with constituents exceeding groundwater standards or show a statistically significant increase over background,
- Other pertinent information.

4.6.6 Detection of Elevated Constituent Levels

If upon completion of sampling and statistical analysis, it is determined that a statistically significant increase over background for one or more of the metals listed in Appendix 1 exists, or, if concentrations are elevated above the 2L Standard or practical quantification limit for any VOC listed in Appendix 1 at any monitoring well or surface water sample at the site's boundary, then:

(1) The county will notify the SWS within 14 days of this finding,

(2) Place a notice in the operating record within 14 days of this finding indicating which constituent(s) have demonstrated a statistically significant change from background,

(3) Resample the monitoring well(s) in question within 30 days of this finding for Appendix 1 constituents to determine the validity of the data; and

(4) An assessment monitoring program shall be established within 90 days of determination of a statistical increase or exceedence of the NC Groundwater Standards.

(5) Demonstrate successfully to the SWS (through certification by a qualified groundwater scientist) that a source other than the MSWLF unit caused the contamination, or that the statistically significant increase resulted from error in sampling, analysis, statistical evaluation or natural variation in groundwater quality.

The actions outlined above are proposed to be implemented if contaminants are detected. Final actions will be mandated by direction of the North Carolina SWS.

Chapter 5
Evaluation of Effectiveness and Report Submittals

5.1 Physical Changes in Aquifer Conditions

Injection of air into the aquifer should not produce any physical changes in aquifer conditions.

5.2 Chemical Changes in Aquifer Conditions

Injection of air into the aquifer should not produce any chemical changes in the naturally occurring aquifer conditions.

5.3 Physical Changes in Plume Characteristics

Injection of air should serve to eliminate the chlorinated solvent plume downgradient of the system.

5.4 Chemical Changes in the Plume

Injection of air should serve to eliminate the chlorinated solvent plume downgradient of the system by enabling a phase transfer of the VOC from a dissolved state to a vapor phase. The vapor will then be recovered by the perimeter gas recovery system.

5.5 Refining the Site Conceptual Model

The conceptual model will be refined as necessary based on the semi-annual sampling results conducted after installation of the system.

5.6 Report Submittals

The effectiveness of the remedy will be evaluated by review of the semi-annual groundwater quality data from the existing monitoring wells. As required, groundwater and surface water sampling reports will be submitted to the Solid Waste Section on a semi-annual basis. The semi-annual reports will include data tables with laboratory reports and a groundwater elevation contour map. An isoconcentration contour map will be submitted annually along with an evaluation of the corrective action effectiveness in the semi-annual reports. After 5-years, a stand-alone Evaluation of Effectiveness report will be prepared to determine if the selected remedies are working to reduce VOC concentrations. The Evaluation of Effectiveness Report will also determine if the contingency or alternative corrective plan is necessary.

Chapter 6
Contingency Plan

If the approved corrective action does not appear to be effectively reducing the groundwater contamination concentrations at the site horizontally and vertically, then the contingency plan will need to be implemented.

The events that would trigger initiation of the contingency plan include:

- Increasing concentrations of VOC in the downgradient monitoring and assessment wells,
- Detections of VOC above their respective NC2L Standards in assessment wells near the landfill property boundary,
- Increased detection of VOC in downgradient surface water sampling stations.

The contingency plan will be implemented in the approved time frame should any one of the triggering events be encountered. VOC concentrations from compliance monitoring wells MW-6/MW-6d, MW-10/MW-10d, MW-22, MW-23/MW-23d, MW-24, assessment wells MW-36/MW-36d, and downgradient surface water sample locations SW-6 and SW-7 will be used in evaluating the need to implement the contingency plan.

The contingency plan for the site will consist of the existing institutional controls, gas recovery and landfill cap in conjunction with in situ remediation by anaerobic bioremediation or chemical oxidation and/or groundwater extraction and monitored natural attenuation. If it is determined that the air sparging system in the vicinity of MW-9 and MW-6 is not effectively remediating the VOC in groundwater or retarding the rate of contaminant migration, the injection wells will be used to introduce an alternative reagent into the groundwater. The selection of the alternative reagent will be based on the monitoring data and additional data analysis.

The groundwater extraction plan will be used only if in situ treatment is found to be ineffective. Groundwater would be extracted from the surficial and shallow fractured bedrock aquifer through recovery wells located in the vicinity of MW-9 and MW-6, and possibly through the injection wells. Collected groundwater would likely be discharged to an onsite treatment system. Further analysis would be required to evaluate system design and layout.

If it is determined that the selected remedy of MNA with institutional controls and landfill gas recovery coupled with air sparging is not sufficient, the contingency plan will be initiated. If the contingency plan is deemed necessary, Wake County will submit an addendum to the Corrective Action Plan to the SWS within 90 days that will include a detailed work plan of the enhanced anaerobic bioremediation, chemical

oxidation injection, or groundwater recovery system, including a technical approach and O&M Plan prior to injection or installation the groundwater recovery system.

Chapter 7
Schedule and Maintenance

7.1 Timeline

The timeline is as follows:

- CAP approval by SWS,
- May/June 2010; drilling / pilot test well installation,
- June 2010; initial pilot test,
- June - August 2010; evaluation of pilot test, final well spacing determination and system installation,
- August 2011; one year annual evaluation (annual evaluation thereafter and determination if system can be shut down), and
- August 2015; five year thorough evaluation of remedy.

7.2 Operation and Maintenance

Air sparging is an active remediation technology and therefore there is associated operation and maintenance. It is anticipated that monthly site visits will be necessary to check the compressor, make adjustments to the air sparging or perimeter landfill gas recovery system, or equipment replacement. Wake County is responsible for maintaining access to the wells and accompanying system. Johnny Beal or Lee Squires will serve as the County solid waste representative and can be reached at (919) 518–0272 or (919) 518-0274.

7.3 Safeguard Measures and Site Security

Site access controls including fences and locking gates limit unauthorized people from being on the premises. All injection wells will have flush-mounted locking well-head covers. The air compressor will be housed in a building with a locked door. All associated piping will be buried. Vapor generated will be captured by the perimeter landfill gas recovery system. An approved health and safety plan, shown in **Appendix D**, will be followed during remedy implementation.

7.4 Modifications to Approved Corrective Action Plan

As stated in the SWS guidelines any requests for modifications of the approved corrective action and the implementation schedule must be submitted in writing to the SWS. The schedule may not be modified until approved in writing by the Division of Waste Management.

Chapter 8
Financial Assurance Requirements

Documentation of the financial assurance requirements was provided in the approved *North Carolina Solid Waste Permit Modification Application (CDM, December 2009)*.

Chapter 9
Completion of Corrective Action

As conditions at the site appear to be favorable for MNA, it is anticipated that a continued decline in contaminant trends will be seen over time. The MNA sampling and analysis will continue, in accordance with SWS rule .1637, until concentrations of the contaminants of concern, or any additional VOCs, are below the respective 2L Standards in the downgradient compliance wells and the bedrock wells in the MW-6d and MW-36d area.

It is anticipated that the air sparging system will be effective at decreasing the VOC concentrations below respective 2L Standards at the compliance boundary within 2 to 5 years. After 4 semi-annual sampling events with VOC concentrations below the 2L, the system will be shut down. It is possible that VOC concentrations in the compliance wells will rebound and the system will need to be restarted.

Groundwater sampling results will be evaluated and compared to SWS policy at the time of sampling to determine if any trends appear that suggest metal constituents above action levels resulted from a release by the landfill. Current levels of metals detected in groundwater do not warrant corrective action. However, if the sampling data indicates corrective action is necessary, remedial alternatives will be evaluated and provided to the SWS. After 4 consecutive sampling events with no exceedences, Wake County will consider the Corrective Action complete and will submit required documentation to that affect. The detection monitoring program will be implemented immediately after SWS approval of the termination of the corrective action program.

Appendix A

Site Groundwater Data Tables

Table 1
Water Quality Field Parameters - December 2009
North Wake Unlined Landfill

	Field Measurements						Groundwater Elevations		
Monitoring Well I.D.	pH (-)	Conductivity (µS)	Temperature (deg. C)	Turbidity (NTU)	DO (mg/L)	ORP (-)	TOC Elevation (feet AMSL)	Depth to Groundwater (feet)	Groundwater Elevation (feet AMSL)
MW-5R	5.78	249	16.7	3	0.99	272.4	225.28	15.37	209.91
MW-6	6.23	1,321	17.6	10	1.44	90.1	219.80	11.25	208.55
MW-6d	6.20	202	16.6	81	1.34	216.5	218.61	11.87	206.74
MW-7	6.10	624	17.5	283	2.47	58.8	234.15	11.72	222.43
MW-8	6.11	172	17.5	58	1.28	82.5	226.38	10.28	216.10
MW-8d	6.19	177	15.9	1	3.58	170.7	226.16	11.61	214.55
MW-9	6.38	514	17.5	323	1.52	-7.3	242.69	30.05	212.64
MW-10	6.09	239	16.9	139	2.17	148.2	274.76	44.59	230.17
MW-10d	6.14	176	17.0	50	4.51	167.2	274.54	47.34	227.20
MW-11	5.79	109	16.4	>1,000	6.38	246.0	343.63	44.17	299.46
MW-11d	5.93	121	16.6	824	6.12	185.9	343.27	44.39	298.88
MW-22	5.88	208	15.5	>1,000	6.03	139.0	254.62	35.06	219.56
MW-23	5.79	98	15.6	>1,000	6.99	266.3	274.83	45.45	229.38
MW-23d	5.87	160	15.8	809	4.38	192.2	274.89	45.64	229.25
MW-24	5.70	123	16.3	>1,000	7.67	203.2	266.64	45.31	221.33
MW-27	**ABANDONED**						**ABANDONED**		
MW-28	**NOT SAMPLED**						**NOT SAMPLED**		
MW-28d	**NOT SAMPLED**						**NOT SAMPLED**		
MW-29d	5.84	171	15.9	25	5.98	212.6	275.06	42.01	233.05
MW-30	5.90	172	15.5	>1,000	6.57	237.9	282.32	51.07	231.25
MW-31	5.72	212	16.7	>1,000	5.89	263.0	261.67	32.91	228.76
MW-31d	6.08	210	17.0	82	3.06	240.7	260.92	32.35	228.57
MW-32	5.37	119	16.3	572	4.06	267.4	242.99	16.80	226.19
TB-1a	6.24	200	16.2	>1,000	1.97	88.1	255.05	28.33	226.72
TB-1a deep	6.00	190	16.3	174	1.56	154.6	256.01	30.47	225.54
MW-33	**NOT SAMPLED**						**NOT SAMPLED**		
MW-34	**NOT SAMPLED**						**NOT SAMPLED**		
MW-34d	**NOT SAMPLED**						**NOT SAMPLED**		
MW-35	**NOT SAMPLED**						**NOT SAMPLED**		
MW-36	5.74	241	15.3	>1,000	2.45	63.7	237.40	26.70	210.70
MW-36d	6.11	321	16.0	38	1.44	72.1	237.68	26.91	210.77
SW-2	7.09	80	12.6	62	9.68	159.4			
SW-3	7.76	116	12.3	125	10.22	97.1			
SW-7	7.05	93	12.5	63	10.20	165.1			
SW-8	7.51	94	12.1	84	10.10	137.5			

NOTES:
(1) AMSL - Above Mean Sea Level
(2) TOC - Top of Casing
(3) SW - Surface Water
(4) MW-27 was abandoned on November 24, 2008 in accordance with 15A NCAC 2C .0113
(5) MW-36/36d installed November 2008
(6) Monitoring wells MW-28, -28d, -33, -34, and -35 sampled yearly during the spring event

Table 2
Summary of Calculated Groundwater Flow Velocities
North Wake Unlined Landfill

	Sampling Date:		11/11/2005		4/13/2006		11/9/2006		4/17/2007		11/9/2007	
Monitoring Well Designation	Hydraulic Conductivity ft/day (cm/s)	Effective Porosity	Gradient	Average Linear Velocity (ft/day)	Gradient	Average Linear Velocity (ft/day)	Gradient	Average Linear Velocity (ft/day)	Gradient	Average Linear Velocity (ft/day)	Gradient	Average Linear Velocity (ft/day)
MW-5R	0.33 1.16E-04	0.18	0.0179	3.28E-02	0.0417	7.65E-02	0.0399	7.32E-02	0.0125	2.29E-02	0.0119	2.18E-02
MW-6	10.58 3.73E-03	0.13	0.0172	1.40E+00	0.0172	1.40E+00	0.0172	1.40E+00	0.0132	1.07E+00	0.0125	1.02E+00
MW-7	1.15 4.06E-04	0.18	0.0172	1.10E-01	0.0172	1.10E-01	0.0172	1.10E-01	0.0208	1.33E-01	0.0278	1.78E-01
MW-8	3.61 1.27E-03	0.18	0.0217	4.35E-01	0.0313	6.28E-01	0.0313	6.28E-01	0.0135	2.71E-01	0.0125	2.51E-01
MW-9	1.22 4.30E-04	0.30	0.0152	6.18E-02	0.0152	6.18E-02	0.0152	6.18E-02	0.0200	8.13E-02	0.0172	6.99E-02
MW-10	0.509 1.80E-04	0.05	0.0250	2.55E-01	0.0250	2.55E-01	0.0250	2.55E-01	0.0417	4.25E-01	0.0556	5.66E-01
MW-11	5.66 2.00E-03	0.13	0.0200	8.71E-01	0.0204	8.88E-01	0.0204	8.88E-01	0.0213	9.27E-01	0.0213	9.27E-01
MW-22	0.07 2.47E-05	0.18	0.0278	1.08E-02	0.0385	1.50E-02	0.0385	1.50E-02	0.0400	1.56E-02	0.0278	1.08E-02
MW-23	3.59 1.27E-03	0.30	0.0208	2.49E-01	0.0227	2.72E-01	0.0227	2.72E-01	0.0208	2.49E-01	0.0196	2.35E-01
MW-24	0.34 1.20E-04	0.30	0.0161	1.82E-02	0.0156	1.77E-02	0.0156	1.77E-02	0.0313	3.55E-02	0.0417	4.73E-02
MW-36	17.56 6.19E-03	0.30										
MW-36D	0.78 2.75E-04	0.10										

Notes:
(1) MW-36/36D installed November 2008

Table 2
Summary of Calculated Groundwater Flow Velocities
North Wake Unlined Landfill

	Sampling Date:		5/15-21/2008		11/5-08/2008		3/10-13/2009		12/02-04/2009	
Monitoring Well Designation	Hydraulic Conductivity ft/day (cm/s)	Effective Porosity	Gradient	Average Linear Velocity (ft/day)	Gradient	Average Linear Velocity (ft/day)	Gradient	Average Linear Velocity (ft/day)	Gradient	Average Linear Velocity (ft/day)
MW-5R	0.33 1.16E-04	0.18	0.0230	4.21E-02	0.0232	4.26E-02	0.0229	4.20E-02	0.0230	4.22E-02
MW-6	10.58 3.73E-03	0.13	0.0202	1.65E+00	0.0203	1.65E+00	0.0203	1.65E+00	0.0200	1.63E+00
MW-7	1.15 4.06E-04	0.18	0.0250	1.60E-01	0.0251	1.61E-01	0.0251	1.60E-01	0.0251	1.61E-01
MW-8	3.61 1.27E-03	0.18	0.0243	4.87E-01	0.0242	4.85E-01	0.0241	4.84E-01	0.0242	4.86E-01
MW-9	1.22 4.30E-04	0.30	0.0197	8.00E-02	0.0198	8.05E-02	0.0197	8.02E-02	0.0198	8.04E-02
MW-10	0.509 1.80E-04	0.05	0.0168	1.71E-01	0.0171	1.74E-01	0.0170	1.73E-01	0.0171	1.74E-01
MW-11	5.66 2.00E-03	0.13	0.0212	9.23E-01	0.0213	9.29E-01	0.0211	9.17E-01	0.0211	9.19E-01
MW-22	0.07 2.47E-05	0.18	0.0181	7.03E-03	0.0181	7.04E-03	0.0181	7.04E-03	0.0182	7.06E-03
MW-23	3.59 1.27E-03	0.30	0.0194	2.33E-01	0.0196	2.34E-01	0.0196	2.34E-01	0.0196	2.34E-01
MW-24	0.34 1.20E-04	0.30	0.0244	2.76E-02	0.0246	2.78E-02	0.0245	2.78E-02	0.0247	2.80E-02
MW-36	17.56 6.19E-03	0.30					0.0194	1.14E+00	0.0194	1.14E+00
MW-36D	0.78 2.75E-04	0.10					0.0193	1.50E-01	0.0193	1.51E-01

Notes:
(1) MW-36/36D installed November 2008

Table 3a
Detected Groundwater Constituents - Metals
North Wake Unlined Landfill

Monitor Well	Sample Date	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Nickel	Selenium	Silver	Tin	Thallium	Vanadium	Zinc
NC2L		**10**	**700**	**4***	**2**	**10**	**70***	**1,000**	**15**	**1**	**100**	**20**	**20**	**NE**	**0.28***	**3.5***	**1,000**
SWSL		**10**	**100**	**1**	**1**	**10**	**10**	**10**	**10**	**0.2**	**50**	**10**	**10**	**100**	**5.5**	**25**	**10**
MW-11	15-Apr-94		221				23	54	14							**50**	88
MW-11	11-May-94		146				19	55	14							**50**	83
MW-11	10-Jun-94		191				27	111	7.6		20					**90**	114
MW-11	3-Oct-94		143			**16**	26	74	8							**60**	85
MW-11	13-Jun-95																
MW-11	28-Sep-95	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW-11	31-Oct-95	11	842	**8**		**24**	**71**	331	**26**		87					**117**	314
MW-11	22-Mar-96						15			**1.8**						**51**	70
MW-11	29-Nov-96	35															
MW-11	22-Apr-97																130
MW-11	31-Oct-97																66
MW-11	11-May-98																
MW-11	8-Dec-98				**2.1**												
MW-11	14-Apr-99																
MW-11	30-Nov-99																
MW-11	5-Apr-00				1.2												
MW-11	18-Dec-00																
MW-11	18-Apr-01																
MW-11	27-Nov-01		311					16.5									29.7
MW-11	5-Apr-02																
MW-11	5-Nov-02																
MW-11	15-Apr-03																
MW-11	29-Oct-03																
MW-11	18-Nov-04																
MW-11	21-Apr-05																
MW-11	11-Nov-05																83
MW-11	14-Apr-06																
MW-11	10-Nov-06																82
MW-11	20-Apr-07																21
MW-11	8-Nov-07		332	2.1				39	12							**58**	113
MW-11	15-May-08		77.8J			5.4J		10.5	3.92J				4.48J		**5.63**	2.9J	16.1
MW-11	10-Nov-08		53.1J	3.03	0.35JB	2.73JB		5.94JB	9.78JB				4.02JB			1.14J	8.18J
MW-11	11-Mar-09		99.1JB	**6.29**	0.24J	4.39JB	6.51JB	13.6B	5.84JB				6.34JB			**20.3JB**	20.7
MW-11	3-Dec-09		412	2.36	0.022J	**14.9**	25.4	102B	**19.2**		14.5J	10.7				**99B**	120B
MW-11d	31-Oct-95				**2**												
MW-11d	22-Mar-96				1												
MW-11d	29-Nov-96		26														
MW-11d	22-Apr-97																54
MW-11d	31-Oct-97																26
MW-11d	11-May-98																69
MW-11d	8-Dec-98				1.9												
MW-11d	14-Apr-99																
MW-11d	30-Nov-99																
MW-11d	5-Apr-00																
MW-11d	18-Dec-00																
MW-11d	18-Apr-01																
MW-11d	27-Nov-01																
MW-11d	5-Apr-02									0.3							
MW-11d	5-Nov-02																
MW-11d	15-Apr-03																
MW-11d	29-Oct-03																
MW-11d	18-Nov-04																
MW-11d	21-Apr-05																
MW-11d	11-Nov-05																
MW-11d	14-Apr-06																
MW-11d	10-Nov-06															*	
MW-11d	20-Apr-07																
MW-11d	8-Nov-07																16
MW-11d	15-May-08		59.7J	3.07		6.41J		8.21J	4.59J				3.98J		**6.91**	0.97J	9.82J
MW-11d	10-Nov-08		37.6J		0.36JB	1.94JB		5.8JB	8.5JB				4.37JB			**4.09J**	4.14J
MW-11d	16-Mar-09	4.11J	87.7JB	**6.11B**	0.41J	7.14JB		15.3B	6.94JB				1.22JB			**20.1J**	21.9
MW-11d	4-Dec-09		61.4JB			5.41JB		8.2JB					3.16JB			**7.28JB**	8.85JB

Table 3a
Detected Groundwater Constituents - Metals
North Wake Unlined Landfill

Monitor Well	Sample Date	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Nickel	Selenium	Silver	Tin	Thallium	Vanadium	Zinc
NC2L		**10**	**700**	**4***	**2**	**10**	**70***	**1,000**	**15**	**1**	**100**	**20**	**20**	**NE**	**0.28***	**3.5***	**1,000**
SWSL		**10**	**100**	**1**	**1**	**10**	**10**	**10**	**10**	**0.2**	**50**	**10**	**10**	**100**	**5.5**	**25**	**10**
MW-5	6-Mar-94		76														110
MW-5	15-Apr-94		60		0.9								**62**				47
MW-5	11-May-94		58		0.5			11									28
MW-5	31-May-94		66				11				17						63
MW-5	10-Jun-94		54						2.5								20
MW-5	30-Sep-94		48										7.3				10
MW-5	13-Jun-95																
MW-5	28-Sep-95	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW-5	31-Oct-95				1												
MW-5 (dup)	31-Oct-95				1												
MW-5	30-Jan-96																237
MW-5	29-Nov-96	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW-5	22-Apr-97	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW-5	1-Nov-97	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW-5	6-May-98	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW-5	6-Aug-98			2.2	**4.9**	32	24									68	190
MW-5	8-Dec-98				1.5												
MW-5	16-Apr-99				1.5		28.3										
MW-5	2-Dec-99				1		49.8										
MW-5	11-Apr-00						34.8										
MW-5	20-Dec-00						26.9										
MW-5	16-Apr-01						32.1										
MW-5	3-Dec-01						19.3										
MW-5	12-Apr-02						34.9										70.5
MW-5	5-Nov-02						37.7										
MW-5	17-Apr-03						55.1										
MW-5	4-Nov-03		533		**3.06**		**113**										
MW-5 (dup)	4-Nov-03		590		**3.48**		**123**										
MW-5	14-Apr-04				1.52		55.3										
MW-5	18-Nov-04						**166**										57
MW-5	21-Apr-05						18										
MW-5	11-Nov-05						**139**										57
MW-5	14-Apr-06						**90**										
MW-5	9-Nov-06						23										
MW-5	19-Apr-07		125				16										
MW-5	9-Nov-07		164														
MW-5R	21-Apr-04	12.4															
MW-5R	21-May-08		94J	1.42J		2.36J		4.54J									44.1
MW-5R	10-Nov-08		106		0.53JB	2.74JB	5.65J	4.61JB	6.76JB		9.87J		4.41JB			2.76J	8.23J
MW-5R	11-Mar-09		116B	0.63J		4.97JB	10.5B	5.48JB	4.30JB		5.44J		7.03JB			**4.16JB**	9.72J
MW-5R	3-Dec-09		106				3.6J	3.2JB			2.36					**1.45JB**	38.3B

Table 3a
Detected Groundwater Constituents - Metals
North Wake Unlined Landfill

Monitor Well	Sample Date	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Nickel	Selenium	Silver	Tin	Thallium	Vanadium	Zinc
NC2L		**10**	**700**	**4***	**2**	**10**	**70***	**1,000**	**15**	**1**	**100**	**20**	**20**	**NE**	**0.28***	**3.5***	**1,000**
SWSL		**10**	**100**	**1**	**1**	**10**	**10**	**10**	**10**	**0.2**	**50**	**10**	**10**	**100**	**5.5**	**25**	**10**
MW-6	6-Mar-94		190			**32**	10	33	**18**		33					**63**	51
MW-6	15-Apr-94		144			**20**	12	20	11				7.3			**50**	27
MW-6	11-May-94		175			**30**	13	33	9.3				7.3			**70**	35
MW-6	1-Jun-94		260	**5.4**		**49**	16	28	14		13					**100**	72
MW-6	25-Aug-94		68										7.3				
MW-6	29-Sep-94		110			**19**		19	6.9				7.3			**40**	16
MW-6	13-Jun-95			2		**22**				**2.6**						**41**	
MW-6	28-Sep-95	NS	NS	NS	NS	NS	NS	NS	NS	0.5	NS	NS	NS			NS	NS
MW-6	31-Oct-95									**2.5**							
MW-6	30-Jan-96			**7**		**44**	12		13	**1.8**						**65**	61
MW-6	29-Nov-96		150	2		**20**	6	21	6	0.83						**52**	40
MW-6	22-Apr-97					**12**				**1.1**							67
MW-6	2-Nov-98					**14**				0.54							28
MW-6	6-May-98									0.65							
MW-6 (dup)	6-May-98																
MW-6	8-Dec-98				1.4					0.81							
MW-6	16-Apr-99									0.7							
MW-6	2-Dec-99									0.9							
MW-6	11-Apr-00									**1.1**							
MW-6	19-Dec-00									**1.8**							
MW-6	16-Apr-01									**1.9**							
MW-6	3-Dec-01									0.6							
MW-6	12-Apr-02																
MW-6	5-Nov-02									0.9							
MW-6	17-Apr-03						14.4			0.7							
MW-6	4-Nov-03						30.1			0.464							
MW-6	14-Apr-04	20.6					48.1			0.283							
MW-6	18-Nov-04				2	**47**	**88**			0.53						**41**	
MW-6	21-Apr-05						33										
MW-6	11-Nov-05				1	**19**	50										
MW-6	14-Apr-06				2	**10**	69										
MW-6	9-Nov-06					**10**	65										
MW-6	19-Apr-07		461				**89**										13
MW-6	9-Nov-07		701				61										
MW-6	20-May-08		547	3.34	0.57J	4.84J	**92.3**	14.5	5.31J	0.167J	16.3J		1.6J		**14.8**		32.9
MW-6	11-Nov-08		759B	3.61B	0.25J	7.98JB	**74.4**	20.2B	5.74J		19.1J		10.0B		**15.0**	**7.56JB**	6.90JB
MW-6	11-Mar-09		477B		0.58J	5.14JB	**72.1B**	10.4B	7.43JB	0.143J	14J		8.39JB		**7.8**	**3.78JB**	4.50J
MW-6	3-Dec-09		449	0.61J	0.31J	2.47J	**62.4**	7.16JB			11.4J	3.7J					3.41JB
MW-6d	8-Jun-01																
MW-6d	4-Dec-01																
MW-6d	9-Apr-02																
MW-6d	7-Nov-02																
MW-6d	16-Apr-03																
MW-6d	5-Nov-03																
MW-6d	21-Apr-04					**17.3**											
MW-6d	18-Nov-04				1												
MW-6d	21-Apr-05				1												
MW-6d	11-Nov-05				1												
MW-6d	11-Apr-06				1												
MW-6d	9-Nov-06																
MW-6d	20-Apr-07																11
MW-6d	8-Nov-07																
MW-6d	20-May-08		34.2J	0.98J		5.56J		6.79J								0.61J	
MW-6d	6-Nov-08		80.3JB	1.96B		**16.3B**	4.52J	15.9B	9.04JB		6.77J		8.74JB		**6.3**	**17.8JB**	13.2
MW-6d (dup)	6-Nov-08	2.57J	77.0JB	**11.6B**		**13.5B**	4.63J	14.0B	9.24JB		5.22J		8.35JB			**17.9JB**	12
MW-6d	12-Mar-09		69.7J			2.30J		5.24JB							**5.51**	**7.89JB**	6.82J
MW-6d	3-Dec-09		119			2.39J		6.14JB			5.84J					**6.45JB**	9.62JB

Table 3a
Detected Groundwater Constituents - Metals
North Wake Unlined Landfill

Monitor Well	Sample Date	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Nickel	Selenium	Silver	Tin	Thallium	Vanadium	Zinc
NC2L		**10**	**700**	**4***	**2**	**10**	**70***	**1,000**	**15**	**1**	**100**	**20**	**20**	**NE**	**0.28***	**3.5***	**1,000**
SWSL		**10**	**100**	**1**	**1**	**10**	**10**	**10**	**10**	**0.2**	**50**	**10**	**10**	**100**	**5.5**	**25**	**10**
MW-7	6-Mar-94		190			**48**	17	110	**22**		21					**67**	82
MW-7	15-Apr-94		136			**30**	11	53	**25**		20					**40**	56
MW-7	11-May-94		51			**30**	11	24	6.8							**40**	29
MW-7	31-May-94		350	**5.4**		**89**	30	180	**34**		40					**140**	150
MW-7	25-Aug-94		44					25	2.7								19
MW-7	29-Sep-94		49			**15**		26	4.7							**20**	20
MW-7	13-Jun-95																
MW-7	28-Sep-95	NS	NS	NS	NS	NS	NS	NS	NS		NS	NS	NS			NS	NS
MW-7	31-Oct-95																
MW-7	30-Jan-96			2		**35**			10								
MW-7	29-Nov-96		17														
MW-7	21-Apr-97									0.38							
MW-7 (dup)	21-Apr-97									0.22							
MW-7	1-Nov-97									0.58							48
MW-7	6-May-98									0.24							
MW-7	8-Dec-98				**2.6**	**15**				0.25							
MW-7	16-Apr-99																
MW-7	2-Dec-99									0.2							
MW-7	11-Apr-00									0.2							
MW-7 (dup)	11-Apr-00									0.2							
MW-7	19-Dec-00									0.3							
MW-7 (dup)	19-Dec-00									0.3							
MW-7	16-Apr-01																
MW-7	4-Dec-01																
MW-7	9-Apr-02						10.1										
MW-7	6-Nov-02																
MW-7	16-Apr-03						20.3										
MW-7	5-Nov-03						19.2										
MW-7	21-Apr-04						29.5										
MW-7 (dup)	21-Apr-04	12.1					24										
MW-7	18-Nov-04						44										
MW-7	21-Apr-05						44										
MW-7	11-Nov-05						15										
MW-7	11-Apr-06						26										
MW-7	9-Nov-06				**2**	**36**	29			0.63							56
MW-7	20-Apr-07						16										18
MW-7	8-Nov-07				1	**11**	14	13									20
MW-7	15-May-08	2.16J	43.4J			**10.8**	19.3	12.6	4.28J		9.94J	10.4	5.99J		**21.1**		9.72J
MW-7	5-Nov-08	2.68J	38.3JB	**6.84B**		3.42JB		6.81JB	9.68JB				8.61JB	38JB		3.03JB	6.38J
MW-7	10-Mar-09		10.7J			8.23J	19.3	8.17J	4.72J		6.35J		3.42JB			**9.49J**	
MW-7	2-Dec-09		52.8J	0.74J	0.66J	**18.5**	17.5	27.5B			10J					**15.3JB**	13.8B
MW-7 (dup)	2-Dec-09		38.4J	0.56J	0.52J	9.86J	14.5	20.7B			7.69J					**9.07JB**	8.36JB

Table 3a
Detected Groundwater Constituents - Metals
North Wake Unlined Landfill

Monitor Well	Sample Date	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Nickel	Selenium	Silver	Tin	Thallium	Vanadium	Zinc
NC2L		**10**	**700**	**4***	**2**	**10**	**70***	**1,000**	**15**	**1**	**100**	**20**	**20**	**NE**	**0.28***	**3.5***	**1,000**
SWSL		**10**	**100**	**1**	**1**	**10**	**10**	**10**	**10**	**0.2**	**50**	**10**	**10**	**100**	**5.5**	**25**	**10**
MW-8	6-Mar-94		120			**17**		26			13					**35**	49
MW-8	15-Apr-94		97					22	4.2		20					**30**	35
MW-8	11-May-94		89					20	4.3							**20**	26
MW-8	31-May-94		330	**5.4**		**81**	34	90	**16**		39					**150**	150
MW-8	25-Aug-94		76					13	2.7								21
MW-8	30-Sep-94		82			**20**		14	5.4							**20**	19
MW-8	13-Jun-95					**38**	11									**87**	
MW-8	28-Sep-95	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS		NS	NS	NS
MW-8	31-Oct-95																
MW-8	30-Jan-96			3		**35**	12									**64**	63
MW-8 (dup)	30-Jan-96			3		**36**	12									**63**	76
MW-8	29-Nov-96		120			**14**	5	21								**31**	54
MW-8 (dup)	29-Nov-96		82														19
MW-8	21-Apr-97					**19**											
MW-8	2-Nov-97																
MW-8	6-May-98																
MW-8	8-Dec-98				1.2												
MW-8	16-Apr-99																
MW-8 (dup)	16-Apr-99																
MW-8	2-Dec-99	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS		NS	NS	NS
MW-8	11-Apr-00				**2.1**												
MW-8	20-Dec-00				1.5		17.1										
MW-8	16-Apr-01																
MW-8	3-Dec-01																
MW-8	12-Apr-02																
MW-8	5-Nov-02				1.2	**15.3**											
MW-8	17-Apr-03																
MW-8	4-Nov-03																
MW-8	14-Apr-04					**19.8**											
MW-8	18-Nov-04					**198**	**72**		13		**114**					**281**	161
MW-8	21-Apr-05																
MW-8	11-Nov-05			3		**31**			14								116
MW-8	14-Apr-06			3	**2**	**30**			14							**50**	111
MW-8	9-Nov-06			2		**34**			11								99
MW-8	20-Apr-07																
MW-8	9-Nov-07																15
MW-8	20-May-08		26.4J			4.72J		3.99J		0.091J							6.16J
MW-8	10-Nov-08		25.6J	2.49	0.33JB	3.27JB		4.37JB	9.17JB				4.03JB				
MW-8	11-Mar-09		37.1JB	2.75		4.38JB	4.48JB	5.02JB		0.045J	4.91J		7.06JB			**3.71JB**	
MW-8	3-Dec-09		34.1J	0.5J		6.17J		6.8JB			3.15J					**9.97JB**	59.1B
MW-8d	8-Jun-01											12.7					
MW-8d	4-Dec-01																
MW-8d	9-Apr-02																
MW-8d (dup)	9-Apr-02																
MW-8d	7-Nov-02																
MW-8d	16-Apr-03																
MW-8d	4-Nov-03																
MW-8d	21-Apr-04																
MW-8d	18-Nov-04																
MW-8d	21-Apr-05																
MW-8d	11-Nov-05																
MW-8d	14-Apr-06																
MW-8d	10-Nov-06																
MW-8d	20-Apr-07																
MW-8d	8-Nov-07																11
MW-8d	15-May-08		19.1J			6.86J		3.98J	4.10J				4.16J		**8.59**		4.53J
MW-8d	6-Nov-08	2.49J	25.2JB	3.61B		7.57JB		6.96JB	5.20JB				8.71JB			**6.56JB**	4.8J
MW-8d	16-Mar-09		44.5JB	**9.80B**		6.95JB		6.72JB	6.18JB				2.01JB			**9.36JB**	9.52J
MW-8d	4-Dec-09		32.8JB			8.01JB		8.86JB	9.36JB			4.49J	2.65JB			**4.48JB**	6.64JB

Table 3a
Detected Groundwater Constituents - Metals
North Wake Unlined Landfill

Monitor Well	Sample Date	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Nickel	Selenium	Silver	Tin	Thallium	Vanadium	Zinc
NC2L		**10**	**700**	**4***	**2**	**10**	**70***	**1,000**	**15**	**1**	**100**	**20**	**20**	**NE**	**0.28***	**3.5***	**1,000**
SWSL		**10**	**100**	**1**	**1**	**10**	**10**	**10**	**10**	**0.2**	**50**	**10**	**10**	**100**	**5.5**	**25**	**10**
MW-9	6-Mar-94		210														
MW-9	15-Apr-94		199				11										
MW-9	11-May-94		193				10		2.7								14
MW-9	31-May-94		270			**24**	14	25	21							**23**	120
MW-9	25-Aug-94		135														14
MW-9	29-Sep-94		123						4.2								12
MW-9	13-Jun-95						14										
MW-9	28-Sep-95	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW-9	31-Oct-95																
MW-9	30-Jan-96			**4**	1	**20**	16		**17**								65
MW-9	29-Nov-96		140														21
MW-9	22-Apr-97																
MW-9	2-Nov-97						11										37
MW-9	6-May-98																
MW-9	8-Dec-98				1.5												
MW-9	16-Apr-99																
MW-9	2-Dec-99																
MW-9	11-Apr-00																
MW-9	20-Dec-00																
MW-9	16-Apr-01																
MW-9	3-Dec-01	11	166														
MW-9 (dup)	3-Dec-01	12.2	160														
MW-9	12-Apr-02														**10.8**		
MW-9	5-Nov-02						10.1										
MW-9	17-Apr-03						10.6										
MW-9	4-Nov-03						11.3										
MW-9	14-Apr-04	20.6					11.8										
MW-9	18-Nov-04				**7**		10										
MW-9	21-Apr-05																
MW-9	11-Nov-05																
MW-9	14-Apr-06				**3**												
MW-9	9-Nov-06																
MW-9	19-Apr-07		289	2	1	**17**		12	**21**								122
MW-9	9-Nov-07		186														16
MW-9	20-May-08		190	2.9		**27**		5.8J	10.6		11.3J	8.29J	2.84J		**10.4**		5.58J
MW-9 (dup)	20-May-08		190			**22.7**	5.15J	5.87J	8.38J				3.16J		**11.1**		6.10J
MW-9	11-Nov-08		218B	0.3JB		**12.4B**	6.99J	9.59JB	13.5			8.93J	11.1B		**16.9**	**8.49JB**	14.4B
MW-9	11-Mar-09		178B			7.63JB	9.53JB	3.17JB	10.3B				8.89JB			**4.57JB**	
MW-9 (dup)	11-Mar-09		179B			9.27JB	9.33JB	3.39JB	6.28JB		6.45J		8.78JB		**7.3**	**10.8JB**	9.56J
MW-9	3-Dec-09		190	0.64J		7.84J	2.86J	5.25JB				4.37J				**1.49JB**	4.02JB

Table 3a
Detected Groundwater Constituents - Metals
North Wake Unlined Landfill

Monitor Well	Sample Date	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Nickel	Selenium	Silver	Tin	Thallium	Vanadium	Zinc
NC2L		**10**	**700**	**4***	**2**	**10**	**70***	**1,000**	**15**	**1**	**100**	**20**	**20**	**NE**	**0.28***	**3.5***	**1,000**
SWSL		**10**	**100**	**1**	**1**	**10**	**10**	**10**	**10**	**0.2**	**50**	**10**	**10**	**100**	**5.5**	**25**	**10**
MW-10	31-Oct-95																
MW-10	30-Jan-96																
MW-10	28-Nov-96		71				14										
MW-10	22-Apr-97					**31**	23									**43**	98
MW-10	1-Nov-97	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW-10	5-May-98				1.3				13	0.34							720
MW-10	18-Aug-98				**4.9**												150
MW-10	10-Sep-98																
MW-10	6-Oct-98				1.2												
MW-10	8-Dec-98				2												
MW-10	11-Jan-99																
MW-10	8-Feb-99																
MW-10 (dup)	8-Feb-99																
MW-10	16-Apr-99																
MW-10	2-Dec-99									0.3							
MW-10	12-Apr-00																
MW-10	20-Dec-00																
MW-10	17-Apr-01																
MW-10	3-Dec-01																
MW-10	12-Apr-02																
MW-10	5-Nov-02									0.5							
MW-10 (dup)	5-Nov-02									0.4							
MW-10	17-Apr-03									0.4							
MW-10	4-Nov-03																
MW-10	14-Apr-04																
MW-10	18-Nov-04				**2**												
MW-10	21-Apr-05																
MW-10	11-Nov-05									**1.1**							
MW-10	14-Apr-06																
MW-10	9-Nov-06																
MW-10	19-Apr-07									0.38							
MW-10	9-Nov-07		399														
MW-10	20-May-08		24.1J		0.21J	2.08J		6.28J		0.374					**6.74**		8.03J
MW-10	11-Nov-08	5.71JB	174B	**12.2B**	0.84J	9.86JB	4.73J	32.9B	**25.2**	**7.53**	8.21J		9.75JB			**24.9JB**	59.3B
MW-10	11-Mar-09		29.3JB		0.20J	2.27JB	5.65JB	3.07JB	7.77JB	0.247J	5.41J		7.13JB			**4.32JB**	7.14J
MW-10	3-Dec-09		16.3J	0.64J				3.96JB								**2.56JB**	8.35JB
MW-10d	8-Jun-01							30		0.3							
MW-10d	4-Dec-01																
MW-10d	9-Apr-02																
MW-10d	5-Nov-02																
MW-10d	17-Apr-03	**10.9**			1.1	**10.1**											
MW-10d	4-Nov-03																
MW-10d	26-Apr-04																
MW-10d	18-Nov-04																
MW-10d	21-Apr-05				**5**												
MW-10d	11-Nov-05				**5**												
MW-10d	14-Apr-06				**4**												
MW-10d	10-Nov-06																
MW-10d	20-Apr-07																
MW-10d	8-Nov-07				1												
MW-10d	20-May-08	9.06J	57.9J	0.5J		**33**		31.8	**21.9**	0.123J	18.7J		3.92J		**5.93**	**18.9J**	28.6
MW-10d	6-Nov-08	5.94J	40.7JB	**5.27B**		**149B**	5.12J	22.9B	**15.1B**		80.3		8.15JB			**16.7JB**	22
MW-10d	12-Mar-09			0.75J		4.38J		3.46JB	4.98J							**9.69JB**	8.62J
MW-10d	4-Dec-09		19.6JB			3.78JB		8.17JB					2.67JB			2.08JB	5.77JB

Table 3a
Detected Groundwater Constituents - Metals
North Wake Unlined Landfill

Monitor Well	Sample Date	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Nickel	Selenium	Silver	Tin	Thallium	Vanadium	Zinc
NC2L		**10**	**700**	**4***	**2**	**10**	**70***	**1,000**	**15**	**1**	**100**	**20**	**20**	**NE**	**0.28***	**3.5***	**1,000**
SWSL		**10**	**100**	**1**	**1**	**10**	**10**	**10**	**10**	**0.2**	**50**	**10**	**10**	**100**	**5.5**	**25**	**10**
MW-22	9-Jun-97				**2.9**		**130**				66						
MW-22	18-Aug-97	**11.9**			**4.4**		**229**		14.3		**164**						68.6
MW-22	2-Nov-97				1.5		**210**		12		**130**						230
MW-22	6-May-98						**110**				51						80
MW-22	18-Aug-98				**9.6**		**110**										210
MW-22	10-Sep-98						**100**										
MW-22	6-Oct-98						**99**										
MW-22	8-Dec-98				1.9		**130**										
MW-22	11-Jan-99				1.5		**202**				55						
MW-22	8-Feb-99				**2**		**168**										
MW-22	16-Apr-99				**4.1**	**10.1**	**261**		**21**		70.9						
MW-22	2-Dec-99				**7.4**		**160**										
MW-22	12-Apr-00				**6.1**		**98.1**										
MW-22	20-Dec-00				**2.4**		60.7										
MW-22	17-Apr-01				1.2		31.4										
MW-22	5-Dec-01						26.9										
MW-22	9-Apr-02				**2.1**		63.5										
MW-22	6-Nov-02				1.2		26.5										
MW-22	17-Apr-03																
MW-22	5-Nov-03				1.19	**11.1**	30.1		12.9								
MW-22	26-Apr-04																
MW-22	18-Nov-04				**3**		15										
MW-22	22-Apr-05			3	**3**	**17**	48		**62**								196
MW-22	11-Nov-05				**2**		13										
MW-22	14-Apr-06				**2**		12										
MW-22	10-Nov-06				**2**		15										
MW-22	20-Apr-07				**2**												20
MW-22	8-Nov-07				**2.8**		24		13								32
MW-22	15-May-08		45J		**4.66**	8.9J	25.1	7.09J	10.3		16.2J	7.95J	5.69J		**7.37**	1.3J	16.3
MW-22	6-Nov-08	4.58J	75.5JB	2.45B	**6.68**	9.28JB	44.9	9.38JB	**15.4B**		27.5J	10.5	10.6B			**20.7JB**	32.6
MW-22	12-Mar-09		21.5J		**10.3**	2.39J	26.9	1.92JB	4.02J		11.6J		1.79J		**6.65**	**35.1B**	10.3
MW-22	4-Dec-09		44.9JB		**4.05**	4.97JB	22.1	8.74JB			10.4J	3.05J	3.24JB			**5.22JB**	9.59JB

Table 3a
Detected Groundwater Constituents - Metals
North Wake Unlined Landfill

Monitor Well	Sample Date	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Nickel	Selenium	Silver	Tin	Thallium	Vanadium	Zinc
NC2L		**10**	**700**	**4***	**2**	**10**	**70***	**1,000**	**15**	**1**	**100**	**20**	**20**	**NE**	**0.28***	**3.5***	**1,000**
SWSL		**10**	**100**	**1**	**1**	**10**	**10**	**10**	**10**	**0.2**	**50**	**10**	**10**	**100**	**5.5**	**25**	**10**
MW-23	9-Jun-97																
MW-23	18-Aug-97	**10.3**			**2.3**		14.2		**18.8**		59.1						
MW-23	2-Nov-97		600	**4.7**	**2.6**	**54**	35		**56**		**110**					**170**	260
MW-23	5-May-98																
MW-23	18-Aug-98				**5.4**	**24**	10		**17**							**50**	150
MW-23	10-Sep-98																
MW-23	6-Oct-98				1.6					0.26							
MW-23	8-Dec-98				1.7												
MW-23 (dup)	8-Dec-98				**2.3**												
MW-23	11-Jan-99									0.20							
MW-23	8-Feb-99									0.20							
MW-23	16-Apr-99					**11.2**			**23.8**	0.7							
MW-23	2-Dec-99									0.2							
MW-23 (dup)	2-Dec-99																
MW-23	12-Apr-00									**1.1**							
MW-23	20-Dec-00																
MW-23	17-Apr-01																
MW-23	4-Dec-01																
MW-23	11-Apr-02																
MW-23	6-Nov-02																
MW-23	17-Apr-03																
MW-23 (dup)	17-Apr-03																
MW-23	5-Nov-03																
MW-23	26-Apr-04																
MW-23	18-Nov-04																
MW-23	21-Apr-05																
MW-23	11-Nov-05																
MW-23	14-Apr-06																
MW-23	9-Nov-06					**13**		39									133
MW-23	20-Apr-07		133	2		**10**	23	29								**28**	102
MW-23	8-Nov-07		123	1			21	21								**27**	92
MW-23	15-May-08	3.35J	90.7J	6.57		**18.8**	4.50J	32.7	11.7		10.3J		4.56J			**30**	49.2
MW-23	6-Nov-08	4.07J	65.4JB	1.96B		**10.6B**		18.3B	13.2B		8.28J		8.41JB			**17.5JB**	15.9
MW-23	12-Mar-09		62.1J	2.99		**11.9**	3.31J	22.1B	13		7.02J					**36.7B**	35
MW-23	4-Dec-09		48.6JB			4.33JB		12.2B					3.02JB			**3.57JB**	6.88JB

Table 3a
Detected Groundwater Constituents - Metals
North Wake Unlined Landfill

Monitor Well	Sample Date	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Nickel	Selenium	Silver	Tin	Thallium	Vanadium	Zinc
NC2L		**10**	**700**	**4***	**2**	**10**	**70***	**1,000**	**15**	**1**	**100**	**20**	**20**	**NE**	**0.28***	**3.5***	**1,000**
SWSL		**10**	**100**	**1**	**1**	**10**	**10**	**10**	**10**	**0.2**	**50**	**10**	**10**	**100**	**5.5**	**25**	**10**
MW-23d	5-May-98																80
MW-23d	18-Aug-98				**4**												63
MW-23d	10-Sep-98				1.6				11								
MW-23d	6-Oct-98				**2.0**					0.22							60
MW-23d	8-Dec-98				1.8												83
MW-23d	11-Jan-99																
MW-23d	8-Feb-99																
MW-23d	16-Apr-99																
MW-23d	2-Dec-99																
MW-23d	12-Apr-00																
MW-23d	20-Dec-00									0.8							
MW-23d	17-Apr-01																
MW-23d	4-Dec-01																
MW-23d	11-Apr-02																
MW-23d	6-Nov-02																
MW-23d	17-Apr-03																
MW-23d	5-Nov-03																
MW-23d	26-Apr-04																
MW-23d	18-Nov-04																
MW-23d	21-Apr-05				**2**				12								55
MW-23d	11-Nov-05				1												
MW-23d	14-Apr-06																
MW-23d	9-Nov-06																
MW-23d	20-Apr-07																
MW-23d	8-Nov-07																10
MW-23d	15-May-08		36.5J			5.10J		3.39J					3.39J				
MW-23d	6-Nov-08		48.8JB	**7.34B**		6.57JB		5.63JB	6.76JB				8.81JB			**8.38JB**	4.77J
MW-23d	12-Mar-09		24.4J			1.71J		3.23JB								**9.35JB**	12.6
MW-23d	4-Dec-09		50.1JB		0.17J	4.98JB		8.53JB	10.7B				2.77JB			**7.17JB**	11.2B

Table 3a
Detected Groundwater Constituents - Metals
North Wake Unlined Landfill

Monitor Well	Sample Date	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Nickel	Selenium	Silver	Tin	Thallium	Vanadium	Zinc
NC2L		**10**	**700**	**4***	**2**	**10**	**70***	**1,000**	**15**	**1**	**100**	**20**	**20**	**NE**	**0.28***	**3.5***	**1,000**
SWSL		**10**	**100**	**1**	**1**	**10**	**10**	**10**	**10**	**0.2**	**50**	**10**	**10**	**100**	**5.5**	**25**	**10**
MW-24	9-Jun-97																
MW-24	18-Aug-97				1.7		11.2										52.8
MW-24	1-Nov-97																66
MW-24 (dup)	1-Nov-97								12	0.25							91
MW-24	5-May-98																
MW-24	18-Aug-98				**4.7**				**16**								180
MW-24 (dup)	18-Aug-98	**11**		2.1	**8.9**	12	11		**22**								290
MW-24	10-Sep-98									0.44							
MW-24	6-Oct-98									0.98							
MW-24	8-Dec-98									0.62							
MW-24	8-Dec-98									0.62							
MW-24	11-Jan-99									0.50							
MW-24	16-Apr-99								13.7	0.4							53.1
MW-24	2-Dec-99																
MW-24	12-Apr-00									0.3							
MW-24	20-Dec-00																
MW-24	16-Apr-01									0.3							
MW-24 (dup)	16-Apr-01																
MW-24	3-Dec-01																
MW-24	12-Apr-02																
MW-24	5-Nov-02																
MW-24	17-Apr-03									0.4							
MW-24	4-Nov-03																
MW-24	14-Apr-04																
MW-24	18-Nov-04									**1.2**							68
MW-24	21-Apr-05									0.65							
MW-24	11-Nov-05			**5**		11			**52**	**2**							539
MW-24	14-Apr-06			3	**2**				**41**	**1.2**							492
MW-24	9-Nov-06			**4**		10			**48**	**1.7**							464
MW-24	19-Apr-07			1					14	0.68							112
MW-24	9-Nov-07			3.3		10		15	**31**	0.98							305
MW-24	20-May-08		42.4J	3.85		3.47J		7.58J	7.16J	0.046J						**4.83J**	27.4
MW-24	11-Nov-08	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW-24	12-Mar-09		52.3J			4.48J		8.35JB	9.33J	0.168J						**18JB**	57.1
MW-24	4-Dec-09		39.7JB			4.11JB		14.9B	11.1B				3.52JB			**4.63JB**	10.2B

Table 3a
Detected Groundwater Constituents - Metals
North Wake Unlined Landfill

Monitor Well	Sample Date	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Nickel	Selenium	Silver	Tin	Thallium	Vanadium	Zinc
NC2L		**10**	**700**	**4***	**2**	**10**	**70***	**1,000**	**15**	**1**	**100**	**20**	**20**	**NE**	**0.28***	**3.5***	**1,000**
SWSL		**10**	**100**	**1**	**1**	**10**	**10**	**10**	**10**	**0.2**	**50**	**10**	**10**	**100**	**5.5**	**25**	**10**
MW-27	4-May-98																
MW-27	7-Dec-98				1	21											
MW-27	29-Apr-99				**2.3**		19										
MW-27	3-Dec-99						13.2										
MW-27	12-Apr-00				1.7		14.5			0.5							75.6
MW-27	18-Apr-01																
MW-27	12-Apr-02				1.7		10.5										51.8
MW-27	17-Apr-03																
MW-27	26-Apr-04																
MW-27	22-Apr-05			3	1	11										**57**	216
MW-27	11-Nov-05																
MW-27	14-Apr-06																
MW-28	1-May-98																
MW-28	17-Aug-98				**5.6**												
MW-28	9-Sep-98																
MW-28	7-Oct-98				**8.8**	43	24									**80**	150
MW-28	9-Dec-98				**8.9**	39	19									**68**	140
MW-28	12-Jan-99																
MW-28	9-Feb-99																
MW-28	19-Apr-99																
MW-28	3-Dec-99																
MW-28	12-Apr-00																
MW-28	18-Apr-01																
MW-28	12-Apr-02																
MW-28	17-Apr-03																
MW-28	26-Apr-04																
MW-28	22-Apr-05			2		33	13		**17**							**67**	331
MW-28	13-Apr-06					12											66
MW-28	20-Apr-07					11											88
MW-28	19-May-08		75.8J	**4.29**		16.9	3.18J	6.12J	4.16J							**25.1**	39.9
MW-28	12-Mar-09		22.8J			4.87J							0.89J			**10.1JB**	13
MW-28d	1-May-98																
MW-28d	17-Aug-98				1.3												
MW-28d	9-Sep-98																
MW-28d	7-Oct-98																
MW-28d	9-Dec-98									0.25							
MW-28d	12-Jan-99																
MW-28d (dup)	12-Jan-99																
MW-28d	9-Feb-99																
MW-28d	19-Apr-99																
MW-28d	3-Dec-99																
MW-28d	12-Apr-00																
MW-28d	18-Apr-01																
MW-28d	12-Apr-02																
MW-28d	17-Apr-03																
MW-28d	26-Apr-04																
MW-28d	22-Apr-05																
MW-28d	13-Apr-06																
MW-28d	20-Apr-07																35
MW-28d	19-May-08			**7.76**		1.53J		5J	3.8J							1.52J	
MW-28d	12-Mar-09					2.99J		2.04JB	6.28J							**12.7JB**	8.95J

Table 3a
Detected Groundwater Constituents - Metals
North Wake Unlined Landfill

Monitor Well	Sample Date	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Nickel	Selenium	Silver	Tin	Thallium	Vanadium	Zinc
NC2L		**10**	**700**	**4***	**2**	**10**	**70***	**1,000**	**15**	**1**	**100**	**20**	**20**	**NE**	**0.28***	**3.5***	**1,000**
SWSL		**10**	**100**	**1**	**1**	**10**	**10**	**10**	**10**	**0.2**	**50**	**10**	**10**	**100**	**5.5**	**25**	**10**
MW-29d	4-May-98					**13**											
MW-29d	17-Aug-98																
MW-29d	9-Sep-98				1	**17**											
MW-29d (dup)	9-Sep-98					**11**											
MW-29d	7-Oct-98				**2.7**	**18**											53
MW-29d	9-Dec-98									0.24							
MW-29d	12-Jan-99																
MW-29d	9-Feb-99																
MW-29d	19-Apr-99																
MW-29d	3-Dec-99																
MW-29d	12-Apr-00																
MW-29d	19-Dec-00																
MW-29d	18-Apr-01																
MW-29d	4-Dec-01																
MW-29d	11-Apr-02																
MW-29d	6-Nov-02																
MW-29d	18-Apr-03																
MW-29d	5-Nov-03																
MW-29d	26-Apr-04																
MW-29d	18-Nov-04				**2**												
MW-29d	22-Apr-05																
MW-29d	11-Nov-05																
MW-29d	14-Apr-06																
MW-29d	10-Nov-06																
MW-29d	20-Apr-07							16									56
MW-29d	9-Nov-07																24
MW-29d	19-May-08		33.8J	**6.72**		4.31J		5.61J									4.02J
MW-29d	7-Nov-08		49.8JB	**10.7B**		8.58JB	3.47J	12.1B	5.59JB				8.05JB			**12.1JB**	10.5
MW-29d	10-Mar-09					**11.8J**		5.96J	6.80J				1.97JB		6.41	**7.77J**	8.23J
MW-29d	2-Dec-09		37.1J			4.39J		12.6B			2.68J					**5.01JB**	4.93JB
MW-30	4-May-98					**60**	19									**56**	60
MW-30	17-Aug-98				**34**	**50**	19				50					**50**	190
MW-30	9-Sep-98					**16**					50						140
MW-30	7-Oct-98				1.1												
MW-30	7-Dec-98				**2.6**	**20**											
MW-30	12-Jan-99					**20**											
MW-30	9-Feb-99					**20**											
MW-30	19-Apr-99																
MW-30	3-Dec-99																
MW-30	12-Apr-00																
MW-30	19-Dec-00																
MW-30	18-Apr-01																
MW-30	4-Dec-01																
MW-30	11-Apr-02																
MW-30	6-Nov-02																
MW-30	17-Apr-03																
MW-30	5-Nov-03																
MW-30	28-Apr-04																
MW-30	18-Nov-04					**108**	41		12		71					**107**	89
MW-30	21-Apr-05																
MW-30	11-Nov-05					**13**											
MW-30	14-Apr-06					**15**											
MW-30	10-Nov-06					**32**											83
MW-30	20-Apr-07		416	3		**43**		60	**18**							**44**	150
MW-30	9-Nov-07		419	3.2		**117**		160	**21**		52					**118**	147
MW-30	19-May-08		106	**10.1**		**31.9**	5.84J	58.4	4.9J		13.9J					**30.7**	25.9
MW-30	7-Nov-08		149B	0.59JB		**32.0B**	5.75J	58.4B	8.97JB		16.6J		8.54JB			**53.4B**	38.4
MW-30	11-Mar-09		206B	3.46		**61.6B**	20.3B	116B	14.4B		34.4J		6.51JB			**85.9B**	57.8
MW-30	4-Dec-09		42.1JB			**7.58JB**		14.2B	10.7B			3.08J	2.47JB			**6.6JB**	23.6B

Table 3a
Detected Groundwater Constituents - Metals
North Wake Unlined Landfill

Monitor Well	Sample Date	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Nickel	Selenium	Silver	Tin	Thallium	Vanadium	Zinc
NC2L		10	700	4*	2	10	70*	1,000	15	1	100	20	20	NE	0.28*	3.5*	1,000
SWSL		10	100	1	1	10	10	10	10	0.2	50	10	10	100	5.5	25	10
MW-31	1-May-98																
MW-31	17-Aug-98				14	88			38		82					81	220
MW-31	9-Sep-98				3.3	42			15								530
MW-31	7-Oct-98				1.8	10											
MW-31	8-Dec-98				2.6	24											
MW-31	11-Jan-99																
MW-31	8-Feb-99																
MW-31	19-Apr-99																
MW-31	3-Dec-99																
MW-31	13-Apr-00																
MW-31	19-Dec-00																
MW-31	17-Apr-01					16.5											
MW-31	6-Dec-01					55											
MW-31	11-Apr-02																
MW-31	6-Nov-02																
MW-31	18-Apr-03																
MW-31	5-Nov-03																
MW-31	28-Apr-04																
MW-31	18-Nov-04					64	32		14							120	64
MW-31	21-Apr-05																
MW-31	11-Nov-05					17											
MW-31	14-Apr-06																
MW-31	9-Nov-06					15											
MW-31	20-Apr-07																
MW-31	9-Nov-07			1		38		19	22	0.22						47	32
MW-31	19-May-08		50.7J			18.1		13.6	8.81J		6.67J		4.33J		7.52	16.9J	13
MW-31	7-Nov-08		66.6JB			30.0B		23.3B	15.3B		7.34J		8.57JB			40.3B	12.1
MW-31	11-Mar-09		85.6JB	1.34		30.2B	6.48JB	21.7B	19.2B		11J		6.54JB			36.4B	11.1
MW-31	4-Dec-09		38.4JB			13.4B		14.5B	11.3B		5.52J	4.62J	2.91JB			11.8JB	10.2B
MW-31d	1-May-98			3		110	13		19		68					280	210
MW-31d	17-Aug-98				8.6	10											94
MW-31d	9-Sep-98				2.8	25										60	260
MW-31d	7-Oct-98				2.2												
MW-31d	8-Dec-98																
MW-31d	11-Jan-99					19.1											
MW-31d	8-Feb-99																
MW-31d	19-Apr-99																
MW-31d	3-Dec-99																
MW-31d	13-Apr-00																
MW-31d	19-Dec-00																
MW-31d	18-Apr-01																
MW-31d	6-Dec-01																
MW-31d	11-Apr-02																
MW-31d	6-Nov-02																
MW-31d	18-Apr-03					10.1											
MW-31d	5-Nov-03																
MW-31d	28-Apr-04																
MW-31d	18-Nov-04					24										50	
MW-31d	21-Apr-05																
MW-31d	11-Nov-05																
MW-31d	14-Apr-06																
MW-31d	9-Nov-06																
MW-31d	20-Apr-07																10
MW-31d	9-Nov-07																
MW-31d	19-May-08		23.2J			8.61J		4.27J	3.63J				4.16J	7.6J		6.26J	4.39J
MW-31d	6-Nov-08	2.66J	31.2JB	6.26B		11.7B		8.19JB	10.2B		5.34J		8.47JB			25.1B	6.85J
MW-31d	10-Mar-09					5.52J			5.19J				1.44JB			19.9J	
MW-31d	2-Dec-09		15.8J			5.23J		9.19JB							0.42J	7.27JB	35.5B

Table 3a
Detected Groundwater Constituents - Metals
North Wake Unlined Landfill

Monitor Well	Sample Date	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Nickel	Selenium	Silver	Tin	Thallium	Vanadium	Zinc
NC2L		**10**	**700**	**4***	**2**	**10**	**70***	**1,000**	**15**	**1**	**100**	**20**	**20**	**NE**	**0.28***	**3.5***	**1,000**
SWSL		**10**	**100**	**1**	**1**	**10**	**10**	**10**	**10**	**0.2**	**50**	**10**	**10**	**100**	**5.5**	**25**	**10**
MW-32	1-May-98					**23**	44									**41**	59
MW-32	17-Aug-98				**5.5**	**10**	31										130
MW-32	9-Sep-98				**5.4**	**34**	45				54					**60**	240
MW-32	6-Oct-98	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW-32	7-Dec-98				8	**40**	42				77					**74**	85
MW-32	11-Jan-99						26.5										
MW-32	8-Feb-99						24										
MW-32	19-Apr-99						28.1										
MW-32	3-Dec-99						25.1										
MW-32	13-Apr-00				1.2		40.9										
MW-32	19-Dec-00				1.0		25.8										
MW-32	17-Apr-01						22.8										
MW-32	4-Dec-01						14.7										
MW-32	11-Apr-02						12.1										
MW-32	6-Nov-02						12.2										
MW-32	18-Apr-03				1.4		24										
MW-32	4-Nov-03						10.3										
MW-32	28-Apr-04						10.5										
MW-32	18-Nov-04						11										
MW-32	21-Apr-05																
MW-32	11-Nov-05																
MW-32	14-Apr-06																
MW-32	9-Nov-06																
MW-32	20-Apr-07							18									21
MW-32	9-Nov-07																29
MW-32	19-May-08		16.7J			4.81J		10.7	4.53J				4.35J			0.72J	5.83J
MW-32	6-Nov-08		18.4JB	**8.50B**		4.14JB	4.41J	6.41JB	6.36JB				9.0JB			**8.39JB**	4.39J
MW-32	11-Mar-09		23.5JB			4JB	7.94JB	13.4B	5.74JB		5.61J		6.91JB			**10.9JB**	
MW-32	4-Dec-09		21.6JB			4JB	8.41JB					3.28J	3.21JB			0.78JB	3.89JB
TB-1a	1-May-98				1.1								14				50
TB-1a	17-Aug-98				**9.3**	**21**	20										130
TB-1a	9-Sep-98				**2.6**	**14**	16										160
TB-1a	7-Oct-98				**4.0**	**17**	14										
TB-1a (dup)	7-Oct-98				**2.1**		14										
TB-1a	9-Dec-98				**3.0**					0.22							
TB-1a	11-Jan-99																
TB-1a	8-Feb-99																
TB-1a	19-Apr-99																
TB-1a	3-Dec-99																
TB-1a	13-Apr-00																
TB-1a	20-Dec-00																
TB-1a	17-Apr-01																
TB-1a	3-Dec-01							17.3									
TB-1a	12-Apr-02																
TB-1a	5-Nov-02				**2.2**	**12.7**											
TB-1a	17-Apr-03																
TB-1a	4-Nov-03																
TB-1a	14-Apr-04																
TB-1a	18-Nov-04				**2**	**20**											
TB-1a	21-Apr-05				**2**												
TB-1a	11-Nov-05				**2**	**12**				0.95							67
TB-1a	14-Apr-06				**3**					0.88							
TB-1a	9-Nov-06				**5**	**17**				**2.5**							87
TB-1a	19-Apr-07				**39**	**14**		88	14	**1.9**						30	262
TB-1a	8-Nov-07				**8**			29									51
TB-1a	20-May-08		22J	1.94	0.87J	3.47J		16.8	3.79J	0.143J							10.1
TB-1a	11-Nov-08	12.9	502		**5.92**	**95.8B**	44.9	511B	**19.4**	0.76	75.5	27.8	7.84JB			**200B**	198
TB-1a	11-Mar-09		64.8JB	3.46	**3.25**	9.58JB	9.49JB	39B	9.25JB	0.253J	12.2J		6.57JB			**23.9JB**	17.3
TB-1a	3-Dec-09		68.5J	0.45J	**3.33**	9.13J	3.89J	56.4B	6.92J		12.2J	3.97J				**23JB**	26.5B

Table 3a
Detected Groundwater Constituents - Metals
North Wake Unlined Landfill

Monitor Well	Sample Date	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Nickel	Selenium	Silver	Tin	Thallium	Vanadium	Zinc
NC2L		**10**	**700**	**4***	**2**	**10**	**70***	**1,000**	**15**	**1**	**100**	**20**	**20**	**NE**	**0.28***	**3.5***	**1,000**
SWSL		**10**	**100**	**1**	**1**	**10**	**10**	**10**	**10**	**0.2**	**50**	**10**	**10**	**100**	**5.5**	**25**	**10**
TB-1a deep	8-Jun-01																
TB-1a deep	6-Dec-01																
TB-1a deep	11-Apr-02																
TB-1a deep	6-Nov-02																
TB-1a deep	18-Apr-03																
TB-1a deep	4-Nov-03																
TB-1a deep	28-Apr-04																
TB-1a deep	18-Nov-04																
TB-1a deep	21-Apr-05																
TB-1a deep	11-Nov-05																
TB-1a deep	14-Apr-06																
TB-1a deep	10-Nov-06																
TB-1a deep	20-Apr-07																
TB-1a deep	8-Nov-07																
TB-1a deep	19-May-08		15.6J			**22.6**		5.37J	5.36J		6.9J		4.69J		**5.54**	**6.86J**	7.06J
TB-1a deep	7-Nov-08		15.2JB	1.05B		**16.8B**		8.18JB	5.33JB				8.69JB			**18.9JB**	
TB-1a deep	12-Mar-09			**4.48**	0.23J	**12.6**		3.46JB	6.73J							**9.29JB**	18.5
TB-1a deep	4-Dec-09		30.1JB			**12.6B**		9.35JB			7.1J		3.05JB			**4.21JB**	77.9B
MW-33	6-Aug-98				**5.8**	46	18									**73**	110
MW-33	7-Dec-98				**2.7**	18											
MW-33	26-Apr-99					15.5											58.5
MW-33	2-Dec-99					18.1											61
MW-33	13-Apr-00																
MW-33	18-Apr-01																
MW-33	9-Apr-02																
MW-33	16-Apr-03				1.2	26.9	11.8									**47.1**	71.5
MW-33	21-Apr-04					10.5											
MW-33	22-Apr-05		660	3		**54**	18		**32**							**92**	885
MW-33	14-Apr-06			3		47	15		**27**							**80**	669
MW-33	20-Apr-07					19		14								**30**	**1165**
MW-33	15-May-08		54.9J			20.2		14.6	5.11J		6.9J		4.47J		**10.7**	**19.2J**	31.1
MW-33	12-Mar-09		21.9J			4.58J		1.88JB	4.65J							**7.79JB**	5.35J
MW-34	6-Aug-98			**4.9**	**8.4**	43	20				64					**110**	180
MW-34	7-Dec-98				**2.2**	14											59
MW-34	26-Apr-99																73.2
MW-34	2-Dec-99																
MW-34	13-Apr-00																
MW-34	18-Apr-01																
MW-34	9-Apr-02																
MW-34	16-Apr-03																
MW-34	21-Apr-04														**10.3**		
MW-34	22-Apr-05		1108	**10**	1.0	29			**33**							**74**	439
MW-34	13-Apr-06																
MW-34	20-Apr-07																16
MW-34	19-May-08		121			11.7		12.3		0.191J	5.43J		4.19J			**8.81J**	23
MW-34	12-Mar-09		73J			3.78J		3.8JB		0.121J						**12.7JB**	12.2

Table 3a
Detected Groundwater Constituents - Metals
North Wake Unlined Landfill

Monitor Well	Sample Date	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Nickel	Selenium	Silver	Tin	Thallium	Vanadium	Zinc
NC2L		**10**	**700**	**4***	**2**	**10**	**70***	**1,000**	**15**	**1**	**100**	**20**	**20**	**NE**	**0.28***	**3.5***	**1,000**
SWSL		**10**	**100**	**1**	**1**	**10**	**10**	**10**	**10**	**0.2**	**50**	**10**	**10**	**100**	**5.5**	**25**	**10**
MW-34d	6-Aug-98																
MW-34d (dup)	6-Aug-98																
MW-34d	7-Dec-98																
MW-34d	26-Apr-99																
MW-34d	2-Dec-99																
MW-34d	13-Apr-00																
MW-34d	18-Apr-01																
MW-34d	9-Apr-02					12.5											
MW-34d	16-Apr-03																
MW-34d	21-Apr-04																
MW-34d	22-Apr-05																
MW-34d	13-Apr-06				**4.0**												
MW-34d	20-Apr-07																
MW-34d	19-May-08		27.4J			10.1		3.95J	5.49J				4.46J				
MW-34d	12-Mar-09		21.5J			4.48J		2.29JB							**5.78**	**8.27JB**	18
MW-35	6-Aug-98			**4.3**	**9.8**	47	30				52					**120**	130
MW-35	7-Dec-98				**4.6**	22	15				79					**43**	74
MW-35	26-Apr-99						13										
MW-35	2-Dec-99																
MW-35	13-Apr-00																
MW-35	18-Apr-01																
MW-35	9-Apr-02																
MW-35	16-Apr-03																
MW-35	21-Apr-04																
MW-35	22-Apr-05			**5**		19			**18**							**52**	134
MW-35	13-Apr-06			2		10											
MW-35	20-Apr-07		316	**6**	1.0	39	10	55	**19**							**109**	149
MW-35	19-May-08		49.5J			5.40J		6.03J					4.43J		**11.7**		8.04J
MW-35	10-Mar-09		34J										1.42JB		**8.59J**		
MW-36	4-Dec-08		159B			**52.3B**	21.9	57.5B	13.6	0.13JB	24.2J	9.10J				**81.6**	47.1
MW-36	10-Mar-09		107			**13**	5.23J	19.1			5.71J		1.56JB			**27.2**	11.5
MW-36	4-Dec-09		71.1JB			4.21JB		8.25JB	9.4JB				2.78JB			**3.72JB**	4.9JB
MW-36d	4-Dec-08		102B			**70.4B**	6.46J	32.8B	4.12J	0.13JB	20.0J				**7.59**	**37**	55.6
MW-36d	10-Mar-09		39.8J			18.1		11.6	3.94J		9.35J		1.87JB			**16.6J**	
MW-36d	2-Dec-09		54J			**26**		11.6B			15.9J					**10.7JB**	4.16JB

Notes:
All units are in micrograms per liter (parts per billion)
- Concentration exceeds NC Groundwater Standards (2L
- Indicates result below detection limits
* - Groundwater Protection Standard
NS - Not Sampled; NE - Standard Not Established; dup - Duplicate Sample
J - Indicates the analytical result is an estimated concentration between the Method Detection Limit and the Solid Waste Sectio
Reporting Limit (SWSL)
B - Indicates that the amount detected in the method blank was greater than the Method Detection Lim
MW-27 was abandoned on November 24, 2008 in accordance with 15A NCAC 2C .0113
MW-36/36d installed November 2008
Monitoring wells MW-28, -28d, -33, -34, -34d, and -35 sampled yearly during the spring event

Table 3b
Detected Constituents - Volatile and Semi-Volatile Organic Compounds
North Wake Unlined Landfill

Monitor Well	Sample Date	Acetone	Benzene	Bromodichloromethane	Bromomethane	1,2-Dibromoethane	Carbon Disulfide	Chlorobenzene	Chloroethane	Chloroform	Chloromethane	p-Dichlorobenzene	o-Dichlorobenzene	Dichlorodifluoromethane	1,1-Dichloroethane	1,2-Dichloroethane	1,1-Dichloroethene	cis-1,2-Dichloroethene	trans 1,2-Dichloroethene	1,2-Dichloropropane	Ethylbenzene	Iodomethane	Methylene Chloride	MEK (2-Butanone)	Styrene	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	Trichloroethene	Trichlorofluoromethane	1,2,3-Trichloropropane	Vinyl Chloride	Total Xylenes	bis(2-ethylhexyl) Phthalate	Diethylphthalate	Di-n-Butylphthalate	Dimethylphthalate	3&4-Methylphenol
NC2L		600	1	0.56	NE	0.0004	700	50	3,000	70	3	6	20	1,000	6	0.4	7	70	100	0.6	600	NE	5	4,000	70	0.7	600	200	3	2,000	0.005	0.03	500	3	6,000	700	NE	3.5
SWSL		100	1	1	10	1	100	3	10	5	1.0	1	5	5	5	1	5	5	5	1.00	1	10	1	100	1	1	1	1	1	1	1	1	5	15	10	10	10	10
MW-11	15-Apr-94																																					
MW-11	11-May-94																																					
MW-11	25-Aug-94																																					
MW-11	29-Sep-94																																					
MW-11	13-Jun-95																																					
MW-11	28-Sep-95																																					
MW-11	31-Oct-95																																					
MW-11	22-Mar-96																																					
MW-11	27-Nov-96																																					
MW-11	22-Apr-97																																					
MW-11	31-Oct-97																																					
MW-11	11-May-98																																					
MW-11	8-Dec-98																																	24				
MW-11	14-Apr-99																																					
MW-11	30-Nov-99																																					
MW-11	5-Apr-00																																					
MW-11	18-Dec-00																																					
MW-11	18-Apr-01																																					
MW-11	27-Nov-01																																					
MW-11	5-Apr-02																																					
MW-11	5-Nov-02																																					
MW-11	15-Apr-03																																					
MW-11	30-Oct-03																																					
MW-11	21-Apr-04																																					
MW-11	18-Nov-04																																					
MW-11	21-Apr-05																																					
MW-11	11-Nov-05																																					
MW-11	14-Apr-06																																					
MW-11	10-Nov-06																																					
MW-11	20-Apr-07																																					
MW-11	8-Nov-07																																					
MW-11	15-May-08																																					
MW-11	10-Nov-08									0.12J																												
MW-11	11-Mar-09									0.14J																	0.11J											
MW-11	3-Dec-09									0.14J																												

Table 3b
Detected Constituents - Volatile and Semi-Volatile Organic Compounds
North Wake Unlined Landfill

Monitor Well	Sample Date	Acetone	Benzene	Bromodichloromethane	Bromomethane	1,2-Dibromoethane	Carbon Disulfide	Chlorobenzene	Chloroethane	Chloroform	Chloromethane	p-Dichlorobenzene	o-Dichlorobenzene	Dichlorodifluoromethane	1,1-Dichloroethane	1,2-Dichloroethane	1,1-Dichloroethene	cis-1,2-Dichloroethene	trans 1,2-Dichloroethene	1,2-Dichloropropane	Ethylbenzene	Iodomethane	Methylene Chloride	MEK (2-Butanone)	Styrene	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	Trichloroethene	Trichlorofluoromethane	1,2,3-Trichloropropane	Vinyl Chloride	Total Xylenes	bis(2-ethylhexyl) Phthalate	Diethylphthalate	Di-n-Butylphthalate	Dimethylphthalate	3&4-Methylphenol
NC2L		600	1	0.56	NE	0.0004	700	50	3,000	70	3	6	20	1,000	6	0.4	7	70	100	0.6	600	NE	5	4,000	70	0.7	600	200	3	2,000	0.005	0.03	500	3	6,000	700	NE	3.5
SWSL		100	1	1	10	1	100	3	10	5	1.0	1	5	5	5	1	5	5	5	1.00	1	10	1	100	1	1	1	1	1	1	1	1	5	15	10	10	10	10
MW-11d	31-Oct-95																																					
MW-11d	22-Mar-96																																					
MW-11d	27-Nov-96																																					
MW-11d	22-Apr-97																																					
MW-11d	31-Oct-97																																					
MW-11d	11-May-98																																					
MW-11d	8-Dec-98																																					
MW-11d	14-Apr-99																																					
MW-11d	30-Nov-99																																	20				
MW-11d	5-Apr-00																																					
MW-11d	18-Dec-00																																					
MW-11d	18-Apr-01																																					
MW-11d	27-Nov-01																																					
MW-11d	5-Apr-02																																					
MW-11d	5-Nov-02																																					
MW-11d	15-Apr-03																																					
MW-11d	30-Oct-03																																					
MW-11d	21-Apr-04																																					
MW-11d	18-Nov-04																																					
MW-11d	21-Apr-05																																					
MW-11d	11-Nov-05																																					
MW-11d	14-Apr-06																																					
MW-11d	10-Nov-06																																					
MW-11d	20-Apr-07																																	24.5				
MW-11d	8-Nov-07																																					
MW-11d	15-May-08									0.31J																												
MW-11d	10-Nov-08									0.22J																												
MW-11d	16-Mar-09									0.28J																								0.999J				
MW-11d	4-Dec-09									0.29J																												

Table 3b
Detected Constituents - Volatile and Semi-Volatile Organic Compounds
North Wake Unlined Landfill

Monitor Well	Sample Date	Acetone	Benzene	Bromodichloromethane	Bromomethane	1,2-Dibromoethane	Carbon Disulfide	Chlorobenzene	Chloroethane	Chloroform	Chloromethane	p-Dichlorobenzene	o-Dichlorobenzene	Dichlorodifluoromethane	1,1-Dichloroethane	1,2-Dichloroethane	1,1-Dichloroethene	cis-1,2-Dichloroethene	trans 1,2-Dichloroethene	1,2-Dichloropropane	Ethylbenzene	Iodomethane	Methylene Chloride	MEK (2-Butanone)	Styrene	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	Trichloroethene	Trichlorofluoromethane	1,2,3-Trichloropropane	Vinyl Chloride	Total Xylenes	bis(2-ethylhexyl) Phthalate	Diethylphthalate	Di-n-Butylphthalate	Dimethylphthalate	3&4-Methylphenol
NC2L		600	1	0.56	NE	0.0004	700	50	3,000	70	3	6	20	1,000	6	0.4	7	70	100	0.6	600	NE	5	4,000	70	0.7	600	200	3	2,000	0.005	0.03	500	3	6,000	700	NE	3.5
SWSL		100	1	1	10	1	100	3	10	5	1.0	1	5	5	5	1	5	5	5	1.00	1	10	1	100	1	1	1	1	1	1	1	1	5	15	10	10	10	10
MW-5	6-Mar-94		4.9												150		0.84	2.1					17			6.3		5.3	14	9.2		2	3.23					
MW-5	15-Apr-94		4.2						35.7		5.7				99.6	1.1	1.2	1.5					11.7			6.3			11.8	17.9								
MW-5	11-May-94		2.4						24		5.7				74		1.1						11			4.9	2		8.2	26								
MW-5	31-May-94		3.1							0.6					47		1.2	1.2								5.4		7.2	8.1				2.72					
MW-5	10-Jun-94		2.8						24.5						71.8		1.4	1.2								3.6		7.6	7.1									
MW-5	30-Sep-94		1.9						18.7						41.6											4.6		8.9										
MW-5	13-Jun-95		10						48					22				8	196							10			19									
MW-5	28-Sep-95	NS	NS	NS		NS		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS		NS	NS
MW-5	31-Oct-95		9						61						230			14					18						11									
MW-5 (dup)	31-Oct-95		9						53						210			14					15			9			16									
MW-5	30-Jan-96		10						50					16	198			23								7			17									
MW-5	28-Nov-96	NS	NS	NS		NS		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS		NS	NS
MW-5	22-Apr-97	NS	NS	NS		NS		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS		NS	NS
MW-5	1-Nov-97	NS	NS	NS		NS		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS		NS	NS
MW-5	6-May-98	NS	NS	NS		NS		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS		NS	NS
MW-5	8-Dec-98		7.9						20			6.0		10	74			15					79			11			17				6.5					
MW-5	16-Apr-99		8						22						87			42					100			6			14									26
MW-5	2-Dec-99		6												60			72								6			16									
MW-5	11-Apr-00		6						14			11.0			70			34								10			22		140							
MW-5	20-Dec-00														39			17											14									
MW-5	16-Apr-01											7.0			44			29											17									
MW-5	3-Dec-01														31			20											12									
MW-5	12-Apr-02											7.0			32			33											16									
MW-5	5-Nov-02								10			6.0			26			31											15									
MW-5	17-Apr-03											14.0			24			44											11									
MW-5	4-Nov-03	540										8												360														
MW-5	4-Nov-03	490										8												360														
MW-5	14-Apr-04																										1000											
MW-5	18-Nov-04																																					
MW-5	21-Apr-05																																					
MW-5	11-Nov-05								6	9.2																												
MW-5	14-Apr-06																																					
MW-5	9-Nov-06								8.6	5.8																												
MW-5	19-Apr-07								6.7	6.8																												
MW-5	8-Nov-07		4.9					5.9	20.5	8.8																			2.6			13						
MW-5R	21-Apr-04											16.5			13.1			56.2																				
MW-5R	21-May-08		0.34J					1.00J	0.67J			6.17			0.8J			4.22J					0.24J						0.26J									
MW-5R	10-Nov-08		0.23J					0.63J				5.49			0.61J			1.95J					0.23J						0.13J									
MW-5R	11-Mar-09											0.91J																										
MW-5R	3-Dec-09											0.51J						0.09J																				

Table 3b
Detected Constituents - Volatile and Semi-Volatile Organic Compounds
North Wake Unlined Landfill

Monitor Well	Sample Date	Acetone	Benzene	Bromodichloromethane	Bromomethane	1,2-Dibromoethane	Carbon Disulfide	Chlorobenzene	Chloroethane	Chloroform	Chloromethane	p-Dichlorobenzene	o-Dichlorobenzene	Dichlorodifluoromethane	1,1-Dichloroethane	1,2-Dichloroethane	1,1-Dichloroethene	cis-1,2-Dichloroethene	trans 1,2-Dichloroethene	1,2-Dichloropropane	Ethylbenzene	Iodomethane	Methylene Chloride	MEK (2-Butanone)	Styrene	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	Trichloroethene	Trichlorofluoromethane	1,2,3-Trichloropropane	Vinyl Chloride	Total Xylenes	bis(2-ethylhexyl) Phthalate	Diethylphthalate	Di-n-Butylphthalate	Dimethylphthalate	3&4-Methylphenol
NC2L		600	1	0.56	NE	0.0004	700	50	3,000	70	3	6	20	1,000	6	0.4	7	70	100	0.6	600	NE	5	4,000	70	0.7	600	200	3	2,000	0.005	0.03	500	3	6,000	700	NE	3.5
SWSL		100	1	1	10	1	100	3	10	5	1.0	1	5	5	5	1	5	5	5	1.00	1	10	1	100	1	1	1	1	1	1	1	1	5	15	10	10	10	10
MW-6	6-Mar-94		1.7							0.83					34								37			3.4		5.9	4.6	3.9			2.42					
MW-6	15-Apr-94								8.5		1.2				12.5								21			1.9			2.1	2.6								
MW-6	11-May-94								18.4		1.2				28.7								64.2			2.3			4.9	2.6								
MW-6 (dup)	1-Jun-94		3.7							4.3					50								130			7		14	7.5	11			16.6					
MW-6	25-Aug-94								22						36								79.8															
MW-6	29-Sep-94		2						18		66				34								6.1			3		1.4										
MW-6	13-Jun-95								19						28								61						6									
MW-6	28-Sep-95	NS	NS	NS		NS		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS		NS	NS
MW-6	31-Oct-95								22						32								56						6									
MW-6	30-Jan-96		6						37						61														11									
MW-6	29-Nov-96								34						41								91						16									
MW-6	22-Apr-97		5.4						37						29			6.7					88						15									
MW-6	2-Nov-97		6.1						28						28			7.8					90			5.2			16									
MW-6	6-May-98								29						34			13					140						17									
MW-6 (dup)	6-May-98								30						35			14					140						19									
MW-6	8-Dec-98								26						40			14					180						19									
MW-6	16-Apr-99		5						16						26								110						11									
MW-6	2-Dec-99														12			7					67						6									
MW-6	11-Apr-00														12			7					63						6									
MW-6	19-Dec-00														6								20															
MW-6	16-Apr-01														8			6					46															
MW-6	3-Dec-01																	6																				
MW-6	12-Apr-02														7			5					26															
MW-6	5-Nov-02																	5					10															
MW-6	17-Apr-03																																	13				
MW-6	4-Nov-03																	6																				
MW-6	14-Apr-04																	5.7																				
MW-6	18-Nov-04																																					
MW-6	21-Apr-05																																					
MW-6	11-Nov-05																																					
MW-6	14-Apr-06																																					
MW-6	9-Nov-06																																					
MW-6	19-Apr-07																																					
MW-6	8-Nov-07		3.3									7.4																				3.4						
MW-6	20-May-08		3.85					1J	3.85J			2.07			1.22J			2.3J					0.62J				0.14J		0.9J			3.29		2.17J	1.86J		1.06J	
MW-6	11-Nov-08		4.12					1.29J	3.90J			2.72		0.33J	1.27J			2.22J					1.08				0.20J		0.98J			4.01						
MW-6	11-Mar-09		3.3					1.22J	2.43J			2.02			0.75J			2.21J									0.11J		0.71J			3.61						
MW-6	3-Dec-09		2.56					1.7J	1.79J			1.78			0.79J			1.49J					0.28J				0.14J		0.6J			2.24						

Table 3b
Detected Constituents - Volatile and Semi-Volatile Organic Compounds
North Wake Unlined Landfill

Monitor Well	Sample Date	Acetone	Benzene	Bromodichloromethane	Bromomethane	1,2-Dibromoethane	Carbon Disulfide	Chlorobenzene	Chloroethane	Chloroform	Chloromethane	p-Dichlorobenzene	o-Dichlorobenzene	Dichlorodifluoromethane	1,1-Dichloroethane	1,2-Dichloroethane	1,1-Dichloroethene	cis-1,2-Dichloroethene	trans 1,2-Dichloroethene	1,2-Dichloropropane	Ethylbenzene	Iodomethane	Methylene Chloride	MEK (2-Butanone)	Styrene	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	Trichloroethene	Trichlorofluoromethane	1,2,3-Trichloropropane	Vinyl Chloride	Total Xylenes	bis(2-ethylhexyl) Phthalate	Diethylphthalate	Di-n-Butylphthalate	Dimethylphthalate	3&4-Methylphenol
NC2L		600	1	0.56	NE	0.0004	700	50	3,000	70	3	6	20	1,000	6	0.4	7	70	100	0.6	600	NE	5	4,000	70	0.7	600	200	3	2,000	0.005	0.03	500	3	6,000	700	NE	3.5
SWSL		100	1	1	10	1	100	3	10	5	1.0	1	5	5	5	1	5	5	5	1.00	1	10	1	100	1	1	1	1	1	1	1	1	5	15	10	10	10	10
MW-6d	8-Jun-01														8			6																				
MW-6d	4-Dec-01																																					
MW-6d	9-Apr-02																																					
MW-6d	7-Nov-02																																					
MW-6d	16-Apr-03																																					
MW-6d	4-Nov-03																																					
MW-6d	21-Apr-04																																					
MW-6d	18-Nov-04																																					
MW-6d	21-Apr-05																																					
MW-6d	11-Nov-05																																					
MW-6d	11-Apr-06																																					
MW-6d	9-Nov-06																																					
MW-6d	20-Apr-07																																					
MW-6d	8-Nov-07																																					
MW-6d	20-May-08									0.49J				3.04J	5.7			0.85J					0.34J			0.71J			0.91J	0.91J								
MW-6d	6-Nov-08		0.23J							0.57J		0.44J		2.76J	**6.12**			1.10J					0.77J			**1.06**			1.13	1.10								
MW-6d (dup)	6-Nov-08		0.25J							0.61J		0.45J		2.69J	**6.16**			1.00J					0.68J			**1.08**			1.13	0.99J								
MW-6d	12-Mar-09									0.43J				1.47J	3.24J			0.54J					0.33J			**0.77J**			0.49J	0.55J								
MW-6d	3-Dec-09									0.58J		0.28J		1.86J	5.51			0.9J					0.42J			0.69J			0.86J	0.75J								

Table 3b
Detected Constituents - Volatile and Semi-Volatile Organic Compounds
North Wake Unlined Landfill

Monitor Well	Sample Date	Acetone	Benzene	Bromodichloromethane	Bromomethane	1,2-Dibromoethane	Carbon Disulfide	Chlorobenzene	Chloroethane	Chloroform	Chloromethane	p-Dichlorobenzene	o-Dichlorobenzene	Dichlorodifluoromethane	1,1-Dichloroethane	1,2-Dichloroethane	1,1-Dichloroethene	cis-1,2-Dichloroethene	trans 1,2-Dichloroethene	1,2-Dichloropropane	Ethylbenzene	Iodomethane	Methylene Chloride	MEK (2-Butanone)	Styrene	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	Trichloroethene	Trichlorofluoromethane	1,2,3-Trichloropropane	Vinyl Chloride	Total Xylenes	bis(2-ethylhexyl) Phthalate	Diethylphthalate	Di-n-Butylphthalate	Dimethylphthalate	3&4-Methylphenol
NC2L		600	1	0.56	NE	0.0004	700	50	3,000	70	3	6	20	1,000	6	0.4	7	70	100	0.6	600	NE	5	4,000	70	0.7	600	200	3	2,000	0.005	0.03	500	3	6,000	700	NE	3.5
SWSL		100	1	1	10	1	100	3	10	5	1.0	1	5	5	5	1	5	5	5	1.00	1	10	1	100	1	1	1	1	1	1	1	1	5	15	10	10	10	10
MW-7	6-Mar-94																																					
MW-7	15-Apr-94																																					
MW-7	11-May-94																																					
MW-7	31-May-94																																					
MW-7	25-Aug-94																																					
MW-7	29-Sep-94																																					
MW-7	13-Jun-95																																					
MW-7	28-Sep-95	NS	NS	NS		NS		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS		NS	NS
MW-7	31-Oct-95								11						5																							
MW-7	30-Jan-96																																					
MW-7	29-Nov-96								22						**9**			2								4			**5**									
MW-7	21-Apr-97								19						**11**			5.9																				
MW-7	1-Nov-97								26						**10**			6.2																				
MW-7	6-May-98								24						**17**			21																				
MW-7	8-Dec-98		**7.2**						32						**20**			36					**12**						**5.2**									
MW-7	16-Apr-99								21						**14**			24																				
MW-7	2-Dec-99														**9**			16																				
MW-7	11-Apr-00														**8**			17																				
MW-7 (dup)	11-Apr-00														**8**			17																**16**				
MW-7	19-Dec-00														5			10																				
MW-7 (dup)	19-Dec-00														**6**			12																				
MW-7	16-Apr-01														**6**			13																**16**				
MW-7	4-Dec-01																																					
MW-7	9-Apr-02																	7																				
MW-7	6-Nov-02																	12																				
MW-7	16-Apr-03																	24																				
MW-7	5-Nov-03																	15																				
MW-7	21-Apr-04																	18.3																				
MW-7 (dup)	21-Apr-04																	19.9																				
MW-7	18-Nov-04																	16.4																				
MW-7	21-Apr-05																	26																				
MW-7	11-Nov-05																	12.2																				
MW-7	14-Apr-06																	19.3																				
MW-7	9-Nov-06																	27.2																				
MW-7	20-Apr-07																	24.3													**5.4**							
MW-7	8-Nov-07		**3.5**									2.7						22.3													**7.7**							
MW-7	15-May-08		**1.61**					0.24J				0.77J	0.15J		0.44J			7.68													**2.74**		0.907J					
MW-7	5-Nov-08		**1.04**					0.14J				0.83J	0.16J	1.10J	0.25J			3.14J									0.15J				**2.09**							
MW-7	10-Mar-09		**1.56**					0.20J				1.17		1.34J				3.40J									0.68J				**2.73**	0.96J	2.36J					
MW-7	2-Dec-09		**1.37**					0.2J	0.62J			1.13	0.23J	0.69J	0.32J			2.24J									0.3J				**1.82**	0.48J						
MW-7 (dup)	2-Dec-09		**1.38**					0.22J	0.59J			1.11	0.23J	0.76J	0.29J			2.34J									0.32J				**1.93**	0.45J						

Table 3b
Detected Constituents - Volatile and Semi-Volatile Organic Compounds
North Wake Unlined Landfill

Monitor Well	Sample Date	Acetone	Benzene	Bromodichloromethane	Bromomethane	1,2-Dibromoethane	Carbon Disulfide	Chlorobenzene	Chloroethane	Chloroform	Chloromethane	p-Dichlorobenzene	o-Dichlorobenzene	Dichlorodifluoromethane	1,1-Dichloroethane	1,2-Dichloroethane	1,1-Dichloroethene	cis-1,2-Dichloroethene	trans 1,2-Dichloroethene	1,2-Dichloropropane	Ethylbenzene	Iodomethane	Methylene Chloride	MEK (2-Butanone)	Styrene	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	Trichloroethene	Trichlorofluoromethane	1,2,3-Trichloropropane	Vinyl Chloride	Total Xylenes	bis(2-ethylhexyl) Phthalate	Diethylphthalate	Di-n-Butylphthalate	Dimethylphthalate	3&4-Methylphenol
NC2L		600	1	0.56	NE	0.0004	700	50	3,000	70	3	6	20	1,000	6	0.4	7	70	100	0.6	600	NE	5	4,000	70	0.7	600	200	3	2,000	0.005	0.03	500	3	6,000	700	NE	3.5
SWSL		100	1	1	10	1	100	3	10	5	1.0	1	5	5	5	1	5	5	5	1.00	1	10	1	100	1	1	1	1	1	1	1	1	5	15	10	10	10	10
MW-8	6-Mar-94		6.8							2.2		3.2			13	1	1.3	7.6			0.56		450			7.5	4	18	16	7.3		0.76	35.6					
MW-8	15-Apr-94		7.9						39.8	1.3	8.8	4.9			88.6	1.8	1.5	8.9		3	1.4		310			8.1	5		17.5	5.1			39.7					
MW-8	11-May-94		5.6						34						83								278			7			15				27.1					
MW-8	31-May-94		12							1.1		13			110	2.6	1.6	23					310		3.1	16	11	16	29	4.4			89					
MW-8	25-Aug-94								51.3						109								400										32					
MW-8	30-Sep-94		5.8						35		12.2	5.2			86			5.6					300					8.9	13				22.8					
MW-8	13-Jun-95								15						36								47						6				19					
MW-8	28-Sep-95	NS	NS	NS		NS		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS		NS	NS
MW-8	31-Oct-95		8						40	8				8	72			23			32		137			9			14									
MW-8	30-Jan-96		10						37					10	71			34					123			18			23				58	20				
MW-8	29-Nov-96		4			8			15			3		5	18			24					23			13		1	12				13					
MW-8	21-Apr-97														10			20					16			8.3			8.1					8				
MW-8	2-Nov-97														6.3			22											5.2									
MW-8	6-May-98		5.7												15			56					13			7.8			8.7				6.1					
MW-8	8-Dec-98														7.9			37											5.2									
MW-8	16-Apr-99											6			13			55											6									
MW-8 (dup)	16-Apr-99														10			41																				
MW-8	2-Dec-99	NS	NS	NS		NS		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS		NS	NS
MW-8	11-Apr-00																	12																				
MW-8	20-Dec-00																																					
MW-8	16-Apr-01																																					
MW-8	3-Dec-01																																					
MW-8	12-Apr-02																																					
MW-8	5-Nov-02																																					
MW-8	17-Apr-03																																	10				
MW-8	4-Nov-03																	12																				
MW-8	14-Apr-04																	7.9																				
MW-8	18-Nov-04																	7.9																				
MW-8	21-Apr-05																																					
MW-8	11-Nov-05																																					
MW-8	14-Apr-06																																					
MW-8	9-Nov-06																																					
MW-8	20-Apr-07																	18.9																				
MW-8	8-Nov-07																	6.6																				
MW-8	20-May-08		0.19J					0.16J		0.38J		0.16J			0.96J			14.2					0.76J			0.28J			0.39J									
MW-8	10-Nov-08		0.14J							0.39J					0.58J								1.17			0.17J	0.11J		0.23J									
MW-8	11-Mar-09		0.20J					0.19J		0.32J					0.61J			6.84					0.30J															
MW-8	3-Dec-09		0.22J							0.35J					0.62J			8.04					0.45J			0.13J			0.25J			0.44J						

Table 3b
Detected Constituents - Volatile and Semi-Volatile Organic Compounds
North Wake Unlined Landfill

Monitor Well	Sample Date	Acetone	Benzene	Bromodichloromethane	Bromomethane	1,2-Dibromoethane	Carbon Disulfide	Chlorobenzene	Chloroethane	Chloroform	Chloromethane	p-Dichlorobenzene	o-Dichlorobenzene	Dichlorodifluoromethane	1,1-Dichloroethane	1,2-Dichloroethane	1,1-Dichloroethene	cis-1,2-Dichloroethene	trans 1,2-Dichloroethene	1,2-Dichloropropane	Ethylbenzene	Iodomethane	Methylene Chloride	MEK (2-Butanone)	Styrene	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	Trichloroethene	Trichlorofluoromethane	1,2,3-Trichloropropane	Vinyl Chloride	Total Xylenes	bis(2-ethylhexyl) Phthalate	Diethylphthalate	Di-n-Butylphthalate	Dimethylphthalate	3&4-Methylphenol
NC2L		600	1	0.56	NE	0.0004	700	50	3,000	70	3	6	20	1,000	6	0.4	7	70	100	0.6	600	NE	5	4,000	70	0.7	600	200	3	2,000	0.005	0.03	500	3	6,000	700	NE	3.5
SWSL		100	1	1	10	1	100	3	10	5	1.0	1	5	5	5	1	5	5	5	1.00	1	10	1	100	1	1	1	1	1	1	1	1	5	15	10	10	10	10
MW-8d	8-Jun-01																																					
MW-8d	4-Dec-01																																					
MW-8d	9-Apr-02																																					
MW-8d (dup)	9-Apr-02																																					
MW-8d	7-Nov-02																																					
MW-8d	16-Apr-03																																					
MW-8d	4-Nov-03																																					
MW-8d	21-Apr-04																																					
MW-8d	18-Nov-04																																					
MW-8d	21-Apr-05																																					
MW-8d	11-Nov-05																																					
MW-8d	14-Apr-06																																					
MW-8d	10-Nov-06																																					
MW-8d	20-Apr-07																																					
MW-8d	8-Nov-07																																					
MW-8d	15-May-08									0.28J					0.17J			0.07J																				
MW-8d	6-Nov-08									0.31J													0.62J															
MW-8d	16-Mar-09									0.39J					0.14J			0.07J								0.44J												
MW-8d	4-Dec-09									0.36J					0.14J			0.08J																				

Table 3b
Detected Constituents - Volatile and Semi-Volatile Organic Compounds
North Wake Unlined Landfill

Monitor Well	Sample Date	Acetone	Benzene	Bromodichloromethane	Bromomethane	1,2-Dibromoethane	Carbon Disulfide	Chlorobenzene	Chloroethane	Chloroform	Chloromethane	p-Dichlorobenzene	o-Dichlorobenzene	Dichlorodifluoromethane	1,1-Dichloroethane	1,2-Dichloroethane	1,1-Dichloroethene	cis-1,2-Dichloroethene	trans 1,2-Dichloroethene	1,2-Dichloropropane	Ethylbenzene	Iodomethane	Methylene Chloride	MEK (2-Butanone)	Styrene	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	Trichloroethene	Trichlorofluoromethane	1,2,3-Trichloropropane	Vinyl Chloride	Total Xylenes	bis(2-ethylhexyl) Phthalate	Diethylphthalate	Di-n-Butylphthalate	Dimethylphthalate	3&4-Methylphenol
NC2L		600	1	0.56	NE	0.0004	700	50	3,000	70	3	6	20	1,000	6	0.4	7	70	100	0.6	600	NE	5	4,000	70	0.7	600	200	3	2,000	0.005	0.03	500	3	6,000	700	NE	3.5
SWSL		100	1	1	10	1	100	3	10	5	1.0	1	5	5	5	1	5	5	5	1.00	1	10	1	100	1	1	1	1	1	1	1	1	5	15	10	10	10	10
MW-9	6-Mar-94		5.3							5.8		1.6			100		1.3				0.73		680			6.6	6	7	8.7	4.2		0.96	15.2					
MW-9	15-Apr-94		5.6						14.1	4.9	7.3	2.4			96.8		1.8	0.7					357			8.2	1.6		12.4	3.6			17.3					
MW-9	11-May-94		6.8							5	20.1				134								357			7.6			13				20.5					
MW-9	31-May-94		8.2							6.6		3.4			170		1.7						460			8.8	1.7	8.7	14	3.6			23.3					
MW-9	25-Aug-94														165								558															
MW-9	29-Sep-94		7							5.1					131								400			8.2		6.5					16					
MW-9	13-Jun-95		11						20					28	203								258			11		7	23				8					
MW-9	28-Sep-95	NS	NS	NS		NS		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS		NS	NS
MW-9	31-Oct-95		15						29					44	310								278			14			27				14					
MW-9	30-Jan-96		14						22		11			33	270											8			23				6					
MW-9	29-Nov-96		22												280														31									
MW-9	22-Apr-97		24											16	220														28				14.2					
MW-9	2-Nov-97													32	200																							
MW-9	6-May-98		17											31	210											13			32									
MW-9	8-Dec-98		14											53	200											13			31					20				
MW-9	16-Apr-99		7											49	140											7			20					12				
MW-9	2-Dec-99														120														20									
MW-9	11-Apr-00														110														20									
MW-9	20-Dec-00													25	100														18									
MW-9	16-Apr-01													20	93			6								6			15					21				
MW-9	3-Dec-01													25	100			20											5									
MW-9 (dup)	3-Dec-01													20	89			19																22				
MW-9	12-Apr-02														97			21																				
MW-9	5-Nov-02													19	84			20																				
MW-9	17-Apr-03		5											19	100			29									6							59				
MW-9	4-Nov-03		5												83			28									13						8					
MW-9	14-Apr-04		5.86									5.5		11.8	96			27			2.5						15					6.2	7.4	28				
MW-9	18-Nov-04											5.2		13.2	73.7			6.4									6.6					26.5						
MW-9	21-Apr-05											5.2		9.5	69.6																	29.6						
MW-9	11-Nov-05											6.7		8.3	63.1																	28.8						
MW-9	14-Apr-06											6.9			47.6																	29.5						
MW-9	9-Nov-06											5.8			39.9																	23						
MW-9	19-Apr-07		4.4									8.4			44.4																	32.9						
MW-9	8-Nov-07		1.6									7.4			28.9	1													1.1			26.4						
MW-9	20-May-08		2.17					0.28J	3.53J			7.73		0.42J	28.9	0.86J		3.83J		0.9J	1.51		0.24J				1.01		0.45J	0.24J		25.6	1.69J		1.11J			
MW-9 (dup)	20-May-08		2.27					0.27J				7.42			30.3			3.62J	0.23J		1.32		0.26J				1.03		0.42J			27.7	1.10J		1.01J			
MW-9	11-Nov-08		1.74					0.20J	2.24J			6.26			21.6			3.28J			1.06		0.72J				0.60J		0.28J			19.1	0.48J					
MW-9	11-Mar-09		1.96					0.24J	2.50J			6.99			22.9			4.16J	0.15J	0.86J	1.06						0.54J		0.20J			22.1	0.77J	0.834J				
MW-9 (dup)	11-Mar-09		1.85					0.24J	2.36J			6.93			22.5			4.14J	0.13J	0.83J	1.06						0.54J		0.24J			21.5	0.89J	2.07J				
MW-9	3-Dec-09		1.58					0.22J	2.37J			6.06			18.9	0.67J		5.99	0.21J	0.8J	1.15						0.37J		0.28J			21.5	0.79J					

Table 3b
Detected Constituents - Volatile and Semi-Volatile Organic Compounds
North Wake Unlined Landfill

Monitor Well	Sample Date	Acetone	Benzene	Bromodichloromethane	Bromomethane	1,2-Dibromoethane	Carbon Disulfide	Chlorobenzene	Chloroethane	Chloroform	Chloromethane	p-Dichlorobenzene	o-Dichlorobenzene	Dichlorodifluoromethane	1,1-Dichloroethane	1,2-Dichloroethane	1,1-Dichloroethene	cis-1,2-Dichloroethene	trans 1,2-Dichloroethene	1,2-Dichloropropane	Ethylbenzene	Iodomethane	Methylene Chloride	MEK (2-Butanone)	Styrene	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	Trichloroethene	Trichlorofluoromethane	1,2,3-Trichloropropane	Vinyl Chloride	Total Xylenes	bis(2-ethylhexyl) Phthalate	Diethylphthalate	Di-n-Butylphthalate	Dimethylphthalate	3&4-Methylphenol
NC2L		600	1	0.56	NE	0.0004	700	50	3,000	70	3	6	20	1,000	6	0.4	7	70	100	0.6	600	NE	5	4,000	70	0.7	600	200	3	2,000	0.005	0.03	500	3	6,000	700	NE	3.5
SWSL		100	1	1	10	1	100	3	10	5	1.0	1	5	5	5	1	5	5	5	1.00	1	10	1	100	1	1	1	1	1	1	1	1	5	15	10	10	10	10
MW-10	6-Mar-94		2.4							2.5					37		2.4						72			4.6		16	9.8	12			26.7					
MW-10	15-Apr-94		1.8						18.1	1.6	5.5				24.2	2.6	2.6						67.3			4.8			8				16.9					
MW-10	11-May-94		1.4						15.8	1.7	4				23	2.6	1.8						54.8			4			6.8	16.3			6.7					
MW-10	31-May-94		3.7							3.9					57		2.7						120			8.7		17	15	15			19.1					
MW-10	25-Aug-94								47.7		18.7				72						8		194			9.2		18.4		18			15					
MW-10	29-Sep-94		4.2						37.7	3.4	7.2				56.3		3.5						148					3.5	19	17.1			13.1					
MW-10	13-Jun-95		7						53		13			18	84								223			13		13	20				14					
MW-10	28-Sep-95	NS	NS	NS		NS		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS		NS	NS
MW-10	31-Oct-95								33					46	44			10					47			7		14	8	14								
MW-10	30-Jan-96		8						48		10			29	101			12								9		8	18				8					
MW-10	28-Nov-96								3						12			1					15			2			2									
MW-10	22-Apr-97		12						31					8.5	160			20					120			25			33				19.6	7.3				
MW-10	1-Nov-97	NS	NS	NS		NS		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS		NS	NS
MW-10	8-Dec-98														140			48					270			16			19				12					
MW-10	11-Jan-99		7						19						140			36					320			14			18					NS				
MW-10	8-Feb-99		9						24						140			41								17			21				20	NS				
MW-10 (dup)	8-Feb-99		8						20						130			38								13			17					NS				
MW-10	16-Apr-99														160			26					410											16				
MW-10	2-Dec-99														40								77			6								14				
MW-10	12-Apr-00														46			7					88			7			6									
MW-10	20-Dec-00														35								40															
MW-10	17-Apr-01														34								34															
MW-10	3-Dec-01														26								18															
MW-10	12-Apr-02														22								18															
MW-10	5-Nov-02													6	20								16			8												
MW-10 (dup)	5-Nov-02													6	21								16			9												
MW-10	17-Apr-03													5	26								22			7												
MW-10	4-Nov-03													5	26																							
MW-10	14-Apr-04													5																				189				
MW-10	18-Nov-04																	6.4																37				
MW-10	21-Apr-05																	9.9																				
MW-10	11-Nov-05														5.7			17.6																				
MW-10	14-Apr-06																	11.9																				
MW-10	9-Nov-06														7.8			27.7																				
MW-10	19-Apr-07														6.3			7.4																24				
MW-10	8-Nov-07																						1			1.3								21				
MW-10	20-May-08		1.16						1.03J			0.46J		0.55J	6.07		0.14J	7.13					3.69			2.34			1.81	0.17J		0.49J	0.52J	3.12J				
MW-10	11-Nov-08		2.26						1.46J			0.66J		0.83J	9.44			11.3					1.89			4.2			2.99			1.67	0.41J					
MW-10	11-Mar-09		3.53						1.50J			0.50J			8.52			22.3								4.06			4			1.70	0.65J	0.616J				
MW-10	3-Dec-09		4.32					0.09J	1.06J			0.68J		0.38J	7.58			28.8					0.42J			2.65			2.99			0.95J	0.15J					

Table 3b
Detected Constituents - Volatile and Semi-Volatile Organic Compounds
North Wake Unlined Landfill

Monitor Well	Sample Date	Acetone	Benzene	Bromodichloromethane	Bromomethane	1,2-Dibromoethane	Carbon Disulfide	Chlorobenzene	Chloroethane	Chloroform	Chloromethane	p-Dichlorobenzene	o-Dichlorobenzene	Dichlorodifluoromethane	1,1-Dichloroethane	1,2-Dichloroethane	1,1-Dichloroethene	cis-1,2-Dichloroethene	trans 1,2-Dichloroethene	1,2-Dichloropropane	Ethylbenzene	Iodomethane	Methylene Chloride	MEK (2-Butanone)	Styrene	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	Trichloroethene	Trichlorofluoromethane	1,2,3-Trichloropropane	Vinyl Chloride	Total Xylenes	bis(2-ethylhexyl) Phthalate	Diethylphthalate	Di-n-Butylphthalate	Dimethylphthalate	3&4-Methylphenol
NC2L		600	1	0.56	NE	0.0004	700	50	3,000	70	3	6	20	1,000	6	0.4	7	70	100	0.6	600	NE	5	4,000	70	0.7	600	200	3	2,000	0.005	0.03	500	3	6,000	700	NE	3.5
SWSL		100	1	1	10	1	100	3	10	5	1.0	1	5	5	5	1	5	5	5	1.00	1	10	1	100	1	1	1	1	1	1	1	1	5	15	10	10	10	10
MW-10d	8-Jun-01														12								16															
MW-10d	4-Dec-01														17																							
MW-10d	11-Apr-02														16																							
MW-10d	5-Nov-02														13																							
MW-10d	17-Apr-03														11																							
MW-10d	4-Nov-03														8																			13				
MW-10d	26-Apr-04														5.9																			32.4				
MW-10d	18-Nov-04																																	43				
MW-10d	21-Apr-05																																					
MW-10d	11-Nov-05																																					
MW-10d	14-Apr-06																																					
MW-10d	10-Nov-06																																					
MW-10d	20-Apr-07																																	19.9				
MW-10d	8-Nov-07																																	20				
MW-10d	20-May-08									0.3J				0.36J	2.01J			0.2J					0.71J			0.29J			0.36J									
MW-10d	6-Nov-08		0.22J				6.01J			0.21J					2.16J			0.15J					1.47			0.32J			0.37J	0.39J								
MW-10d	12-Mar-09									0.26J				0.67J	2.30J			0.18J					1.17			0.33J			0.37J					1.12J				
MW-10d	4-Dec-09									0.25J				0.56J	2.44J			0.27J					1.06			0.47J			0.48J	0.29J								
MW-22	9-Jun-97																																					
MW-22	18-Aug-97																																					
MW-22	2-Nov-97													5.2	6.9																							
MW-22	6-May-98																																					
MW-22	8-Dec-98														8.6																							
MW-22	16-Apr-99														6																							
MW-22	2-Dec-99																																					
MW-22	12-Apr-00																																					
MW-22	20-Dec-00														9																							
MW-22	17-Apr-01														9																							
MW-22	4-Dec-01														6																							
MW-22	9-Apr-02														5																							
MW-22	6-Nov-02														5																							
MW-22	17-Apr-03																																					
MW-22	5-Nov-03																																					
MW-22	26-Apr-04																																					
MW-22	19-Nov-04																																					
MW-22	22-Apr-06																																					
MW-22	11-Nov-05																																					
MW-22	14-Apr-07																																					
MW-22	9-Nov-06																																					
MW-22	20-Apr-07																																					
MW-22	8-Nov-07																																					
MW-22	15-May-08														0.25J											0.31J								1.47J				
MW-22	6-Nov-08																						0.74J			0.32J												
MW-22	12-Mar-09														0.09J											0.66J								0.71J				
MW-22	4-Dec-09		0.15J							1.2J													0.4J			0.31J												

Table 3b
Detected Constituents - Volatile and Semi-Volatile Organic Compounds
North Wake Unlined Landfill

Monitor Well	Sample Date	Acetone	Benzene	Bromodichloromethane	Bromomethane	1,2-Dibromoethane	Carbon Disulfide	Chlorobenzene	Chloroethane	Chloroform	Chloromethane	p-Dichlorobenzene	o-Dichlorobenzene	Dichlorodifluoromethane	1,1-Dichloroethane	1,2-Dichloroethane	1,1-Dichloroethene	cis-1,2-Dichloroethene	trans 1,2-Dichloroethene	1,2-Dichloropropane	Ethylbenzene	Iodomethane	Methylene Chloride	MEK (2-Butanone)	Styrene	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	Trichloroethene	Trichlorofluoromethane	1,2,3-Trichloropropane	Vinyl Chloride	Total Xylenes	bis(2-ethylhexyl) Phthalate	Diethylphthalate	Di-n-Butylphthalate	Dimethylphthalate	3&4-Methylphenol
NC2L		600	1	0.56	NE	0.0004	700	50	3,000	70	3	6	20	1,000	6	0.4	7	70	100	0.6	600	NE	5	4,000	70	0.7	600	200	3	2,000	0.005	0.03	500	3	6,000	700	NE	3.5
SWSL		100	1	1	10	1	100	3	10	5	1.0	1	5	5	5	1	5	5	5	1.00	1	10	1	100	1	1	1	1	1	1	1	1	5	15	10	10	10	10
MW-23	9-Jun-97								40						86			7.6					100			9.3	16	6.4	9.1				13					
MW-23	18-Aug-97								33						93			11					85															
MW-23	2-Nov-97								26						68			11					40			5.6			6.3									
MW-23	5-May-98														6.9								10															
MW-23	8-Dec-98														7.4																			8.3				
MW-23 (dup)	8-Dec-98														9.2																							
MW-23	16-Apr-99																																					
MW-23	2-Dec-99																																					
MW-23 (dup)	2-Dec-99																																					
MW-23	12-Apr-00																																					
MW-23	20-Dec-00																																					
MW-23	17-Apr-01																																					
MW-23	4-Dec-01																																					
MW-23	11-Apr-02																																					
MW-23	6-Nov-02																																					
MW-23	17-Apr-03																																					
MW-23 (dup)	17-Apr-03																																					
MW-23	5-Nov-03																																					
MW-23	26-Apr-04																																					
MW-23	19-Nov-04																																					
MW-23	21-Apr-05																																					
MW-23	11-Nov-05																																					
MW-23	14-Apr-06																																					
MW-23	9-Nov-06																																					
MW-23	20 ap 07																																					
MW-23	8-Nov-07																																					
MW-23	15-May-08									0.17J					0.67J											0.19J								0.86J				
MW-23	6-Nov-08														0.35J								0.37J			0.13J												
MW-23	12-Mar-09														0.35J											0.48J												
MW-23	4-Dec-09														0.23J																							

Table 3b
Detected Constituents - Volatile and Semi-Volatile Organic Compounds
North Wake Unlined Landfill

Monitor Well	Sample Date	Acetone	Benzene	Bromodichloromethane	Bromomethane	1,2-Dibromoethane	Carbon Disulfide	Chlorobenzene	Chloroethane	Chloroform	Chloromethane	p-Dichlorobenzene	o-Dichlorobenzene	Dichlorodifluoromethane	1,1-Dichloroethane	1,2-Dichloroethane	1,1-Dichloroethene	cis-1,2-Dichloroethene	trans 1,2-Dichloroethene	1,2-Dichloropropane	Ethylbenzene	Iodomethane	Methylene Chloride	MEK (2-Butanone)	Styrene	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	Trichloroethene	Trichlorofluoromethane	1,2,3-Trichloropropane	Vinyl Chloride	Total Xylenes	bis(2-ethylhexyl) Phthalate	Diethylphthalate	Di-n-Butylphthalate	Dimethylphthalate	3&4-Methylphenol
NC2L		600	1	0.56	NE	0.0004	700	50	3,000	70	3	6	20	1,000	6	0.4	7	70	100	0.6	600	NE	5	4,000	70	0.7	600	200	3	2,000	0.005	0.03	500	3	6,000	700	NE	3.5
SWSL		100	1	1	10	1	100	3	10	5	1.0	1	5	5	5	1	5	5	5	1.00	1	10	1	100	1	1	1	1	1	1	1	1	5	15	10	10	10	10
MW-23d	5-May-98																																					
MW-23d	8-Dec-98																																	7.8				
MW-23d	16-Apr-98																																					
MW-23d	2-Dec-99																																	10				
MW-23d	12-Apr-00																																	10				
MW-23d	20-Dec-00																																					
MW-23d	17-Apr-01																																					
MW-23d	4-Dec-01																																					
MW-23d	11-Apr-02																																					
MW-23d	6-Nov-02																																					
MW-23d	17-Apr-03																																					
MW-23d	5-Nov-03																																					
MW-23d	26-Apr-04																																					
MW-23d	19-Nov-04									6.4																												
MW-23d	21-Apr-05									6.9																												
MW-23d	11-Nov-05																																					
MW-23d	14-Apr-06																																					
MW-23d	9-Nov-06																																					
MW-23d	20-Apr-07																																					
MW-23d	8-Nov-07																																					
MW-23d	15-May-08									0.3J																												
MW-23d	6-Nov-08									0.15J																												
MW-23d	12-Mar-09									0.24J																								1.21J				
MW-23d	4-Dec-09									0.2J																												

Table 3b
Detected Constituents - Volatile and Semi-Volatile Organic Compounds
North Wake Unlined Landfill

Monitor Well	Sample Date	Acetone	Benzene	Bromodichloromethane	Bromomethane	1,2-Dibromoethane	Carbon Disulfide	Chlorobenzene	Chloroethane	Chloroform	Chloromethane	p-Dichlorobenzene	o-Dichlorobenzene	Dichlorodifluoromethane	1,1-Dichloroethane	1,2-Dichloroethane	1,1-Dichloroethene	cis-1,2-Dichloroethene	trans 1,2-Dichloroethene	1,2-Dichloropropane	Ethylbenzene	Iodomethane	Methylene Chloride	MEK (2-Butanone)	Styrene	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	Trichloroethene	Trichlorofluoromethane	1,2,3-Trichloropropane	Vinyl Chloride	Total Xylenes	bis(2-ethylhexyl) Phthalate	Diethylphthalate	Di-n-Butylphthalate	Dimethylphthalate	3&4-Methylphenol
NC2L		600	1	0.56	NE	0.0004	700	50	3,000	70	3	6	20	1,000	6	0.4	7	70	100	0.6	600	NE	5	4,000	70	0.7	600	200	3	2,000	0.005	0.03	500	3	6,000	700	NE	3.5
SWSL		100	1	1	10	1	100	3	10	5	1.0	1	5	5	5	1	5	5	5	1.00	1	10	1	100	1	1	1	1	1	1	1	1	5	15	10	10	10	10
MW-24	9-Jun-97								12						37			5.1			14		200				160		8.5				57					
MW-24	18-Aug-97														68								380				400											
MW-24	1-Nov-97														56						25		340				260						98					
MW-24 (dup)	1-Nov-97														68						33		370				340						131					
MW-24	5-May-98														42						28		240				230						112					
MW-24	8-Dec-98		12						30						85			26			23		280				140		15				93	7.7				
MW-24	16-Apr-99								19						55						13		170				46						60					
MW-24	2-Dec-99														25								43										21	11				
MW-24	12-Apr-00														42			5					39			7			7				33					
MW-24	20-Dec-00														44			5					29			8			7				21					
MW-24	16-Apr-01														34			5					18			6							12					
MW-24 (dup)	16-Apr-01														34			5					20			6							12					
MW-24	3-Dec-01														33			5					12			8							10					
MW-24	12-Apr-02														27											6							8					
MW-24	5-Nov-02														21																							
MW-24	17-Apr-03														19																			30				
MW-24	4-Nov-03														9																							
MW-24	14-Apr-04														6.5																							
MW-24	18-Nov-04																																					
MW-24	21-Apr-05																																					
MW-24	11-Nov-05									7																												
MW-24	14-Apr-06									8.5																												
MW-24	9-Nov-06									9.8																												
MW-24	19-Apr-07									11.4																												
MW-24	8-Nov-07									7.2																												
MW-24	20-May-08									14.8					0.29J								0.19J			0.38J								1.52J				
MW-24	11-Nov-08	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS		NS	NS
MW-24	12-Mar-09									10.1					0.26J											0.62J								1.69J				
MW-24	4-Dec-09				*1.48J					9.11	*422				0.2J							*2.93J				0.2J												
MW-27	4-May-98																																	7.5				
MW-27	7-Dec-98																																	6.4				
MW-27	26-Apr-99																																	20				
MW-27	3-Dec-99																																					
MW-27	12-Apr-00																																					
MW-27	18-Apr-01																																					
MW-27	12-Apr-02																																					
MW-27	17-Apr-03																																					
MW-27	26-Apr-04																																					

Table 3b
Detected Constituents - Volatile and Semi-Volatile Organic Compounds
North Wake Unlined Landfill

Monitor Well	Sample Date	Acetone	Benzene	Bromodichloromethane	Bromomethane	1,2-Dibromoethane	Carbon Disulfide	Chlorobenzene	Chloroethane	Chloroform	Chloromethane	p-Dichlorobenzene	o-Dichlorobenzene	Dichlorodifluoromethane	1,1-Dichloroethane	1,2-Dichloroethane	1,1-Dichloroethene	cis-1,2-Dichloroethene	trans 1,2-Dichloroethene	1,2-Dichloropropane	Ethylbenzene	Iodomethane	Methylene Chloride	MEK (2-Butanone)	Styrene	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	Trichloroethene	Trichlorofluoromethane	1,2,3-Trichloropropane	Vinyl Chloride	Total Xylenes	bis(2-ethylhexyl) Phthalate	Diethylphthalate	Di-n-Butylphthalate	Dimethylphthalate	3&4-Methylphenol
NC2L		600	1	0.56	NE	0.0004	700	50	3,000	70	3	6	20	1,000	6	0.4	7	70	100	0.6	600	NE	5	4,000	70	0.7	600	200	3	2,000	0.005	0.03	500	3	6,000	700	NE	3.5
SWSL		100	1	1	10	1	100	3	10	5	1.0	1	5	5	5	1	5	5	5	1.00	1	10	1	100	1	1	1	1	1	1	1	1	5	15	10	10	10	10
MW-28	1-May-98																																					
MW-28	17-Aug-98																																					
MW-28	9-Sep-98																																					
MW-28	7-Oct-98																																					
MW-28	9-Dec-98																																	12				
MW-28	12-Jan-99																																					
MW-28	9-Feb-99																																					
MW-28	19-Apr-99																																					
MW-28	3-Dec-99																																					
MW-28	12-Apr-00																																					
MW-28	18-Apr-01																																					
MW-28	12-Apr-02																																					
MW-28	17-Apr-03																																					
MW-28	26-Apr-04																																					
MW-28	22-Apr-05																																					
MW-28	14-Apr-06																																					
MW-28	20-Apr-07																																					
MW-28	19-May-08									0.39J																												
MW-28	12-Mar-09									0.39J																												
MW-28d	1-May-98																																					
MW-28d	17-Aug-98																																					
MW-28d	9-Sep-98																																					
MW-28d	7-Oct-98																																					
MW-28d	9-Dec-98																																	20				
MW-28d	12-Jan-99																																					
MW-28d (dup)	12-Jan-99																																					
MW-28d	9-Feb-99																																					
MW-28d	19-Apr-99																																					
MW-28d	3-Dec-99																																	94				
MW-28d	12-Apr-00																																	46				
MW-28d	18-Apr-01																																					
MW-28d	12-Apr-02																																	36				
MW-28d	17-Apr-03																																					
MW-28d	26-Apr-04																																	28.3				
MW-28d	22-Apr-05																																					
MW-28d	14-Apr-06																																					
MW-28d	20-Apr-07																																					
MW-28d	19-May-08									0.45J																												
MW-28d	12-Mar-09									0.33J																0.42J												

Table 3b
Detected Constituents - Volatile and Semi-Volatile Organic Compounds
North Wake Unlined Landfill

Monitor Well	Sample Date	Acetone	Benzene	Bromodichloromethane	Bromomethane	1,2-Dibromoethane	Carbon Disulfide	Chlorobenzene	Chloroethane	Chloroform	Chloromethane	p-Dichlorobenzene	o-Dichlorobenzene	Dichlorodifluoromethane	1,1-Dichloroethane	1,2-Dichloroethane	1,1-Dichloroethene	cis-1,2-Dichloroethene	trans 1,2-Dichloroethene	1,2-Dichloropropane	Ethylbenzene	Iodomethane	Methylene Chloride	MEK (2-Butanone)	Styrene	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	Trichloroethene	Trichlorofluoromethane	1,2,3-Trichloropropane	Vinyl Chloride	Total Xylenes	bis(2-ethylhexyl) Phthalate	Diethylphthalate	Di-n-Butylphthalate	Dimethylphthalate	3&4-Methylphenol
NC2L		600	1	0.56	NE	0.0004	700	50	3,000	70	3	6	20	1,000	6	0.4	7	70	100	0.6	600	NE	5	4,000	70	0.7	600	200	3	2,000	0.005	0.03	500	3	6,000	700	NE	3.5
SWSL		100	1	1	10	1	100	3	10	5	1.0	1	5	5	5	1	5	5	5	1.00	1	10	1	100	1	1	1	1	1	1	1	1	5	15	10	10	10	10
MW-29d	4-May-98																																					
MW-29d	17-Aug-98																																					
MW-29d	4-May-98																																					
MW-29d	17-Aug-98																																					
MW-29d	9-Sep-98																																					
MW-29d (dup)	9-Sep-98																																					
MW-29d	7-Oct-98																																					
MW-29d	9-Dec-98																																	37				
MW-29d	12-Jan-99																																					
MW-29d	9-Feb-99																																					
MW-29d	19-Apr-99																																					
MW-29d	3-Dec-99																																					
MW-29d	12-Apr-00																																					
MW-29d	19-Dec-00																																					
MW-29d	18-Apr-01																																					
MW-29d	4-Dec-01																																					
MW-29d	11-Apr-02																																					
MW-29d	6-Nov-02																																					
MW-29d	18-Apr-03																																					
MW-29d	5-Nov-03																																					
MW-29d	26-Apr-04																																					
MW-29d	19-Nov-04																																					
MW-29d	21-Apr-05																																					
MW-29d	11-Nov-05																																					
MW-29d	14-Apr-06																																					
MW-29d	10-Nov-06																																					
MW-29d	20-Apr-07																																	23				
MW-29d	9-Nov-07																																					
MW-29d	19-May-08									0.13J																								1.44J				
MW-29d	7-Nov-08																						0.37J															
MW-29d	10-Mar-09									0.12J																								0.857J				
MW-29d	2-Dec-09									0.15J																0.21J												

Table 3b
Detected Constituents - Volatile and Semi-Volatile Organic Compounds
North Wake Unlined Landfill

Monitor Well	Sample Date	Acetone	Benzene	Bromodichloromethane	Bromomethane	1,2-Dibromoethane	Carbon Disulfide	Chlorobenzene	Chloroethane	Chloroform	Chloromethane	p-Dichlorobenzene	o-Dichlorobenzene	Dichlorodifluoromethane	1,1-Dichloroethane	1,2-Dichloroethane	1,1-Dichloroethene	cis-1,2-Dichloroethene	trans 1,2-Dichloroethene	1,2-Dichloropropane	Ethylbenzene	Iodomethane	Methylene Chloride	MEK (2-Butanone)	Styrene	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	Trichloroethene	Trichlorofluoromethane	1,2,3-Trichloropropane	Vinyl Chloride	Total Xylenes	bis(2-ethylhexyl) Phthalate	Diethylphthalate	Di-n-Butylphthalate	Dimethylphthalate	3&4-Methylphenol
NC2L		600	1	0.56	NE	0.0004	700	50	3,000	70	3	6	20	1,000	6	0.4	7	70	100	0.6	600	NE	5	4,000	70	0.7	600	200	3	2,000	0.005	0.03	500	3	6,000	700	NE	3.5
SWSL		100	1	1	10	1	100	3	10	5	1.0	1	5	5	5	1	5	5	5	1.00	1	10	1	100	1	1	1	1	1	1	1	1	5	15	10	10	10	10
MW-30	4-May-98																																					
MW-30	17-Aug-98																																					
MW-30	9-Sep-98																																					
MW-30	7-Oct-98																																					
MW-30	7-Dec-98																																					
MW-30	12-Jan-99																																					
MW-30	9-Feb-99																																					
MW-30	19-Apr-99																																					
MW-30	3-Dec-99																																					
MW-30	12-Apr-00																																					
MW-30	19-Dec-00																																					
MW-30	18-Apr-01																																					
MW-30	4-Dec-01																																					
MW-30	11-Apr-02																																					
MW-30	6-Nov-02																																					
MW-30	17-Apr-03																																					
MW-30	5-Nov-03																																					
MW-30	28-Apr-04																																					
MW-30	19-Nov-04																																	27.7				
MW-30	21-Apr-05																																					
MW-30	11-Nov-05																																					
MW-30	14-Apr-06																																					
MW-30	10-Nov-06																																					
MW-30	20-Apr-07																																					
MW-30	9-Nov-07																																					
MW-30	19-May-08									0.55J																												
MW-30	7-Nov-08									0.45J													0.21J															
MW-30	11-Mar-09									0.39J																												
MW-30	4-Dec-09	3.01J																																				

Table 3b
Detected Constituents - Volatile and Semi-Volatile Organic Compounds
North Wake Unlined Landfill

Monitor Well	Sample Date	Acetone	Benzene	Bromodichloromethane	Bromomethane	1,2-Dibromoethane	Carbon Disulfide	Chlorobenzene	Chloroethane	Chloroform	Chloromethane	p-Dichlorobenzene	o-Dichlorobenzene	Dichlorodifluoromethane	1,1-Dichloroethane	1,2-Dichloroethane	1,1-Dichloroethene	cis-1,2-Dichloroethene	trans 1,2-Dichloroethene	1,2-Dichloropropane	Ethylbenzene	Iodomethane	Methylene Chloride	MEK (2-Butanone)	Styrene	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	Trichloroethene	Trichlorofluoromethane	1,2,3-Trichloropropane	Vinyl Chloride	Total Xylenes	bis(2-ethylhexyl) Phthalate	Diethylphthalate	Di-n-Butylphthalate	Dimethylphthalate	3&4-Methylphenol
NC2L		600	1	0.56	NE	0.0004	700	50	3,000	70	3	6	20	1,000	6	0.4	7	70	100	0.6	600	NE	5	4,000	70	0.7	600	200	3	2,000	0.005	0.03	500	3	6,000	700	NE	3.5
SWSL		100	1	1	10	1	100	3	10	5	1.0	1	5	5	5	1	5	5	5	1.00	1	10	1	100	1	1	1	1	1	1	1	1	5	15	10	10	10	10
MW-31	1-May-98																																					
MW-31	17-Aug-98																																					
MW-31	9-Sep-98																																					
MW-31	7-Oct-98																																					
MW-31	8-Dec-98																																					
MW-31	11-Jan-99																																					
MW-31	8-Feb-99																																					
MW-31	19-Apr-99																																					
MW-31	3-Dec-99																																					
MW-31	13-Apr-00									13																												
MW-31	19-Dec-00									25																												
MW-31	17-Apr-01									21																												
MW-31	6-Dec-01									54																												
MW-31	11-Apr-02									37																												
MW-31	6-Nov-02									43																												
MW-31	18-Apr-03									32																												
MW-31	5-Nov-03									48																												
MW-31	28-Apr-04									32.5																												
MW-31	18-Nov-04									26.5																												
MW-31	21-Apr-05									27.2																												
MW-31	11-Nov-05									38.2																												
MW-31	14-Apr-06									36.6																												
MW-31	9-Nov-06									26.2																												
MW-31	20-Apr-07									23.4																												
MW-31	9-Nov-07									9.9																												
MW-31	19-May-08									14.9																												
MW-31	6-Nov-08									10.1													0.15J															
MW-31	11-Mar-09									10.1																												
MW-31	4-Dec-09									4.62J																												

Table 3b
Detected Constituents - Volatile and Semi-Volatile Organic Compounds
North Wake Unlined Landfill

Monitor Well	Sample Date	Acetone	Benzene	Bromodichloromethane	Bromomethane	1,2-Dibromoethane	Carbon Disulfide	Chlorobenzene	Chloroethane	Chloroform	Chloromethane	p-Dichlorobenzene	o-Dichlorobenzene	Dichlorodifluoromethane	1,1-Dichloroethane	1,2-Dichloroethane	1,1-Dichloroethene	cis-1,2-Dichloroethene	trans 1,2-Dichloroethene	1,2-Dichloropropane	Ethylbenzene	Iodomethane	Methylene Chloride	MEK (2-Butanone)	Styrene	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	Trichloroethene	Trichlorofluoromethane	1,2,3-Trichloropropane	Vinyl Chloride	Total Xylenes	bis(2-ethylhexyl) Phthalate	Diethylphthalate	Di-n-Butylphthalate	Dimethylphthalate	3&4-Methylphenol
NC2L		600	1	0.56	NE	0.0004	700	50	3,000	70	3	6	20	1,000	6	0.4	7	70	100	0.6	600	NE	5	4,000	70	0.7	600	200	3	2,000	0.005	0.03	500	3	6,000	700	NE	3.5
SWSL		100	1	1	10	1	100	3	10	5	1.0	1	5	5	5	1	5	5	5	1.00	1	10	1	100	1	1	1	1	1	1	1	1	5	15	10	10	10	10
MW-31d	1-May-98																																					
MW-31d	17-Aug-98																																					
MW-31d	9-Sep-98																																					
MW-31d	7-Oct-98																																					
MW-31d	8-Dec-98																																	10				
MW-31d	11-Jan-99																																					
MW-31d	8-Feb-99																																					
MW-31d	19-Apr-99																																	10				
MW-31d	3-Dec-99																																	41				
MW-31d	13-Apr-00																																					
MW-31d	19-Dec-00																																					
MW-31d	18-Apr-01									7																												
MW-31d	6-Dec-01									14																												
MW-31d	11-Apr-02									23																												
MW-31d	6-Nov-02									31																												
MW-31d	18-Apr-03									26																												
MW-31d	5-Nov-03									34																												
MW-31d	28-Apr-04									38.3																												
MW-31d	19-Nov-04									23.8																												
MW-31d	21-Apr-05									31.9																												
MW-31d	11-Nov-05									34																												
MW-31d	14-Apr-06									33.1																												
MW-31d	9-Nov-06									37.7																												
MW-31d	20-Apr-07									37.5																								23				
MW-31d	9-Nov-07									31.5																												
MW-31d	19-May-08									36.6																												
MW-31d	6-Nov-08									33																												
MW-31d	10-Mar-09									30.2																												
MW-31d	2-Dec-09									20																												

Table 3b
Detected Constituents - Volatile and Semi-Volatile Organic Compounds
North Wake Unlined Landfill

Monitor Well	Sample Date	Acetone	Benzene	Bromodichloromethane	Bromomethane	1,2-Dibromoethane	Carbon Disulfide	Chlorobenzene	Chloroethane	Chloroform	Chloromethane	p-Dichlorobenzene	o-Dichlorobenzene	Dichlorodifluoromethane	1,1-Dichloroethane	1,2-Dichloroethane	1,1-Dichloroethene	cis-1,2-Dichloroethene	trans 1,2-Dichloroethene	1,2-Dichloropropane	Ethylbenzene	Iodomethane	Methylene Chloride	MEK (2-Butanone)	Styrene	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	Trichloroethene	Trichlorofluoromethane	1,2,3-Trichloropropane	Vinyl Chloride	Total Xylenes	bis(2-ethylhexyl) Phthalate	Diethylphthalate	Di-n-Butylphthalate	Dimethylphthalate	3&4-Methylphenol
NC2L		600	1	0.56	NE	0.0004	700	50	3,000	70	3	6	20	1,000	6	0.4	7	70	100	0.6	600	NE	5	4,000	70	0.7	600	200	3	2,000	0.005	0.03	500	3	6,000	700	NE	3.5
SWSL		100	1	1	10	1	100	3	10	5	1.0	1	5	5	5	1	5	5	5	1.00	1	10	1	100	1	1	1	1	1	1	1	1	5	15	10	10	10	10
MW-32	1-May-98																																					
MW-32	18-Aug-98																																					
MW-32	9-Sep-98																																					
MW-32	6-Oct-98																																					
MW-32	7-Dec-98																																					
MW-32	11-Jan-99																																					
MW-32	8-Feb-99																																					
MW-32	19-Apr-99																																					
MW-32	3-Dec-99																																					
MW-32	13-Apr-00																																					
MW-32	19-Dec-00																																					
MW-32	17-Apr-01																																					
MW-32	4-Dec-01																																					
MW-32	11-Apr-02																																					
MW-32	6-Nov-02																																					
MW-32	18-Apr-03																																					
MW-32	4-Nov-03																																	11				
MW-32	28-Apr-04																																					
MW-32	18-Nov-04																																					
MW-32	21-Apr-05																																					
MW-32	11-Nov-05																																					
MW-32	14-Apr-06																																					
MW-32	9-Nov-06																																					
MW-32	20-Apr-07																																					
MW-32	9-Nov-07																																					
MW-32	19-May-08																																					
MW-32	6-Nov-08																						0.47J															
MW-32	11-Mar-09																																					
MW-32	4-Dec-09				*1.65J						*455											*3.23J																

Table 3b
Detected Constituents - Volatile and Semi-Volatile Organic Compounds
North Wake Unlined Landfill

Monitor Well	Sample Date	Acetone	Benzene	Bromodichloromethane	Bromomethane	1,2-Dibromoethane	Carbon Disulfide	Chlorobenzene	Chloroethane	Chloroform	Chloromethane	p-Dichlorobenzene	o-Dichlorobenzene	Dichlorodifluoromethane	1,1-Dichloroethane	1,2-Dichloroethane	1,1-Dichloroethene	cis-1,2-Dichloroethene	trans 1,2-Dichloroethene	1,2-Dichloropropane	Ethylbenzene	Iodomethane	Methylene Chloride	MEK (2-Butanone)	Styrene	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	Trichloroethene	Trichlorofluoromethane	1,2,3-Trichloropropane	Vinyl Chloride	Total Xylenes	bis(2-ethylhexyl) Phthalate	Diethylphthalate	Di-n-Butylphthalate	Dimethylphthalate	3&4-Methylphenol
NC2L		600	1	0.56	NE	0.0004	700	50	3,000	70	3	6	20	1,000	6	0.4	7	70	100	0.6	600	NE	5	4,000	70	0.7	600	200	3	2,000	0.005	0.03	500	3	6,000	700	NE	3.5
SWSL		100	1	1	10	1	100	3	10	5	1.0	1	5	5	5	1	5	5	5	1.00	1	10	1	100	1	1	1	1	1	1	1	1	5	15	10	10	10	10
TB-1a	1-May-98														5.3												6.9	6.9										
TB-1a	18-Aug-98								20						39								22			7.5		9.8	7.6				23					
TB-1a	9-Sep-98								21						40								22			7.7		11	7.9				20					
TB-1a	7-Oct-98								17						35								16			8.2		11	7.1				13					
TB-1a (dup)	7-Oct-98								17						33								16			8.3		11	7.2				17					
TB-1a	9-Dec-98								14						23											5.3		8.2					11					
TB-1a	11-Jan-99								16						21											6.0		11	5.0				6					
TB-1a	8-Feb-99								15						18											7.0		10					8					
TB-1a	19-Apr-99								10						14											5.0		10					5					
TB-1a	3-Dec-99								11						19											6.0		10					9					
TB-1a	13-Apr-00								11						22											7.0		8	5.0				11					
TB-1a	20-Dec-00														13																							
TB-1a	17-Apr-01														11																							
TB-1a	3-Dec-01														7																							
TB-1a	12-Apr-02														8																							
TB-1a	5-Nov-02														9																							
TB-1a	17-Apr-03														30											7.0			6.0									
TB-1a	4-Nov-03									8					8																							
TB-1a	14-Apr-04									20.4																												
TB-1a	18-Nov-04									17.3																												
TB-1a	21-Apr-05									18.8																												
TB-1a	11-Nov-05									24.3																												
TB-1a	14-Apr-06									18.6																												
TB-1a	9-Nov-06									25.5																												
TB-1a	19-Apr-07									22.5																												
TB-1a	9-Nov-07									21.8																												
TB-1a	20-May-08			0.66J						11.5					0.21J								0.31J			0.17J												
TB-1a	11-Nov-08			0.54J						11.6					0.33J								1.1			0.16J												
TB-1a	11-Mar-09									5.6					0.33J											0.12J												
TB-1a	3-Dec-09									5.5					0.3J											0.16J												
TB-1a deep	8-Jun-01																																					
TB-1a deep	6-Dec-01																																					
TB-1a deep	11-Apr-02																																					
TB-1a deep	6-Nov-02																																					
TB-1a deep	18-Apr-03									8																												
TB-1a deep	4-Nov-03																																	19				
TB-1a deep	28-Apr-04									22																												
TB-1a deep	18-Nov-04									17.9																												
TB-1a deep	21-Apr-05									25.6																												
TB-1a deep	11-Nov-05									30.6																												
TB-1a deep	14-Apr-06									29.1																												
TB-1a deep	10-Nov-06									35.6																												
TB-1a deep	20-Apr-07									32.4																												
TB-1a deep	9-Nov-07									26.2																												
TB-1a deep	19-May-08		0.77J							25.2													0.72J															
TB-1a deep	7-Nov-08									32.5													0.42J															
TB-1a deep	12-Mar-09									31.8																												
TB-1a deep	4-Dec-09									33.9																												

Table 3b
Detected Constituents - Volatile and Semi-Volatile Organic Compounds
North Wake Unlined Landfill

Monitor Well	Sample Date	Acetone	Benzene	Bromodichloromethane	Bromomethane	1,2-Dibromoethane	Carbon Disulfide	Chlorobenzene	Chloroethane	Chloroform	Chloromethane	p-Dichlorobenzene	o-Dichlorobenzene	Dichlorodifluoromethane	1,1-Dichloroethane	1,2-Dichloroethane	1,1-Dichloroethene	cis-1,2-Dichloroethene	trans 1,2-Dichloroethene	1,2-Dichloropropane	Ethylbenzene	Iodomethane	Methylene Chloride	MEK (2-Butanone)	Styrene	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	Trichloroethene	Trichlorofluoromethane	1,2,3-Trichloropropane	Vinyl Chloride	Total Xylenes	bis(2-ethylhexyl) Phthalate	Diethylphthalate	Di-n-Butylphthalate	Dimethylphthalate	3&4-Methylphenol
NC2L		600	1	0.56	NE	0.0004	700	50	3,000	70	3	6	20	1,000	6	0.4	7	70	100	0.6	600	NE	5	4,000	70	0.7	600	200	3	2,000	0.005	0.03	500	3	6,000	700	NE	3.5
SWSL		100	1	1	10	1	100	3	10	5	1.0	1	5	5	5	1	5	5	5	1.00	1	10	1	100	1	1	1	1	1	1	1	1	5	15	10	10	10	10
MW-33	6-Aug-98																																					
MW-33	7-Dec-98																																					
MW-33	26-Apr-99																																					
MW-33	2-Dec-99																																					
MW-33	13-Apr-00																																					
MW-33	18-Apr-01																																					
MW-33	9-Apr-02																																					
MW-33	16-Apr-03																																					
MW-33	21-Apr-04																																					
MW-33	22-Apr-05																																					
MW-33	14-Apr-06																																					
MW-33	20-Apr-07																																					
MW-33	15-May-08																																					
MW-33	12-Mar-09																																					
MW-34	6-Aug-98																																					
MW-34	7-Dec-98																																					
MW-34	26-Apr-99																																					
MW-34	2-Dec-99																																					
MW-34	13-Apr-00																																					
MW-34	18-Apr-01																																					
MW-34	9-Apr-02																																					
MW-34	16-Apr-03																																					
MW-34	21-Apr-04																																					
MW-34	22-Apr-05																																					
MW-34	14-Apr-06														12.7			6.9																				
MW-34	20-Apr-07														13.8			6.2																				
MW-34	19-May-08		0.56J						1.74J	0.45J		0.95J		1.72J	15.3		0.23J	9.75					10.7			2.14		0.13J	3.07	0.56J			0.16J					
MW-34	12-Mar-09		0.47J						1.26J	0.37J		0.71J		1.72J	13.5		0.47J	9.34					12.7			1.71			2.67	0.68J			0.15J					
MW-34d	6-Aug-98																																	7.3				
MW-34d (dup)	6-Aug-98																																					
MW-34d	7-Dec-98																																					
MW-34d	26-Apr-99																																					
MW-34d	2-Dec-99																																					
MW-34d	13-Apr-00																																					
MW-34d	18-Apr-01																																					
MW-34d	9-Apr-02														5																							
MW-34d	16-Apr-03														11																							
MW-34d	21-Apr-04														6.8																							
MW-34d	22-Apr-05														5.7																							
MW-34d	14-Apr-06																																					
MW-34d	20-Apr-07														6.9																			35				
MW-34d	19-May-08									0.21J				0.36J	1.64J			1.07J					0.2J			0.32J			0.38J	0.19J								
MW-34d	12-Mar-09														0.64J			0.62J								0.51J			0.19J					1.02J				

Table 3b
Detected Constituents - Volatile and Semi-Volatile Organic Compounds
North Wake Unlined Landfill

Monitor Well	Sample Date	Acetone	Benzene	Bromodichloromethane	Bromomethane	1,2-Dibromoethane	Carbon Disulfide	Chlorobenzene	Chloroethane	Chloroform	Chloromethane	p-Dichlorobenzene	o-Dichlorobenzene	Dichlorodifluoromethane	1,1-Dichloroethane	1,2-Dichloroethane	1,1-Dichloroethene	cis-1,2-Dichloroethene	trans 1,2-Dichloroethene	1,2-Dichloropropane	Ethylbenzene	Iodomethane	Methylene Chloride	MEK (2-Butanone)	Styrene	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	Trichloroethene	Trichlorofluoromethane	1,2,3-Trichloropropane	Vinyl Chloride	Total Xylenes	bis(2-ethylhexyl) Phthalate	Diethylphthalate	Di-n-Butylphthalate	Dimethylphthalate	3&4-Methylphenol
NC2L		600	1	0.56	NE	0.0004	700	50	3,000	70	3	6	20	1,000	6	0.4	7	70	100	0.6	600	NE	5	4,000	70	0.7	600	200	3	2,000	0.005	0.03	500	3	6,000	700	NE	3.5
SWSL		100	1	1	10	1	100	3	10	5	1.0	1	5	5	5	1	5	5	5	1.00	1	10	1	100	1	1	1	1	1	1	1	1	5	15	10	10	10	10
MW-35	6-Aug-98																																					
MW-35	7-Dec-98																																					
MW-35	26-Apr-99																																					
MW-35	2-Dec-99																																					
MW-35	13-Apr-00																																					
MW-35	18-Apr-01																																					
MW-35	9-Apr-02																																					
MW-35	16-Apr-03																																					
MW-35	21-Apr-04																																					
MW-35	22-Apr-05																																					
MW-35	14-Apr-06																																					
MW-35	20-Apr-07																																					
MW-35	19-May-08					0.55J				0.17J																0.13J												
MW-35	10-Mar-09									0.15J				0.67J																								
MW-36	4-Dec-08		0.81J						0.77J	0.14J		1.46		2.25J	23.5		0.40J	7.6					0.77J			2.00			3.4	0.28J		0.84J				0.906J		
MW-36	10-Mar-09		0.86J						1.16J	0.13J		1.42		2.52J	23.4	0.36J	0.41J	7.9		0.3J			0.64J			1.62			3.22	0.38J		0.96J						
MW-36	4-Dec-09		0.68J		*1.78J				0.8J		*485	1.4		1.56J	18.6		0.33J	7.25		0.27J		*3.84J	0.46J			0.92J			2.29			0.94J						
MW-36d	4-Dec-08		0.37J	0.24J						1.05J		0.28J		1.78J	10.9			3.18J					9.11			1.95	0.10J		1.5									
MW-36d	10-Mar-09		0.51J						0.74J	0.41J		0.39J		2.94J	12.4		0.28J	3.86J		0.12J			2.27			1.35			1.81	0.29J								
MW-36d	2-Dec-09		0.47J							0.4J		0.44J		1.71J	10.7		0.24J	4.2J					1.32			0.91J			1.64									

Notes:
All units are in micrograms per liter (parts per billion)
- Concentration exceeds NC Groundwater Standards (2L)
- Indicates result below detection limits
NS - Not Sampled; NE - Standard Not Established; dup - Duplicate Sample
J - Indicates the analytical result is an estimated concentration between the Method Detection Limit and the Solid Waste Section Reporting Limit (SWSL)
B - Indicates that the amount detected in the method blank was greater than the Method Detection Limit
MW-27 was abandoned on November 24, 2008 in accordance with 15A NCAC 2C .0113
MW-36/36d installed November 2008
MW-24 was dry during the November 2008 sampling event
Monitoring wells MW-28, -28d, -33, -34, -34d, and -35 sampled yearly during the spring event
* - Solvent contamination in HCl-preserved bottles caused elevated levels of chloromethane, bromomethane, and iodomethane to appear in several analyses during the December 2009 sampling event

Table 3c
Detected Constituents - Pesticides, Herbicides, and PCB's
North Wake Unlined Landfill

Monitor Well	Sample Date	Alpha-BHC	Beta-BHC	Delta-BHC	Gamma-BHC (Lindane)	Heptachlor	Aldrin	4,4'-DDT	DDD	Dieldrin	Endrin Aldehyde	Endosulfan I	Endrin	Dinoseb
NC2L		**0.006***	**0.019***	**0.019***	**0.2**	**0.0078**	**NE**	**0.1**	**0.14**	**0.0022**	**2.1**	**NE**	**2**	**7***
SWSL		**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.1**	**0.1**	**0.075**	**0.1**	**0.1**	**0.1**	**1**
MW-11	18-Nov-04													
MW-11	21-Apr-05													
MW-11	11-Nov-05													
MW-11	14-Apr-06													
MW-11	10-Nov-06													
MW-11	20-Apr-07													
MW-11	8-Nov-07													
MW-11	15-May-08													
MW-11	11-Mar-09													
MW-11d	18-Nov-04													
MW-11d	21-Apr-05													
MW-11d	11-Nov-05													
MW-11d	14-Apr-06													
MW-11d	10-Nov-06													
MW-11d	20-Apr-07													
MW-11d	8-Nov-07													
MW-11d	15-May-08							0.0297J				0.0096J**		
MW-11d	16-Mar-09													
MW-5	18-Nov-04		**0.384**	**0.152**										
MW-5	21-Apr-05		**0.405**	**0.933**	0.098									
MW-5	11-Nov-05													
MW-5	14-Apr-06													
MW-5	9-Nov-06													
MW-5	19-Apr-07													
MW-5	8-Nov-07													
MW-5R	21-May-08							0.0609J				0.0752J**		
MW-5R	11-Mar-09													
MW-6	18-Nov-04	**0.235**		**0.706**						**0.281**			0.412	
MW-6	21-Apr-05	**0.182**		**0.48**										
MW-6	11-Nov-05		**0.31**		0.053									1.72
MW-6	14-Apr-06													
MW-6	9-Nov-06													
MW-6	19-Apr-07													
MW-6	8-Nov-07		**0.062**							**0.094**				
MW-6	20-May-08		0.0233J					0.0312J**						
MW-6	11-Mar-09	**0.0743J**	**0.0437JD**	**0.0611J**		**0.0292JD**	0.104JD	0.0466JD	0.018JD		0.0574JD	0.0322JD		
MW-6d	18-Nov-04													
MW-6d	21-Apr-05													
MW-6d	11-Nov-05													
MW-6d	11-Apr-06													
MW-6d	9-Nov-06													
MW-6d	20-Apr-07													
MW-6d	8-Nov-07													
MW-6d	20-May-08													
MW-7	18-Nov-04													
MW-7	21-Apr-05													1.21
MW-7	11-Nov-05													
MW-7	14-Apr-06													
MW-7	9-Nov-06													
MW-7	20-Apr-07													
MW-7	8-Nov-07													
MW-7	15-May-08											0.0929J**		
MW-8	18-Nov-04													
MW-8	21-Apr-05	**0.132**												
MW-8	11-Nov-05													
MW-8	14-Apr-06													
MW-8	9-Nov-06													
MW-8	20-Apr-07													
MW-8	8-Nov-07													
MW-8	20-May-08													
MW-8d	18-Nov-04													
MW-8d	21-Apr-05													
MW-8d	11-Nov-05													
MW-8d	14-Apr-06													
MW-8d	10-Nov-06													
MW-8d	20-Apr-07													
MW-8d	8-Nov-07													
MW-8d	15-May-08											0.0254J**		
MW-9	18-Nov-04			**0.138**	0.051									1.8
MW-9	21-Apr-05			**0.896**	**0.622**									
MW-9	11-Nov-05													1.4
MW-9	14-Apr-06				0.143									
MW-9	9-Nov-06				**0.786**									
MW-9	19-Apr-07													
MW-9	8-Nov-07			**0.06**										
MW-9	20-May-08			0.0132J								0.0368J**		
MW-9 (dup)	20-May-08													
MW-9	11-Mar-09													
MW-9 (MW-18 dup)	11-Mar-09													

Table 3c
Detected Constituents - Pesticides, Herbicides, and PCB's
North Wake Unlined Landfill

Monitor Well	Sample Date	Alpha-BHC	Beta-BHC	Delta-BHC	Gamma-BHC (Lindane)	Heptachlor	Aldrin	4,4'-DDT	DDD	Dieldrin	Endrin Aldehyde	Endosulfan I	Endrin	Dinoseb
NC2L		0.006*	0.019*	0.019*	0.2	0.0078	NE	0.1	0.14	0.0022	2.1	NE	2	7*
SWSL		0.05	0.05	0.05	0.05	0.05	0.05	0.1	0.1	0.075	0.1	0.1	0.1	1
MW-10	18-Nov-04													
MW-10	21-Apr-05													
MW-10	11-Nov-05													
MW-10	14-Apr-06													
MW-10	9-Nov-06													
MW-10	19-Apr-07													
MW-10	8-Nov-07													
MW-10	20-May-08													
MW-10d	18-Nov-04													
MW-10d	21-Apr-05													
MW-10d	11-Nov-05													1.72
MW-10d	14-Apr-06													
MW-10d	10-Nov-06													
MW-10d	20-Apr-07													
MW-10d	8-Nov-07													
MW-10d	20-May-08											0.0234J**		
MW-22	19-Nov-04													
MW-22	22-Apr-06													
MW-22	11-Nov-05													
MW-22	14-Apr-07													
MW-22	9-Nov-06													
MW-22	20-Apr-07													
MW-22	8-Nov-07													
MW-22	15-May-08											0.124		
MW-22	12-Mar-09													
MW-23	19-Nov-04													
MW-23	21-Apr-05													
MW-23	11-Nov-05													
MW-23	14-Apr-06													
MW-23	9-Nov-06													
MW-23	20 ap 07													
MW-23	8-Nov-07													
MW-23	15-May-08													
MW-23d	19-Nov-04													
MW-23d	21-Apr-05													
MW-23d	11-Nov-05													
MW-23d	14-Apr-06													
MW-23d	9-Nov-06													
MW-23d	20-Apr-07													
MW-23d	8-Nov-07													
MW-23d	15-May-08											0.0256J**		
MW-24	18-Nov-04													
MW-24	21-Apr-05													
MW-24	11-Nov-05													
MW-24	14-Apr-06													
MW-24	9-Nov-06													
MW-24	19-Apr-07													
MW-24	8-Nov-07													
MW-24	20-May-08											0.017J**		
MW-28	22-Apr-05													
MW-28	14-Apr-06													
MW-28	20-Apr-07													
MW-28	19-May-08			0.0209J								0.0412J**		
MW-28	12-Mar-09													
MW-28d	22-Apr-05													
MW-28d	14-Apr-06													
MW-28d	20-Apr-07													
MW-28d	19-May-08											0.0308J**		
MW-29d	19-Nov-04													
MW-29d	21-Apr-05													
MW-29d	11-Nov-05													
MW-29d	14-Apr-06													
MW-29d	10-Nov-06													
MW-29d	20-Apr-07													
MW-29d	9-Nov-07													
MW-29d	19-May-08			0.0309J								0.0464J**		
MW-29d	10-Mar-09													

Table 3c
Detected Constituents - Pesticides, Herbicides, and PCB's
North Wake Unlined Landfill

Monitor Well	Sample Date	Alpha-BHC	Beta-BHC	Delta-BHC	Gamma-BHC (Lindane)	Heptachlor	Aldrin	4,4'-DDT	DDD	Dieldrin	Endrin Aldehyde	Endosulfan I	Endrin	Dinoseb
NC2L		0.006*	0.019*	0.019*	0.2	0.0078	NE	0.1	0.14	0.0022	2.1	NE	2	7*
SWSL		0.05	0.05	0.05	0.05	0.05	0.05	0.1	0.1	0.075	0.1	0.1	0.1	1
MW-30	19-Nov-04													
MW-30	21-Apr-05													
MW-30	11-Nov-05													
MW-30	14-Apr-06													
MW-30	10-Nov-06													
MW-30	20-Apr-07													
MW-30	9-Nov-07													
MW-30	19-May-08			**0.0632**								0.155		
MW-30	11-Mar-09													
MW-31	18-Nov-04													
MW-31	21-Apr-05													
MW-31	11-Nov-05													
MW-31	14-Apr-06													
MW-31	9-Nov-06													
MW-31	20-Apr-07													
MW-31	9-Nov-07													
MW-31	19-May-08			0.0111J										
MW-31	11-Mar-09													
MW-31d	19-Nov-04													
MW-31d	21-Apr-05													
MW-31d	11-Nov-05													
MW-31d	14-Apr-06													
MW-31d	9-Nov-06													
MW-31d	20-Apr-07													
MW-31d	9-Nov-07													
MW-31d	19-May-08											0.0375J**		
MW-32	18-Nov-04													
MW-32	21-Apr-05													
MW-32	11-Nov-05													
MW-32	14-Apr-06													
MW-32	9-Nov-06													
MW-32	20-Apr-07													
MW-32	9-Nov-07													
MW-32	19-May-08											0.0492J**		
TB-1a	18-Nov-04													
TB-1a	21-Apr-05													
TB-1a	11-Nov-05													
TB-1a	14-Apr-06													
TB-1a	9-Nov-06													
TB-1a	19-Apr-07													
TB-1a	9-Nov-07													
TB-1a	20-May-08	0.0183J										0.0828J**		
TB-1a	11-Mar-09													
TB-1a deep	11-Nov-05													
TB-1a deep	14-Apr-06													
TB-1a deep	10-Nov-06													
TB-1a deep	20-Apr-07													
TB-1a deep	9-Nov-07													
TB-1a deep	19-May-08											0.0595J**		
MW-33	22-Apr-05													
MW-33	14-Apr-06													
MW-33	20-Apr-07													
MW-33	15-May-08			0.00175J								0.0318J**		
MW-33	12-Mar-09													
MW-34	22-Apr-05													
MW-34	14-Apr-06													
MW-34	20-Apr-07													
MW-34	19-May-08													
MW-34d	22-Apr-05													
MW-34d	14-Apr-06													
MW-34d	20-Apr-07													
MW-34d	19-May-08											0.0145J**		
MW-35	22-Apr-05													
MW-35	14-Apr-06													
MW-35	20-Apr-07													
MW-35	19-May-08													
MW-36	4-Dec-08		**0.059**	0.0102J	0.162									
MW-36	10-Mar-09				0.186D									
MW-36d	4-Dec-08				0.0366J									
MW-36d	10-Mar-09			0.0139J	0.0259JD			0.075J						

Notes:
All units are in micrograms per liter (parts per billion)
- Concentration exceeds NC Groundwater Standards (2L)
- Indicates result below detection limits
* - Groundwater Protection Standard
** - Endosulfan I was also detected in the background well MW-11d and batch and equipment blanks at similar concentrations
NE - Standard Not Established
J - Indicates the analytical result is an estimated concentration between the Method Detection Limit and the Solid Waste Section Reporting Limits (SWSL)
D - Detected but the relative percent difference is greater than 40% between results in the dual column method
MW-36/36d installed November 2008
Monitoring wells MW-28, -28d, -33, -34, -34d, and -35 sampled yearly during the spring event

Table 3d
Detected Surface Water Constituents - Metals
North Wake Unlined Landfill

Monitor Well	Sample Date	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Nickel	Silver	Thallium	Vanadium	Zinc
NC2B		**50**	**NE**	**6.4**	**2**	**50**	**NE**	**7***	**25**	**88**	**0.06**	**NE**	**NE**	**50***
SWSL		**10**	**100**	**1**	**1**	**10**	**10**	**10**	**10**	**50**	**10**	**5.5**	**25**	**10**
SW-2	13-Jun-95													
SW-2	31-Oct-95				**2**									
SW-2	28-Nov-96		25				2							21
SW-2	21-Apr-97		29											
SW-2	5-Nov-97													
SW-2	11-May-98													
SW-2	24-Nov-98													
SW-2	14-Apr-99													
SW-2	9-Apr-02													
SW-2	16-Apr-03													
SW-2	29-Oct-03													
SW-2	8-Apr-04													
SW-2	18-Nov-04				1									
SW-2	21-Apr-05													
SW-2	11-Nov-05													
SW-2	13-Apr-06													
SW-2	9-Nov-06													
SW-2	20-Apr-07													
SW-2	7-Nov-07													
SW-2	21-May-08		28.9J			1.53J		5.97J						5.81J
SW-2	7-Nov-08		33.5JB	3.10B		4.28JB		**7.72JB**	3.62JB		**8.20JB**		15.1JB	4.51J
SW-2	16-Mar-09		52.8JB	**9.06B**		4.73JB		**8.54JB**	3.61JB		**2.01JB**	5.89	10.4JB	12.5
SW-2	2-Dec-09		16.7J	0.46J				**7.65JB**					8.31JB	7.57JB
SW-3	13-Jun-95													
SW-3	31-Oct-95													
SW-3	27-Nov-96		33				2							32
SW-3	21-Apr-97		19											
SW-3	1-Nov-97													**56**
SW-3	11-May-98													
SW-3	24-Nov-98													
SW-3	14-Apr-99													
SW-3	30-Nov-99													
SW-3	12-Apr-00													
SW-3	15-Dec-00													
SW-3	16-Apr-01													
SW-3	29-Nov-01													
SW-3	9-Apr-02													
SW-3	16-Apr-03													
SW-3	29-Oct-03					11.1								
SW-3	8-Apr-04													
SW-3	18-Nov-04													
SW-3	21-Apr-05													
SW-3	11-Nov-05													
SW-3	13-Apr-06													
SW-3	9-Nov-06													
SW-3	20-Apr-07													
SW-3	7-Nov-07				1									13
SW-3	19-May-08		28.5J			3.21J		6.36J			**4.09J**			
SW-3	6-Nov-08		40.8JB			3.41JB		5.94JB	8.95JB		**9.04JB**		6.43JB	4.79J
SW-3	16-Mar-09	3.86J	47.6JB	3.16B		5.02JB		**7.72JB**	5.76JB	5.09J	**1.89JB**	5.97	12.5JB	7.17J
SW-3	2-Dec-09		32.9J	0.49J		3.65J	2.65J	**12.1B**					14.9JB	14.3B
SW-7	7-Nov-08		50.8JB			16.0B	10.7	**20.3B**	9.63JB		**9.62JB**		19.8JB	6.33J
SW-7	16-Mar-09	3.45J	45.5JB	5.37B		4.51JB		**7.4JB**	9.39JB		**2.04JB**		14.8JB	7.09J
SW-7	2-Dec-09		21.1J	0.05J		4.8J		**7.02JB**					8.72JB	8.19JB
SW-8	7-Nov-08		26.7JB			3.14JB		**7.10JB**			**8.56JB**		7.92JB	
SW-8	16-Mar-09		44.8JB	6.11B		5.02JB		**7.51JB**	8.08JB		**1.56JB**		10.6JB	10.2
SW-8	2-Dec-09		28.1J	0.5J		2.38J		**8.11JB**					11.8JB	20.8B

Notes:
All units are in micrograms per liter (parts per billion)
- Concentration exceeds NC Surface Water Standards for Class C Waters
- Indicates result below detection limits
* - Action Level
NE - Standard Not Established
J - Indicates the analytical result is an estimated concentration between the Method Detection Limit and the Solid Waste Section Reporting Limit (SWSL)
B - Indicates that the amount detected in the method blank was greater than the Method Detection Limit

Table 3e
Detected Surface Water Constituents - Volatile Organic Compounds
North Wake Unlined Landfill

Monitor Well	Sample Date	Acetone	Bromodichloromethane	Bromoform	2-Butanone (MEK)	Carbon Disulfide	Chloroform	Chloromethane	Dibromochloromethane	Cis 1,2-Dichloroethene	1,1-Dichloroethane	Methylene Chloride	Tetrachloroethene	Toluene	Trichlorofluoromethane
NC2B		**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**10.8**	**11**	**NE**
SWSL		**100**	**1**	**3**	**100**	**1000**	**5**	**1**	**1**	**5**	**5**	**1**	**1**	**1**	**1**
SW-2	18-Nov-04														
SW-2	21-Apr-05														
SW-2	11-Nov-05														
SW-2	14-Apr-06														
SW-2	9-Nov-06														
SW-2	19-Apr-07														
SW-2	9-Nov-07						0.2J	0.3J							
SW-2	21-May-08						0.13J								
SW-2	7-Nov-08						0.13J					0.21J			
SW-2	16-Mar-09														
SW-2	2-Dec-09														
SW-3	18-Nov-04														
SW-3	21-Apr-05														
SW-3	11-Nov-05														
SW-3	14-Apr-06														
SW-3	9-Nov-06														
SW-3	19-Apr-07														
SW-3	9-Nov-07	1.3J			0.9J			0.3J							
SW-3	19-May-08														
SW-3	6-Nov-08											0.25J			
SW-3	16-Mar-09														
SW-3	2-Dec-09	3.66J													
SW-7	7-Nov-08									0.20J	0.72J				
SW-7	16-Mar-09									0.070J	0.29J				
SW-7	2-Dec-09														
SW-8	7-Nov-08										0.12J	0.20J			
SW-8	16-Mar-08														
SW-8	2-Dec-09														

Notes:
All units are in micrograms per liter (parts per billion)
- Concentration exceeds NC Surface Water Standards for Class C Waters
- Indicates result below detection limits
* - Action Level
NE - Standard Not Established
J - Indicates the analytical result is an estimated concentration between the Method Detection Limit and the Solid Waste Section Reporting Limit (SWSL)

Table 4
Geochemical Data
North Wake Unlined Landfill

Monitor Well	Sample Date	ORP (mV)	pH	Dissolved Oxygen	BOD	COD	Methane (ug/l)	Ethane (ug/l)	Ethene (ug/l)	Chloride	Nitrate	Total Organic Carbon	Alkalinity (CaCO3 - Lab)	Alkalinity (CaCO3 - Field)	Sulfate (Lab)	Sulfate (Field)	Sulfide (Lab)	Free Chlorine	Carbon Dioxide	Ferrous Iron	Acetic Acid	Butyric Acid	Lactic Acid	Propionic Acid	Pyruvic Acid	Dissolved Hydrogen (nM)
MW-11	8-Dec-98	156.2	5.57	6.03						3.5	0.6	2.1	21	40				0.17	50	0.02						0.02
MW-11	18-Dec-00	742	5.69																							
MW-11	18-Apr-01		6.80																							
MW-11	27-Nov-01		5.48																							
MW-11	5-Apr-02		6.19																							
MW-11	5-Nov-02		6.14																							
MW-11	15-Apr-03		6.36																							
MW-11	29-Oct-03		6.47																							
MW-11	21-Apr-04		5.31																							
MW-11	15-May-08	135.8	5.53	6.71																						
MW-11	10-Nov-08	167.0	5.74	6.71	<2	6	<7.2	<20	<20	3.67	0.794	1.42	34		<0.3		<0.01		26	<0.2	<1	<1	<25	<1	<10	
MW-11	11-Mar-09	102.5	5.34	7.16	<2	<25	<7.2	<20	<20	3.38	0.719	0.543	32.2		<0.3		<0.05		158	0.21	<1	<1	<25	<1	<10	
MW-11	3-Dec-09	246.0	5.79	6.38	2.00	92	<7.2	<20	<20	2.92	0.662	0.343J	22.5		0.381		<0.05		53	<0.2	<1	<1	<25	<1	<10	
MW-11d	8-Dec-98	123.0	6.03	4.68						3.0	0.58	0.64	14	60				0.02	30							
MW-11d	18-Dec-00	154	5.26																							
MW-11d	18-Apr-01		6.91																							
MW-11d	27-Nov-01		5.21																							
MW-11d	5-Apr-02		6.97																							
MW-11d	5-Nov-02		6.26																							
MW-11d	15-Apr-03		6.98																							
MW-11d	29-Oct-03		6.87																							
MW-11d	21-Apr-04		5.79																							
MW-11d	15-May-08	87.2	5.95	5.02																						
MW-11d	16-Mar-09	173.6	5.76	5.85																						

Table 4
Geochemical Data
North Wake Unlined Landfill

Monitor Well	Sample Date	ORP (mV)	pH	Dissolved Oxygen	BOD	COD	Methane (ug/l)	Ethane (ug/l)	Ethene (ug/l)	Chloride	Nitrate	Total Organic Carbon	Alkalinity (CaCO3 - Lab)	Alkalinity (CaCO3 - Field)	Sulfate (Lab)	Sulfate (Field)	Sulfide (Lab)	Free Chlorine	Carbon Dioxide	Ferrous Iron	Acetic Acid	Butyric Acid	Lactic Acid	Propionic Acid	Pyruvic Acid	Dissolved Hydrogen (nM)
MW-5	3-Dec-98		5.70							5.6																
MW-5	20-Dec-00	38	5.40				4500			13.4	0.07	2.7							141							
MW-5	16-Apr-01	85	5.20							8.5		8.8			6.8				141	1.07						1.07
MW-5	3-Dec-01	103	5.68				1600			5.2					1.7				79.2							
MW-5	12-Apr-02	43	5.54				2400			3.3					4.1				44	3.7						3.7
MW-5	5-Nov-02	65	5.72				1500			8.7	0.34	1.2			4.7				244							
MW-5	17-Apr-03	-138	6.08	0.79			6600			13		13.7			4.1				9							
MW-5	4-Nov-03	-142	5.60	0.14			3200			19		1474							2055	18.5						18.5
MW-5R	14-Apr-04	-35	6.30	1.92			4040			8.19		13.8			0.444		0.08		286							
MW-5R	21-May-08	95	6.02	0.14	<2	9	709	<100	<100	3.92	0.576	11.1	280		13.3		<0.01		264	<0.2	<1	<1	<25	<1	<10	1.1
MW-5R	10-Nov-08	113	6.07	0.31	<2	10	340	<20	<20	4.66	1.25	1.95	240		6.42		<0.01		211	<0.2	<1	<1	<25	<1	<10	1.6
MW-5R	11-Mar-09	61	5.73	0.31	<2	<25	<7.2	<20	<20	1.6	11.9	1.23	113		6.61		<0.05		141	<0.2	<1	<1	<25	<1	<10	2.1
MW-5R	3-Dec-09	272	5.78	0.99	<2	16	<7.2	<20	<20	1.34	12.6	2.26	61.9		7.29		<0.05		106	<0.2	<1	<1	<25	<1	<10	2.7
MW-6	3-Dec-98		5.71							6.8																
MW-6	19-Dec-00	156	5.54				669			9.12	0.05	5.9							57							
MW-6	16-Apr-01	97	5.05				450			7.5		7.7			0.66				47							
MW-6	3-Dec-01	136	5.88				470			6.4					0.34				30.8							
MW-6	12-Apr-02	174	5.47				800			7.3					0.46				35							
MW-6	5-Nov-02	73	5.58				1500			11	0.36	2.1			0.74				83							
MW-6	17-Apr-03	234	5.79	0.59			2400			12	0.48	10.4			0.47				9							
MW-6	4-Nov-03	41	4.80	0.25			640			110		8.5			1.2				185							
MW-6	14-Apr-04	316	5.76	1.70			1450			190		16.6			2.2				330							
MW-6	20-May-08	115	5.94	2.41	<4	78	2740	<400	<400	185	0.19J	24.4	474		12		<0.01		466	0.22	<1	<1	<25	<1	<10	1.1
MW-6	11-Nov-08	84	6.14	1.36	2	106	1190	<200	<200	231	<0.3	30.2	750		2.51J		<0.01		541	0.59	<1	<1	<25	<1	<10	1.9
MW-6	11-Mar-09	59	5.81	0.46	3	86	1810	<200	<200	166	0.155J	22.3	476		8.4		<0.05		387	1.16	<1	<1	<25	<1	<10	3.9
MW-6	3-Dec-09	90	6.23	1.44	2	72	1560	<200	<200	175	<0.3	19.4	507		8.66		<0.05		326	2.12	<1	<1	<25	<1	<10	2.3

Table 4
Geochemical Data
North Wake Unlined Landfill

Monitor Well	Sample Date	ORP (mV)	pH	Dissolved Oxygen	BOD	COD	Methane (ug/l)	Ethane (ug/l)	Ethene (ug/l)	Chloride	Nitrate	Total Organic Carbon	Alkalinity (CaCO3 - Lab)	Alkalinity (CaCO3 - Field)	Sulfate (Lab)	Sulfate (Field)	Sulfide (Lab)	Free Chlorine	Carbon Dioxide	Ferrous Iron	Acetic Acid	Butyric Acid	Lactic Acid	Propionic Acid	Pyruvic Acid	Dissolved Hydrogen (nM)
MW-8	3-Dec-98		5.75							7.3																
MW-8	20-Dec-00	66	5.42							6.84	0.09	5.9							22							
MW-8	16-Apr-01	54	5.61				17			3.2	0.23	1.3			0.89		0.04		32							
MW-8	3-Dec-01	111	6.40							3					0.61		0.01		39.6							
MW-8	12-Apr-02	51	6.00				42			3.5					0.81				31							
MW-8	5-Nov-02	44	6.05				11			3.4	0.42	0.7			1.1		0.06		29							
MW-8	17-Apr-03	171	6.30	1.70						4	0.33	2.3			1.1				13							
MW-8	4-Nov-03	127	5.15	1.68			22			3.9		0.7			1				44							
MW-8	14-Apr-04	235	5.86	1.58			371			3.82		2.2			0.912				52.8							
MW-8	20-May-08	63	5.83	1.42	<2	<5	631	<20	<20	5.85	0.158J	0.469J	59		5.46		<0.01		97	<0.2	<1	<1	<25	<1	<10	1.1
MW-8	10-Nov-08	55	5.84	0.26	<2	5	654	<20	<20	6.29	0.211J	0.603	60		<0.3		<0.01		101	<0.2	<1	<1	<25	<1	<10	1.4
MW-8	11-Mar-09	27	5.65	0.31	<2	<25	264	<100	<100	6.27	0.119J	0.752	68.7		0.793		<0.05		88	0.78	<1	<1	<25	<1	<10	1.1
MW-8	3-Dec-09	83	6.11	1.28	<2	20	647	<200	<200	6.09	0.256	0.749	63.5		1.07		<0.05		*	0.88	<1	<1	<25	<1	<10	2.1
MW-9	3-Dec-98		6.27							15																
MW-9	20-Dec-00	102	4.79				3340			21.9	0.09	12.3							176							
MW-9	16-Apr-01	64	5.79				790			19	0.24	5.5			0.75				121	1.28						1.28
MW-9	3-Dec-01	21	6.41				2700			24					0.38				123	2.5						2.5
MW-9	12-Apr-02	77	6.11				1200			29					0.32				136	9.8						9.8
MW-9	5-Nov-02	39	6.16				470			24		5.7			0.66				236	1.67						1.67
MW-9	17-Apr-03	-106	6.39	0.25			1900			36		30.3			0.42				44	6.3						6.3
MW-9	4-Nov-03	-110	5.76	0.14			1800			53		14.2			0.46				312	1.48						1.48
MW-9	14-Apr-04	58	6.33	0.81			3500			92.5		13.3			0.386				299.2	ND						ND
MW-9	20-May-08	-97	6.28	1.39	7	10	2980	<400	<400	20.1	<0.3	3.12	254		0.58		<0.01		260	18.3	<1	<1	<25	<1	<10	18.3
MW-9	11-Nov-08	-37	6.18	2.45	7	27	1910	<200	<200	18.9	<0.3	3.36	263		<0.3		<0.01		264	15.4	<1	<1	<25	<1	<10	
MW-9	11-Mar-09	-9	6.03	2.07	<2	46	1730	<200	<200	20.1	<0.3	4.56	262		0.608		<0.05		233	17.6	<1	0.4J	<25	0.4J	<10	
MW-9	3-Dec-09	-7	6.38	1.52	<2	44	1740	<200	<200	20.5	<0.3	2.97	233		4.31		<0.05		167	14.8	<1	<1	<25	<1	<10	

Table 4
Geochemical Data
North Wake Unlined Landfill

Monitor Well	Sample Date	ORP (mV)	pH	Dissolved Oxygen	BOD	COD	Methane (ug/l)	Ethane (ug/l)	Ethene (ug/l)	Chloride	Nitrate	Total Organic Carbon	Alkalinity (CaCO3 - Lab)	Alkalinity (CaCO3 - Field)	Sulfate (Lab)	Sulfate (Field)	Sulfide (Lab)	Free Chlorine	Carbon Dioxide	Ferrous Iron	Acetic Acid	Butyric Acid	Lactic Acid	Propionic Acid	Pyruvic Acid	Dissolved Hydrogen (nM)
MW-10	3-Dec-98		5.85							6.8																
MW-10	20-Dec-00	76	5.27				372			10.6	1.5	3.7							26							
MW-10	17-Apr-01	81	5.24				320			5.4	2.2	5.3			1.2				101							
MW-10	3-Dec-01	146	5.88							4.2	1.6				3				35.2							
MW-10	12-Apr-02	98	5.58				300			4.9					1.7				35							
MW-10	5-Nov-02	74	5.54				770			5.4	2	1.8			2.9		0.03		216							
MW-10	17-Apr-03	240	5.11	0.44			2400			5	1.4	9.2			0.82				13							
MW-10	4-Nov-03	90	4.90	0.16						6.6	1	1.7			0.66				145							
MW-10	14-Apr-04	349	5.83	0.52			341			7.3	1.3	7.8			0.78				123							
MW-10	20-May-08	-14.6	5.61	0.55	3	35	1950	<200	<200	3.77	0.162J	1.12	42		0.617		0.01		229	0.48	<1	<1	<25	<1	<10	0.48
MW-10	11-Nov-08	130.0	5.50	2.76	8	30	5890	<200	<200	3.71	<0.3	1.31	96		<0.3		<0.01		370	1.79	1.4	<1	<25	<1	<10	
MW-10	11-Mar-09	97.8	5.34	2.56	<2	<25	2310	<200	<200	3.04	<0.3	3.07	105		0.649		<0.05		339	1.23	<1	<1	<25	0.3J	<10	
MW-10	3-Dec-09	146.2	6.09	2.17	3	28	3110	<200	<200	2.69	<0.3	1.02	112		0.624		<0.05		286	0.95	<1	<1	<25	<1	<10	
MW-24	8-Dec-98	145.9	5.75	1.02						4.2		2.5	66	140		2		0.07	260	0.78						0.78
MW-24	20-Dec-00	67	5.61				4410			8.25	0.08	2.5							101							
MW-24	16-Apr-01	93	5.20				2500			4.2	0.28	5			0.59				121	1.18						1.18
MW-24	3-Dec-01	103	5.83				2100			2.9									52.8	0.3						0.3
MW-24	12-Apr-02	17	5.59				1800			1.5									92	0.6						0.6
MW-24	5-Nov-02	62	5.76				2200			0.56		1.6			0.48		0.01		171	0.21						0.21
MW-24	17-Apr-03	10	5.79	0.50			88			3.6	0.33	4.4			0.35				33							
MW-24	4-Nov-03	-20	4.92	0.42			17			2.9		1.7			0.46				141							
MW-24	14-Apr-04	178	6.29	2.09			139			2.94		6.2			0.42				88							
MW-24	20-May-08	101	5.84	4.56	4	<5	<7.2	<20	<20	3.6	0.273J	0.421J	39		<0.3		0.03		75	2.72	<1	<1	<25	<1	<10	2.72

Table 4
Geochemical Data
North Wake Unlined Landfill

Monitor Well	Sample Date	ORP (mV)	pH	Dissolved Oxygen	BOD	COD	Methane (ug/l)	Ethane (ug/l)	Ethene (ug/l)	Chloride	Nitrate	Total Organic Carbon	Alkalinity (CaCO3 - Lab)	Alkalinity (CaCO3 - Field)	Sulfate (Lab)	Sulfate (Field)	Sulfide (Lab)	Free Chlorine	Carbon Dioxide	Ferrous Iron	Acetic Acid	Butyric Acid	Lactic Acid	Propionic Acid	Pyruvic Acid	Dissolved Hydrogen (nM)
TB-1a	9-Dec-98	193.8	5.98	0.64						4.1		0.54	95	120		2		0.05	500	0.15						0.15
TB-1a	20-Dec-00	63	5.52				2470			6.6	0.09	3.3							62							
TB-1a	17-Apr-01	78	5.63				1500			5.1	0.29	2.4			0.58		0.1		99							
TB-1a	3-Dec-01	111	6.01							3.1									52.8							
TB-1a	12-Apr-02	42	5.70				990			1.6									84							
TB-1a	5-Nov-02	58	5.83				400			4.2		0.7			0.47				138							
TB-1a	17-Apr-03	163	5.82	0.54			17			6.1	0.79	8.5			0.82		0.03		4							
TB-1a	4-Nov-03	1	5.04	0.16						7.5		1.6			0.46				213							
TB-1a	14-Apr-04	257	5.36	0.94						8.47		4.8			0.577				101.2							
TB-1a	20-May-08	-102	5.94	2.22	<2	<5	<7.2	<20	<20	14.9	0.356	0.864	42		11.6		<0.01		48	0.24	<1	<1	<25	<1	0.9J	0.24
TB-1a	11-Nov-08	65	6.11	4.08	<2	50	5.1J	<20	<20	15.1	0.338	1.13	42		4.08		<0.01		106	1.59	<1	<1	<25	<1	<10	
TB-1a	11-Mar-09	-44	5.91	1.98	<2	<25	<7.2	<20	<20	12.8	0.209J	1.05	53.4		10.5		<0.05		114	3.06	<1	<1	<25	<1	<10	
TB-1a	3-Dec-09	88	6.24	1.97	<2	20	<7.2	<20	<20	12.7	0.456	1.22	61.6		11.9		<0.05		88	4.7	<1	<1	<25	<1	<10	

Notes:

MW-11 & MW-11d are background wells for the site

All units are in milligrams per liter (parts per million), unless otherwise noted.

ND - Not Detected

-Blank Cells Indicate No Data Collected

J - Indicates the analytical result is an estimated concentration between the Method Detection Limit and the Solid Waste Section Reporting Limit (SWSL)

* Carbon dioxide samples from MW-8 were not analyzed during the December 2009 sampling event due to laboratory oversight

Appendix B

Total Detected Volatile Organic Compounds Vs. Time Trend Figures for Select Wells

Figure 1
MW-6
Total Detected Volatile Organic Compounds Vs. Time
North Wake Unlined Landfill

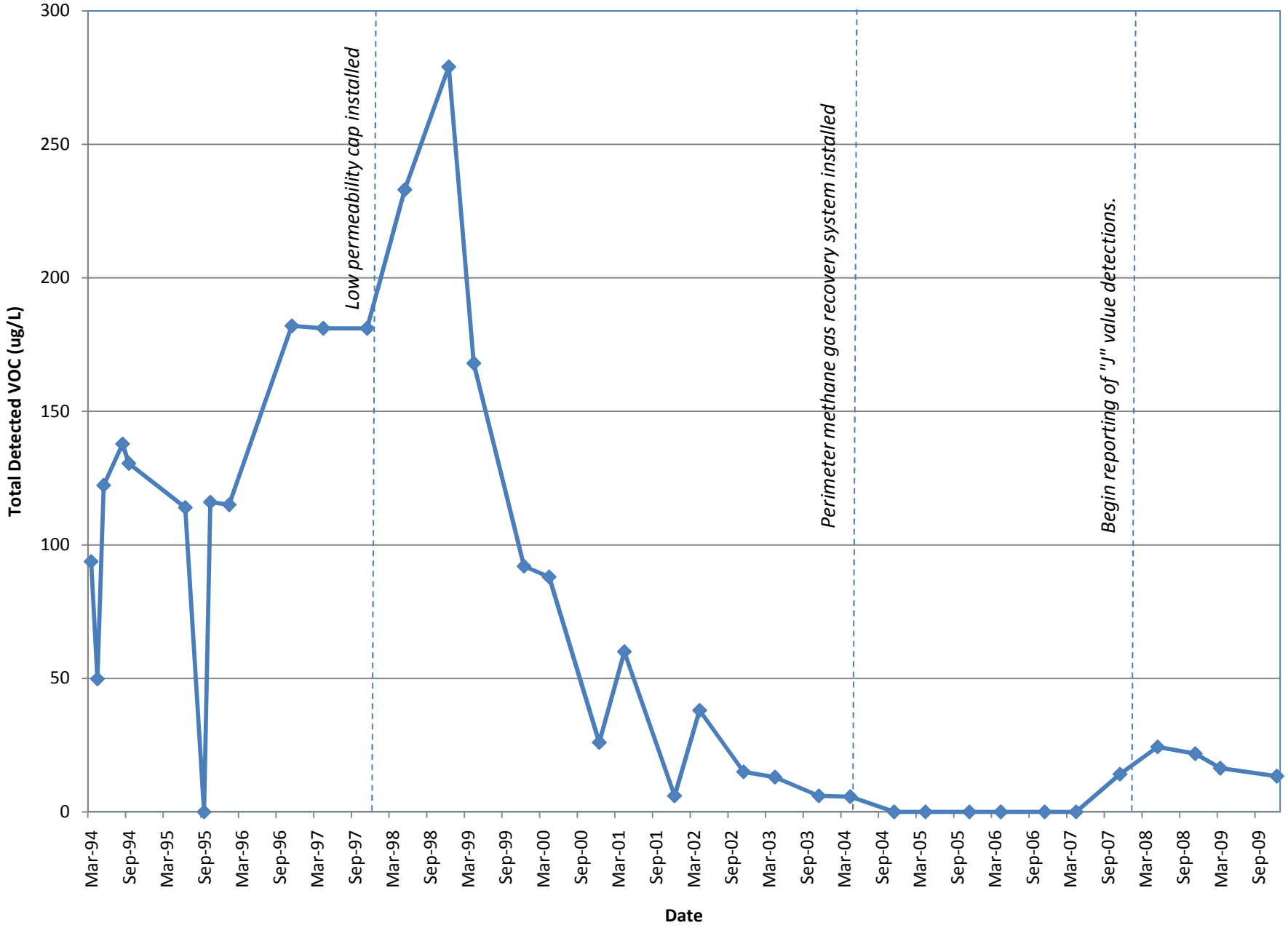
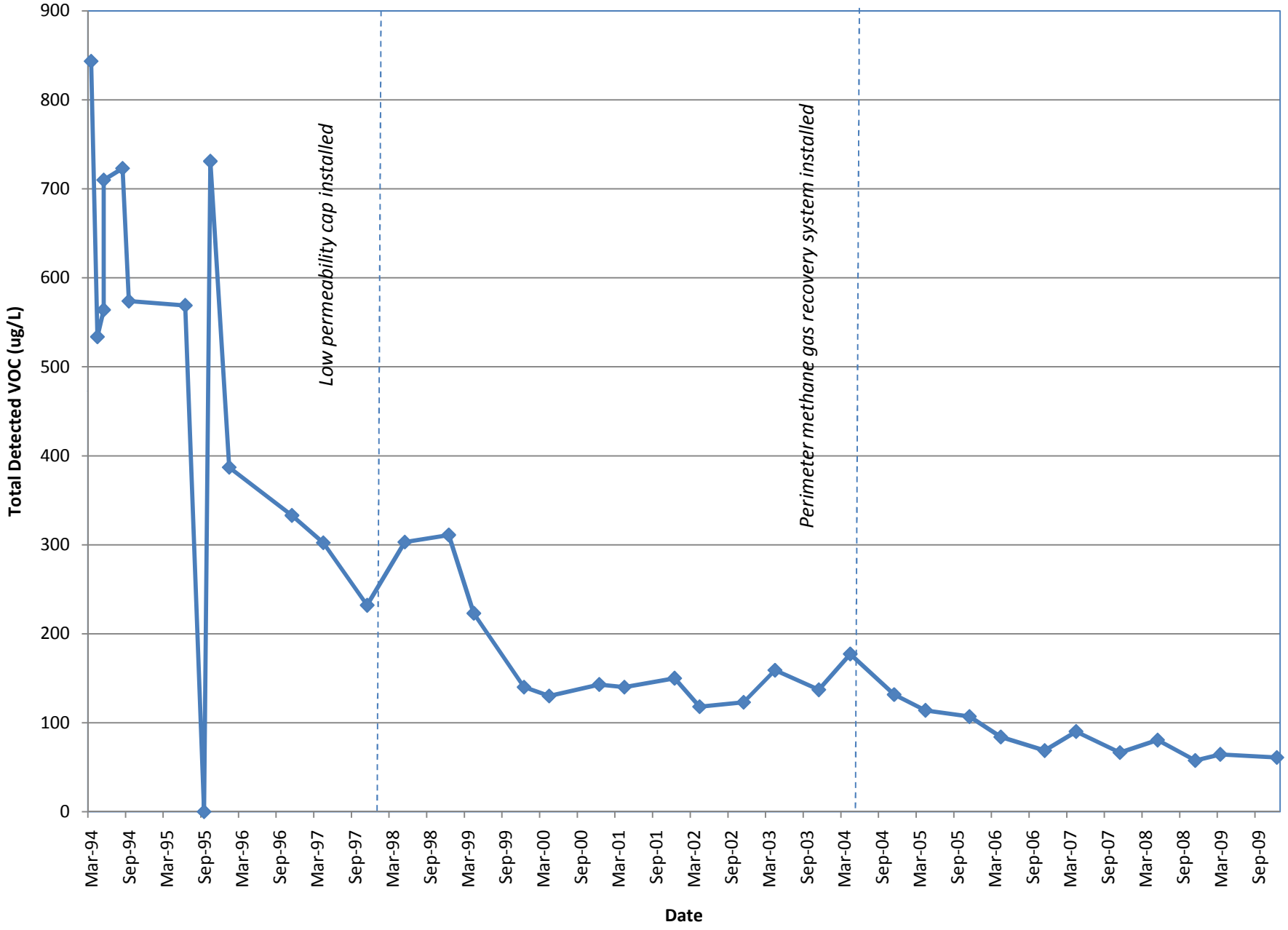
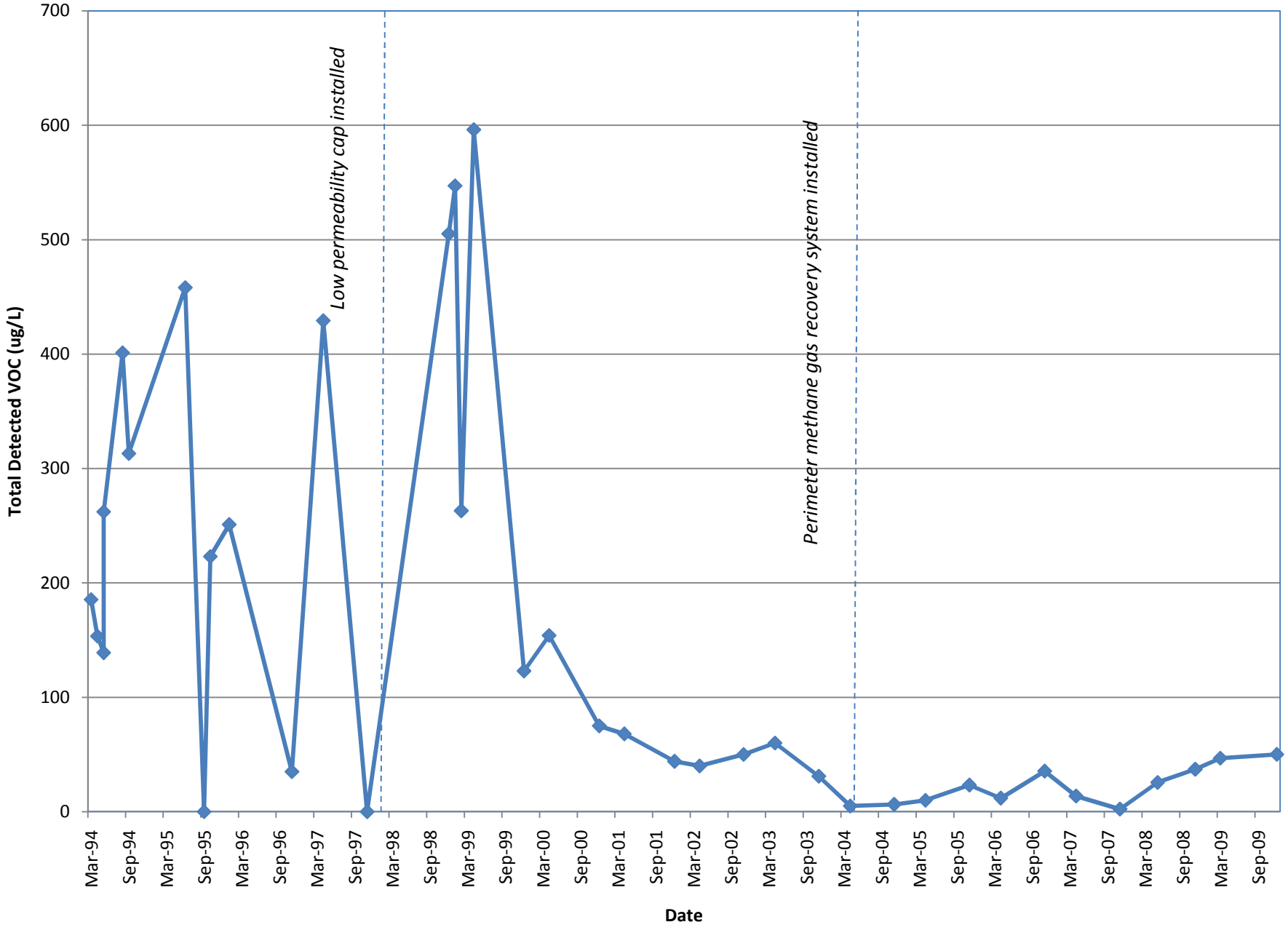


Figure 2
MW-9
Total Detected Volatile Organic Compounds Vs. Time
North Wake Unlined Landfill



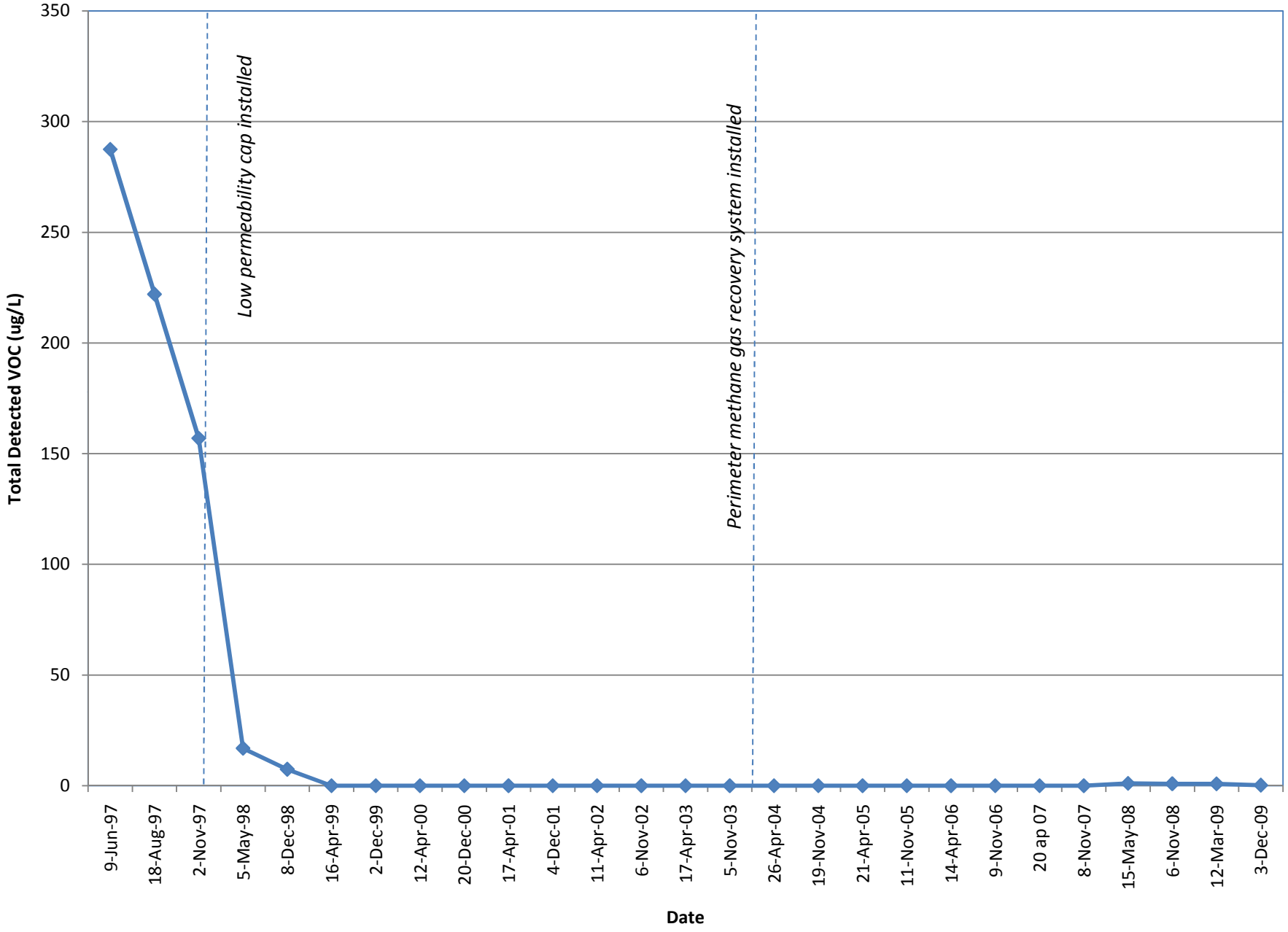
MW-9 Chart

Figure 3
MW-10
Total Detected Volatile Organic Compounds Vs. Time
North Wake Unlined Landfill



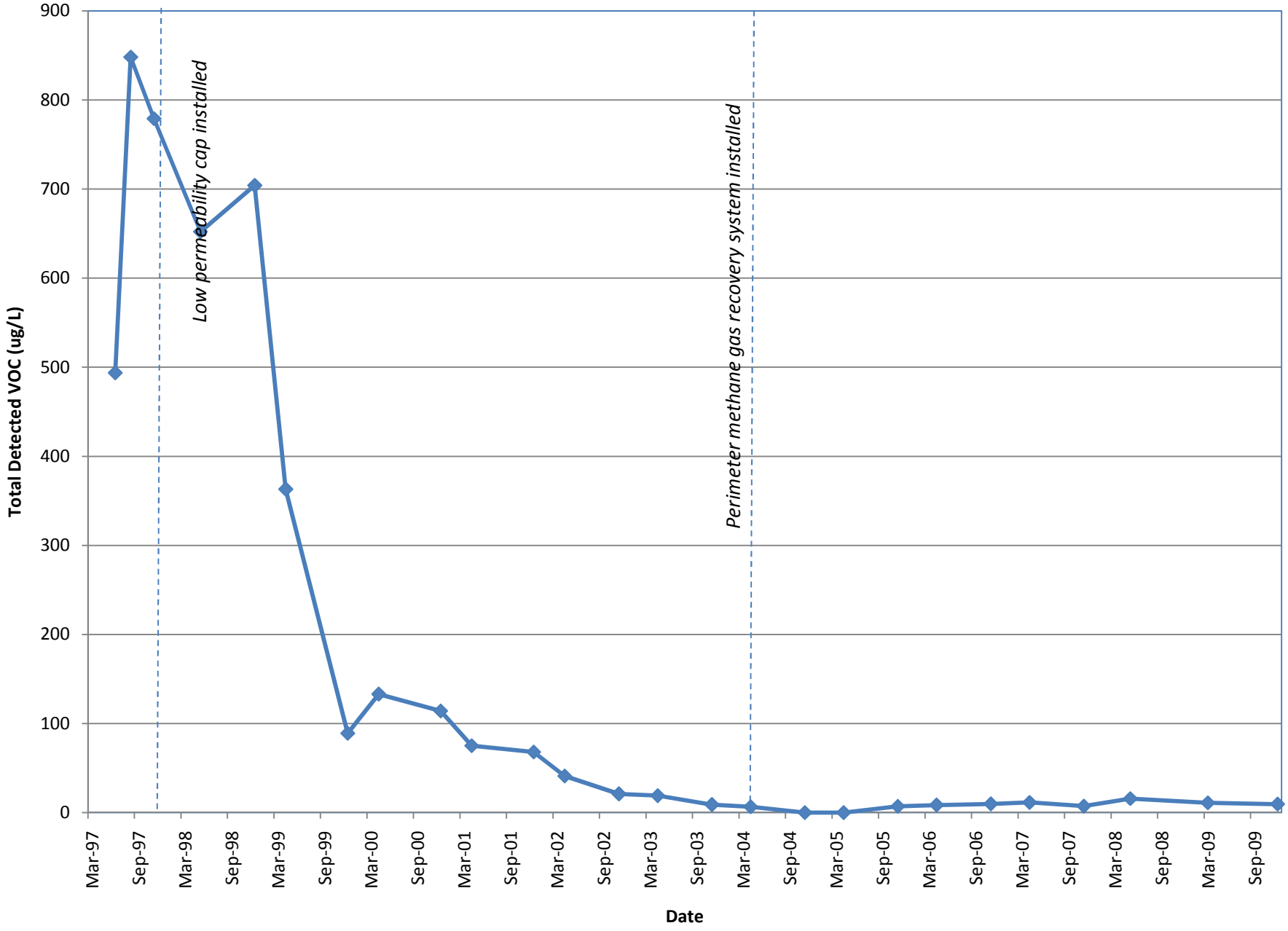
MW-10 Chart

Figure 4
MW-23
Total Detected Volatile Organic Compounds Vs. Time
North Wake Unlined Landfill



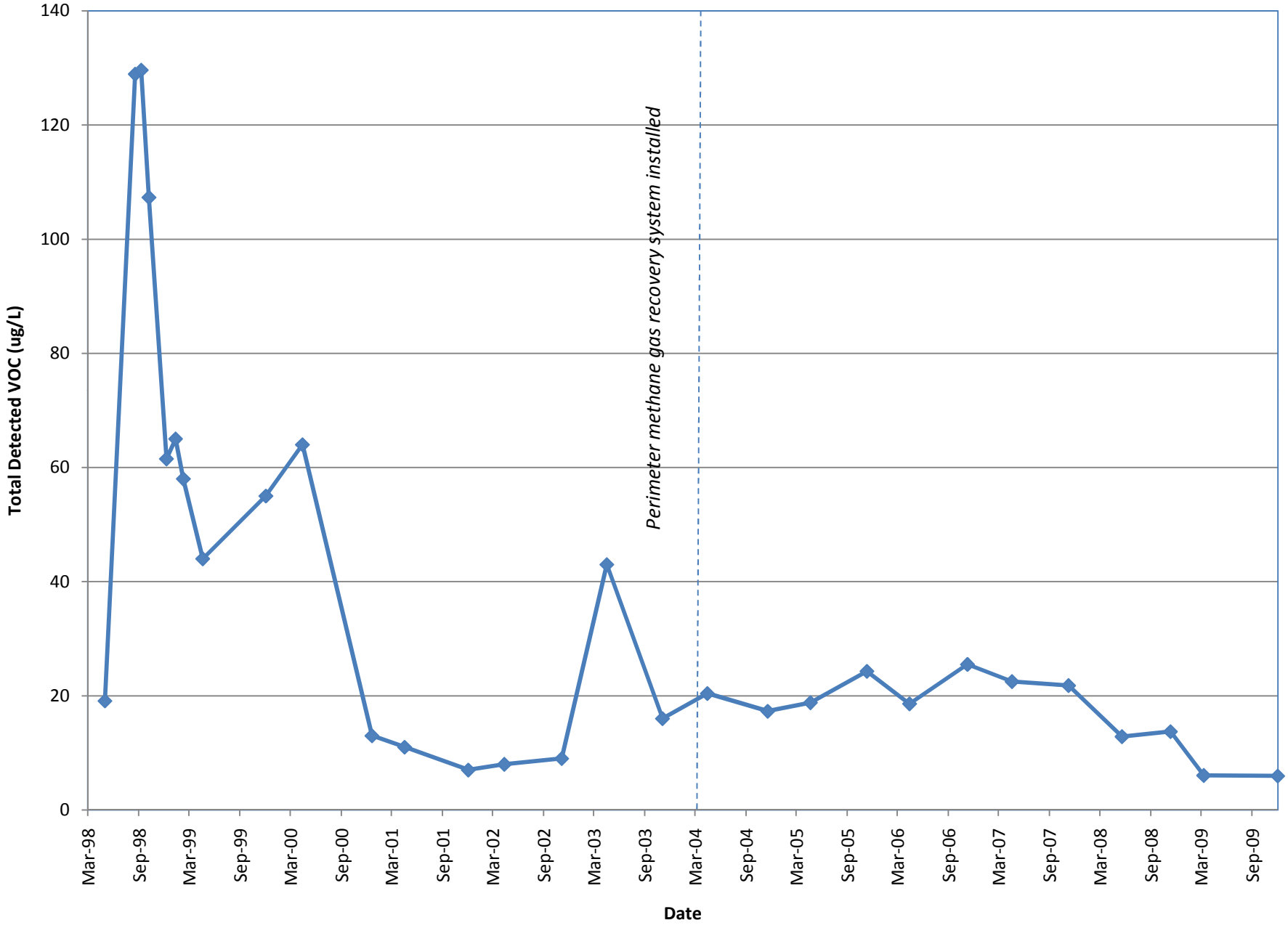
MW-23 Chart

Figure 5
MW-24
Total Detected Volatile Organic Compounds Vs. Time
North Wake Unlined Landfill



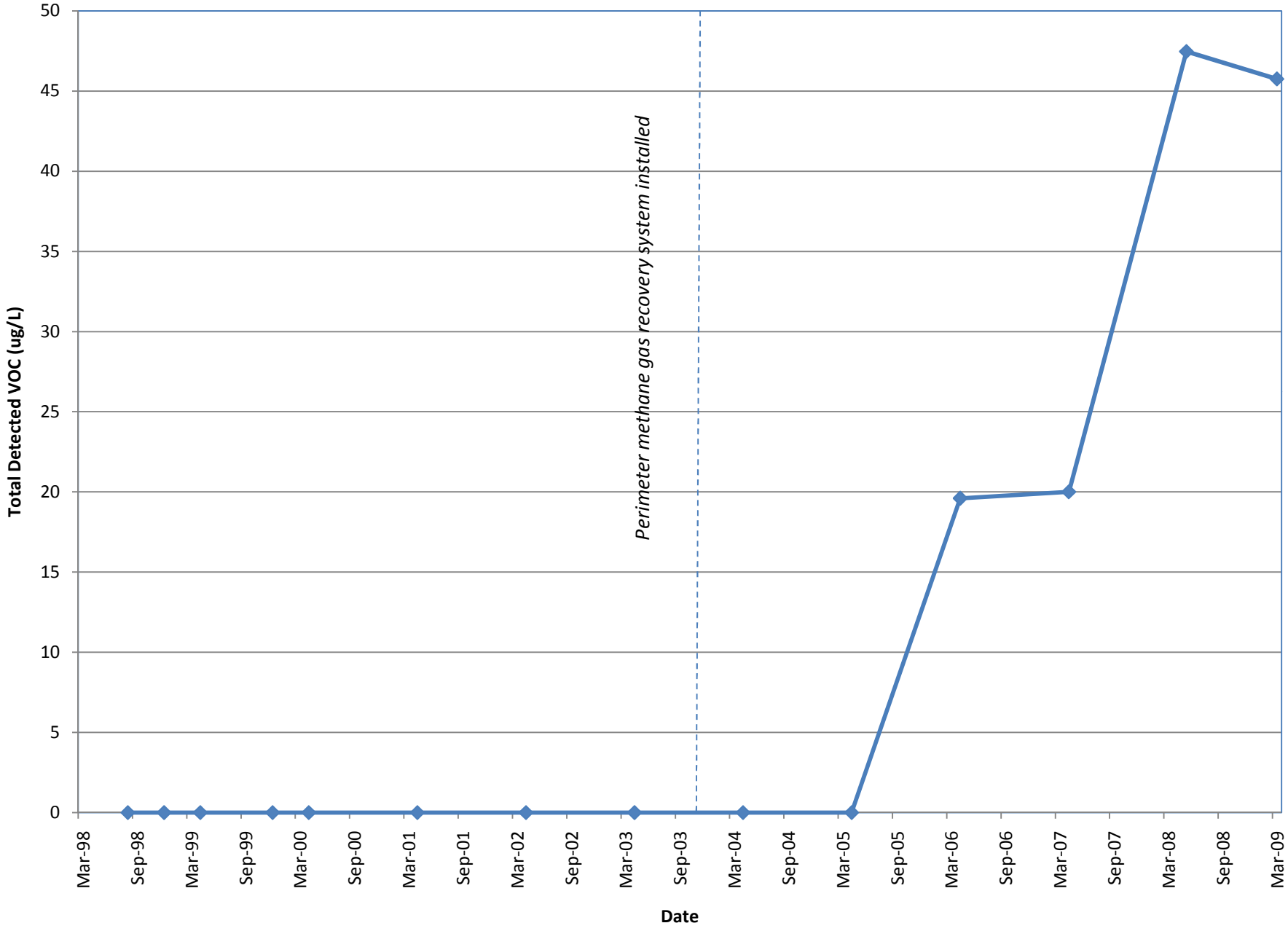
MW-24 Chart

Figure 6
TB-1A
Total Detected Volatile Organic Compounds Vs. Time
North Wake Unlined Landfill



TB-1A Chart

Figure 7
MW-34
Total Detected Volatile Organic Compounds Vs. Time
North Wake Unlined Landfill



Appendix C

BIOCHLOR Screening Sheets

Natural Attenuation Screening Protocol

The following is taken from the USEPA protocol (USEPA, 1998). The results of this scoring process have no regulatory significance.

Interpretation	Score
Inadequate evidence for anaerobic biodegradation* of chlorinated organics	0 to 5
Limited evidence for anaerobic biodegradation* of chlorinated organics	6 to 14
Adequate evidence for anaerobic biodegradation* of chlorinated organics	15 to 20
Strong evidence for anaerobic biodegradation* of chlorinated organics	>20

* reductive dechlorination

Score: 7

Scroll to End of Table

Analysis	Concentration in Most Contam. Zone	MW-5 Interpretation	Yes	No	Points Awarded
Oxygen*	<0.5 mg/L	Tolerated, suppresses the reductive pathway at higher concentrations	○	◉	0
	> 5mg/L	Not tolerated; however, VC may be oxidized aerobically	○	◉	0
Nitrate*	<1 mg/L	At higher concentrations may compete with reductive pathway	○	◉	0
Iron II*	>1 mg/L	Reductive pathway possible; VC may be oxidized under Fe(III)-reducing conditions	○	◉	0
Sulfate*	<20 mg/L	At higher concentrations may compete with reductive pathway	◉	○	2
Sulfide*	>1 mg/L	Reductive pathway possible	○	◉	0
Methane*	>0.5 mg/L	Ultimate reductive daughter product, VC Accumulates	○	◉	0
Oxidation Reduction Potential* (ORP)	<50 millivolts (mV)	Reductive pathway possible	○	◉	0
	<-100mV	Reductive pathway likely	○	◉	0
pH*	5 < pH < 9	Optimal range for reductive pathway	◉	○	0
TOC	>20 mg/L	Carbon and energy source; drives dechlorination; can be natural or anthropogenic	○	◉	0
Temperature*	>20°C	At T >20°C biochemical process is accelerated	○	◉	0
Carbon Dioxide	>2x background	Ultimate oxidative daughter product	◉	○	1
Alkalinity	>2x background	Results from interaction of carbon dioxide with aquifer minerals	◉	○	1
Chloride*	>2x background	Daughter product of organic chlorine	○	◉	0
Hydrogen	>1 nM	Reductive pathway possible, VC may accumulate	◉	○	3
Volatile Fatty Acids	>0.1 mg/L	Intermediates resulting from biodegradation of aromatic compounds; carbon and energy source	○	◉	0
BTEX*	>0.1 mg/L	Carbon and energy source; drives dechlorination	○	◉	0
PCE*		Material released	○	◉	0
TCE*		Daughter product of PCE [a/]	○	◉	0
DCE*		Daughter product of TCE. If cis is greater than 80% of total DCE it is likely a daughter product of TCE[a/]; 1,1-DCE can be a chem. reaction product of TCA	○	◉	0
VC*		Daughter product of DCE[a/]	○	◉	0
1,1,1-Trichloroethane*		Material released	○	◉	0
DCA		Daughter product of TCA under reducing conditions	○	◉	0
Carbon Tetrachloride		Material released			0
Chloroethane*		Daughter product of DCA or VC under reducing conditions			0
Ethene/Ethane	>0.01 mg/L	Daughter product of VC/ethene			0
	>0.1 mg/L	Daughter product of VC/ethene			0
Chloroform		Daughter product of Carbon Tetrachloride			0
Dichloromethane		Daughter product of Chloroform			0

* required analysis.

a/ Points awarded only if it can be shown that the compound is a daughter product (i.e., not a constituent of the source NAPL).

End of Form

Natural Attenuation Screening Protocol

The following is taken from the USEPA protocol (USEPA, 1998). The results of this scoring process have no regulatory significance.

Interpretation	Score
Inadequate evidence for anaerobic biodegradation* of chlorinated organics	0 to 5
Limited evidence for anaerobic biodegradation* of chlorinated organics	6 to 14
Adequate evidence for anaerobic biodegradation* of chlorinated organics	15 to 20
Strong evidence for anaerobic biodegradation* of chlorinated organics	>20

Score: 25

Scroll to End of Table

* reductive dechlorination

Analysis	Concentration in Most Contam. Zone	MW-6 Interpretation	Yes	No	Points Awarded
Oxygen*	<0.5 mg/L	Tolerated, suppresses the reductive pathway at higher concentrations	○	◉	0
	> 5mg/L	Not tolerated; however, VC may be oxidized aerobically	○	◉	0
Nitrate*	<1 mg/L	At higher concentrations may compete with reductive pathway	◉	○	2
Iron II*	>1 mg/L	Reductive pathway possible; VC may be oxidized under Fe(III)-reducing conditions	◉	○	3
Sulfate*	<20 mg/L	At higher concentrations may compete with reductive pathway	◉	○	2
Sulfide*	>1 mg/L	Reductive pathway possible	○	◉	0
Methane*	>0.5 mg/L	Ultimate reductive daughter product, VC Accumulates	◉	○	3
Oxidation Reduction Potential* (ORP)	<50 millivolts (mV)	Reductive pathway possible	○	◉	0
	<-100mV	Reductive pathway likely	○	◉	0
pH*	5 < pH < 9	Optimal range for reductive pathway	◉	○	0
TOC	>20 mg/L	Carbon and energy source; drives dechlorination; can be natural or anthropogenic	○	◉	0
Temperature*	>20°C	At T >20°C biochemical process is accelerated	○	◉	0
Carbon Dioxide	>2x background	Ultimate oxidative daughter product	◉	○	1
Alkalinity	>2x background	Results from interaction of carbon dioxide with aquifer minerals	◉	○	1
Chloride*	>2x background	Daughter product of organic chlorine	◉	○	2
Hydrogen	>1 nM	Reductive pathway possible, VC may accumulate	◉	○	3
Volatile Fatty Acids	>0.1 mg/L	Intermediates resulting from biodegradation of aromatic compounds; carbon and energy source	○	◉	0
BTEX*	>0.1 mg/L	Carbon and energy source; drives dechlorination	○	◉	0
PCE*		Material released	◉	○	0
TCE*		Daughter product of PCE [a/]	◉	○	2
DCE*		Daughter product of TCE. If cis is greater than 80% of total DCE it is likely a daughter product of TCE[a/]; 1,1-DCE can be a chem. reaction product of TCA	◉	○	2
VC*		Daughter product of DCE[a/]	◉	○	2
1,1,1-Trichloroethane*		Material released	○	◉	0
DCA		Daughter product of TCA under reducing conditions	◉	○	0
Carbon Tetrachloride		Material released			0
Chloroethane*		Daughter product of DCA or VC under reducing conditions			2
Ethene/Ethane	>0.01 mg/L	Daughter product of VC/ethene			0
	>0.1 mg/L	Daughter product of VC/ethene			0
Chloroform		Daughter product of Carbon Tetrachloride			0
Dichloromethane		Daughter product of Chloroform			0

* required analysis.

a/ Points awarded only if it can be shown that the compound is a daughter product (i.e., not a constituent of the source NAPL).

End of Form

Natural Attenuation Screening Protocol

The following is taken from the USEPA protocol (USEPA, 1998). The results of this scoring process have no regulatory significance.

Interpretation	Score
Inadequate evidence for anaerobic biodegradation* of chlorinated organics	0 to 5
Limited evidence for anaerobic biodegradation* of chlorinated organics	6 to 14
Adequate evidence for anaerobic biodegradation* of chlorinated organics	15 to 20
Strong evidence for anaerobic biodegradation* of chlorinated organics	>20

Score: 21

Scroll to End of Table

* reductive dechlorination

Analysis	Concentration in Most Contam. Zone	MW-8 Interpretation	Yes	No	Points Awarded
Oxygen*	<0.5 mg/L	Tolerated, suppresses the reductive pathway at higher concentrations	○	◉	0
	> 5mg/L	Not tolerated; however, VC may be oxidized aerobically	○	◉	0
Nitrate*	<1 mg/L	At higher concentrations may compete with reductive pathway	◉	○	2
Iron II*	>1 mg/L	Reductive pathway possible; VC may be oxidized under Fe(III)-reducing conditions	○	◉	0
Sulfate*	<20 mg/L	At higher concentrations may compete with reductive pathway	◉	○	2
Sulfide*	>1 mg/L	Reductive pathway possible	○	◉	0
Methane*	>0.5 mg/L	Ultimate reductive daughter product, VC Accumulates	◉	○	3
Oxidation Reduction Potential* (ORP)	<50 millivolts (mV)	Reductive pathway possible	○	◉	0
	<-100mV	Reductive pathway likely	○	◉	0
pH*	5 < pH < 9	Optimal range for reductive pathway	◉	○	0
TOC	>20 mg/L	Carbon and energy source; drives dechlorination; can be natural or anthropogenic	○	◉	0
Temperature*	>20°C	At T >20°C biochemical process is accelerated	○	◉	0
Carbon Dioxide	>2x background	Ultimate oxidative daughter product	○	◉	0
Alkalinity	>2x background	Results from interaction of carbon dioxide with aquifer minerals	◉	○	1
Chloride*	>2x background	Daughter product of organic chlorine	◉	○	2
Hydrogen	>1 nM	Reductive pathway possible, VC may accumulate	◉	○	3
Volatile Fatty Acids	>0.1 mg/L	Intermediates resulting from biodegradation of aromatic compounds; carbon and energy source	○	◉	0
BTEX*	>0.1 mg/L	Carbon and energy source; drives dechlorination	○	◉	0
PCE*		Material released	◉	○	0
TCE*		Daughter product of PCE [a/]	◉	○	2
DCE*		Daughter product of TCE. If cis is greater than 80% of total DCE it is likely a daughter product of TCE[a/]; 1,1-DCE can be a chem. reaction product of TCA	◉	○	2
VC*		Daughter product of DCE[a/]	◉	○	2
1,1,1-Trichloroethane*		Material released	○	◉	0
DCA		Daughter product of TCA under reducing conditions	○	◉	2
Carbon Tetrachloride		Material released			0
Chloroethane*		Daughter product of DCA or VC under reducing conditions			0
Ethene/Ethane	>0.01 mg/L	Daughter product of VC/ethene			0
	>0.1 mg/L	Daughter product of VC/ethene			0
Chloroform		Daughter product of Carbon Tetrachloride			
Dichloromethane		Daughter product of Chloroform			0

* required analysis.

a/ Points awarded only if it can be shown that the compound is a daughter product (i.e., not a constituent of the source NAPL).

End of Form

Natural Attenuation Screening Protocol

The following is taken from the USEPA protocol (USEPA, 1998). The results of this scoring process have no regulatory significance.

Interpretation	Score
Inadequate evidence for anaerobic biodegradation* of chlorinated organics	0 to 5
Limited evidence for anaerobic biodegradation* of chlorinated organics	6 to 14
Adequate evidence for anaerobic biodegradation* of chlorinated organics	15 to 20
Strong evidence for anaerobic biodegradation* of chlorinated organics	>20

Score: 25

Scroll to End of Table

* reductive dechlorination

Analysis	Concentration in Most Contam. Zone	MW-9 Interpretation	Yes	No	Points Awarded
Oxygen*	<0.5 mg/L	Tolerated, suppresses the reductive pathway at higher concentrations	○	◉	0
	> 5mg/L	Not tolerated; however, VC may be oxidized aerobically	○	◉	0
Nitrate*	<1 mg/L	At higher concentrations may compete with reductive pathway	◉	○	2
Iron II*	>1 mg/L	Reductive pathway possible; VC may be oxidized under Fe(III)-reducing conditions	◉	○	3
Sulfate*	<20 mg/L	At higher concentrations may compete with reductive pathway	◉	○	2
Sulfide*	>1 mg/L	Reductive pathway possible	○	◉	0
Methane*	>0.5 mg/L	Ultimate reductive daughter product, VC Accumulates	◉	○	3
Oxidation Reduction Potential* (ORP)	<50 millivolts (mV)	Reductive pathway possible	◉	○	1
	<-100mV	Reductive pathway likely	○	◉	0
pH*	5 < pH < 9	Optimal range for reductive pathway	◉	○	0
TOC	>20 mg/L	Carbon and energy source; drives dechlorination; can be natural or anthropogenic	○	◉	0
Temperature*	>20°C	At T >20°C biochemical process is accelerated	○	◉	0
Carbon Dioxide	>2x background	Ultimate oxidative daughter product	◉	○	1
Alkalinity	>2x background	Results from interaction of carbon dioxide with aquifer minerals	◉	○	1
Chloride*	>2x background	Daughter product of organic chlorine	◉	○	2
Hydrogen	>1 nM	Reductive pathway possible, VC may accumulate	○	◉	0
Volatile Fatty Acids	>0.1 mg/L	Intermediates resulting from biodegradation of aromatic compounds; carbon and energy source	○	◉	0
BTEX*	>0.1 mg/L	Carbon and energy source; drives dechlorination	○	◉	0
PCE*		Material released	○	◉	0
TCE*		Daughter product of PCE [a/]	◉	○	2
DCE*		Daughter product of TCE. If cis is greater than 80% of total DCE it is likely a daughter product of TCE[a/]; 1,1-DCE can be a chem. reaction product of TCA	◉	○	2
VC*		Daughter product of DCE[a/]	◉	○	2
1,1,1-Trichloroethane*		Material released	○	◉	0
DCA		Daughter product of TCA under reducing conditions	◉	○	2
Carbon Tetrachloride		Material released			0
Chloroethane*		Daughter product of DCA or VC under reducing conditions			2
Ethene/Ethane	>0.01 mg/L	Daughter product of VC/ethene			0
	>0.1 mg/L	Daughter product of VC/ethene			0
Chloroform		Daughter product of Carbon Tetrachloride			0
Dichloromethane		Daughter product of Chloroform			0

* required analysis.

a/ Points awarded only if it can be shown that the compound is a daughter product (i.e., not a constituent of the source NAPL).

End of Form

Natural Attenuation Screening Protocol

The following is taken from the USEPA protocol (USEPA, 1998). The results of this scoring process have no regulatory significance.

Interpretation	Score
Inadequate evidence for anaerobic biodegradation* of chlorinated organics	0 to 5
Limited evidence for anaerobic biodegradation* of chlorinated organics	6 to 14
Adequate evidence for anaerobic biodegradation* of chlorinated organics	15 to 20
Strong evidence for anaerobic biodegradation* of chlorinated organics	>20

* reductive dechlorination

Score: 19

Scroll to End of Table

Analysis	Concentration in Most Contam. Zone	MW-10 Interpretation	Yes	No	Points Awarded
Oxygen*	<0.5 mg/L	Tolerated, suppresses the reductive pathway at higher concentrations	○	◉	0
	> 5mg/L	Not tolerated; however, VC may be oxidized aerobically	○	◉	0
Nitrate*	<1 mg/L	At higher concentrations may compete with reductive pathway	◉	○	2
Iron II*	>1 mg/L	Reductive pathway possible; VC may be oxidized under Fe(III)-reducing conditions	○	◉	0
Sulfate*	<20 mg/L	At higher concentrations may compete with reductive pathway	◉	○	2
Sulfide*	>1 mg/L	Reductive pathway possible	○	◉	0
Methane*	>0.5 mg/L	Ultimate reductive daughter product, VC Accumulates	◉	○	3
Oxidation Reduction Potential* (ORP)	<50 millivolts (mV)	Reductive pathway possible	○	◉	0
	<-100mV	Reductive pathway likely	○	◉	0
pH*	5 < pH < 9	Optimal range for reductive pathway	◉	○	0
TOC	>20 mg/L	Carbon and energy source; drives dechlorination; can be natural or anthropogenic	○	◉	0
Temperature*	>20°C	At T >20°C biochemical process is accelerated	○	◉	0
Carbon Dioxide	>2x background	Ultimate oxidative daughter product	◉	○	1
Alkalinity	>2x background	Results from interaction of carbon dioxide with aquifer minerals	◉	○	1
Chloride*	>2x background	Daughter product of organic chlorine	○	◉	0
Hydrogen	>1 nM	Reductive pathway possible, VC may accumulate	○	◉	0
Volatile Fatty Acids	>0.1 mg/L	Intermediates resulting from biodegradation of aromatic compounds; carbon and energy source	○	◉	0
BTEX*	>0.1 mg/L	Carbon and energy source; drives dechlorination	○	◉	0
PCE*		Material released	◉	○	0
TCE*		Daughter product of PCE [a/]	◉	○	2
DCE*		Daughter product of TCE. If cis is greater than 80% of total DCE it is likely a daughter product of TCE[a/]; 1,1-DCE can be a chem. reaction product of TCA	◉	○	2
VC*		Daughter product of DCE[a/]	◉	○	2
1,1,1-Trichloroethane*		Material released	○	◉	0
DCA		Daughter product of TCA under reducing conditions	◉	○	2
Carbon Tetrachloride		Material released			0
Chloroethane*		Daughter product of DCA or VC under reducing conditions			2
Ethene/Ethane	>0.01 mg/L	Daughter product of VC/ethene			0
	>0.1 mg/L	Daughter product of VC/ethene			0
Chloroform		Daughter product of Carbon Tetrachloride			0
Dichloromethane		Daughter product of Chloroform			0

* required analysis.

a/ Points awarded only if it can be shown that the compound is a daughter product (i.e., not a constituent of the source NAPL).

End of Form

Natural Attenuation Screening Protocol

The following is taken from the USEPA protocol (USEPA, 1998). The results of this scoring process have no regulatory significance.

Interpretation	Score
Inadequate evidence for anaerobic biodegradation* of chlorinated organics	0 to 5
Limited evidence for anaerobic biodegradation* of chlorinated organics	6 to 14
Adequate evidence for anaerobic biodegradation* of chlorinated organics	15 to 20
Strong evidence for anaerobic biodegradation* of chlorinated organics	>20

* reductive dechlorination

Score: 12

Scroll to End of Table

Analysis	Concentration in Most Contam. Zone	TB-1a Interpretation	Yes	No	Points Awarded
Oxygen*	<0.5 mg/L	Tolerated, suppresses the reductive pathway at higher concentrations	○	◉	0
	> 5mg/L	Not tolerated; however, VC may be oxidized aerobically	○	◉	0
Nitrate*	<1 mg/L	At higher concentrations may compete with reductive pathway	◉	○	2
Iron II*	>1 mg/L	Reductive pathway possible; VC may be oxidized under Fe(III)-reducing conditions	◉	○	3
Sulfate*	<20 mg/L	At higher concentrations may compete with reductive pathway	◉	○	2
Sulfide*	>1 mg/L	Reductive pathway possible	○	◉	0
Methane*	>0.5 mg/L	Ultimate reductive daughter product, VC Accumulates	○	◉	0
Oxidation Reduction Potential* (ORP)	<50 millivolts (mV)	Reductive pathway possible	○	◉	0
	<-100mV	Reductive pathway likely	○	◉	0
pH*	5 < pH < 9	Optimal range for reductive pathway	◉	○	0
TOC	>20 mg/L	Carbon and energy source; drives dechlorination; can be natural or anthropogenic	○	◉	0
Temperature*	>20°C	At T >20°C biochemical process is accelerated	○	◉	0
Carbon Dioxide	>2x background	Ultimate oxidative daughter product	○	◉	0
Alkalinity	>2x background	Results from interaction of carbon dioxide with aquifer minerals	◉	○	1
Chloride*	>2x background	Daughter product of organic chlorine	◉	○	2
Hydrogen	>1 nM	Reductive pathway possible, VC may accumulate	○	◉	0
Volatile Fatty Acids	>0.1 mg/L	Intermediates resulting from biodegradation of aromatic compounds; carbon and energy source	○	◉	0
BTEX*	>0.1 mg/L	Carbon and energy source; drives dechlorination	○	◉	0
PCE*		Material released	◉	○	0
TCE*		Daughter product of PCE [a/]	○	◉	0
DCE*		Daughter product of TCE. If cis is greater than 80% of total DCE it is likely a daughter product of TCE[a/]; 1,1-DCE can be a chem. reaction product of TCA	○	◉	0
VC*		Daughter product of DCE[a/]	○	◉	0
1,1,1-Trichloroethane*		Material released	○	◉	0
DCA		Daughter product of TCA under reducing conditions	○	◉	2
Carbon Tetrachloride		Material released			0
Chloroethane*		Daughter product of DCA or VC under reducing conditions			0
Ethene/Ethane	>0.01 mg/L	Daughter product of VC/ethene			0
	>0.1 mg/L	Daughter product of VC/ethene			0
Chloroform		Daughter product of Carbon Tetrachloride			0
Dichloromethane		Daughter product of Chloroform			0

* required analysis.

a/ Points awarded only if it can be shown that the compound is a daughter product (i.e., not a constituent of the source NAPL).

End of Form

Appendix D

Health & Safety Plan

HEALTH AND SAFETY PLAN FORM *This document is for the exclusive* **CDM (Camp Dresser & McKee)**
CDM Health and Safety Program *use of CDM and its subcontractors* **PROJECT DOCUMENT #: 1**

PROJECT NAME	N Wake Unlined Landfill	**PROJECT#**	6172-71371	**REGION**	SOUTH
	Corrective Action Implementation	**CLIENT ORGANIZATION**			Wake County
SITE ADDRESS	9029 Deponie Drive	**CLIENT CONTACT**			Thomas Esqueda
	Raleigh, NC 27614, Wake County	**CLIENT CONTACT PHONE #**			(919) 856-7444

( ) AMENDMENT TO EXISTING APPROVED H&SP?
( ) H&SP AMENDMENT NUMBER? ____ **( ) DATE OF PREVIOUS H&SP APPROVAL** ____

OBJECTIVES OF FIELD WORK:
(e.g. collect surface soil samples):

1. Installation of air sparging wells and system
2. Perform groundwater sampling.

SITE TYPE: *Check as many as applicable*

Active	( )	Landfill	(X)	Unknown	( )
Inactive	(X)	Uncontrolled	( )	Military	( )
Secure	(X)	Industrial	( )	Other (specify)	
Unsecure	( )	Recovery	( )		
Enclosed space	( )	Well Field	( )		

All requirements described in the **CDM Health and Safety Manual** are incorporated in this health and safety plan by reference.

PERSONNEL AND RESPONSIBILITIES

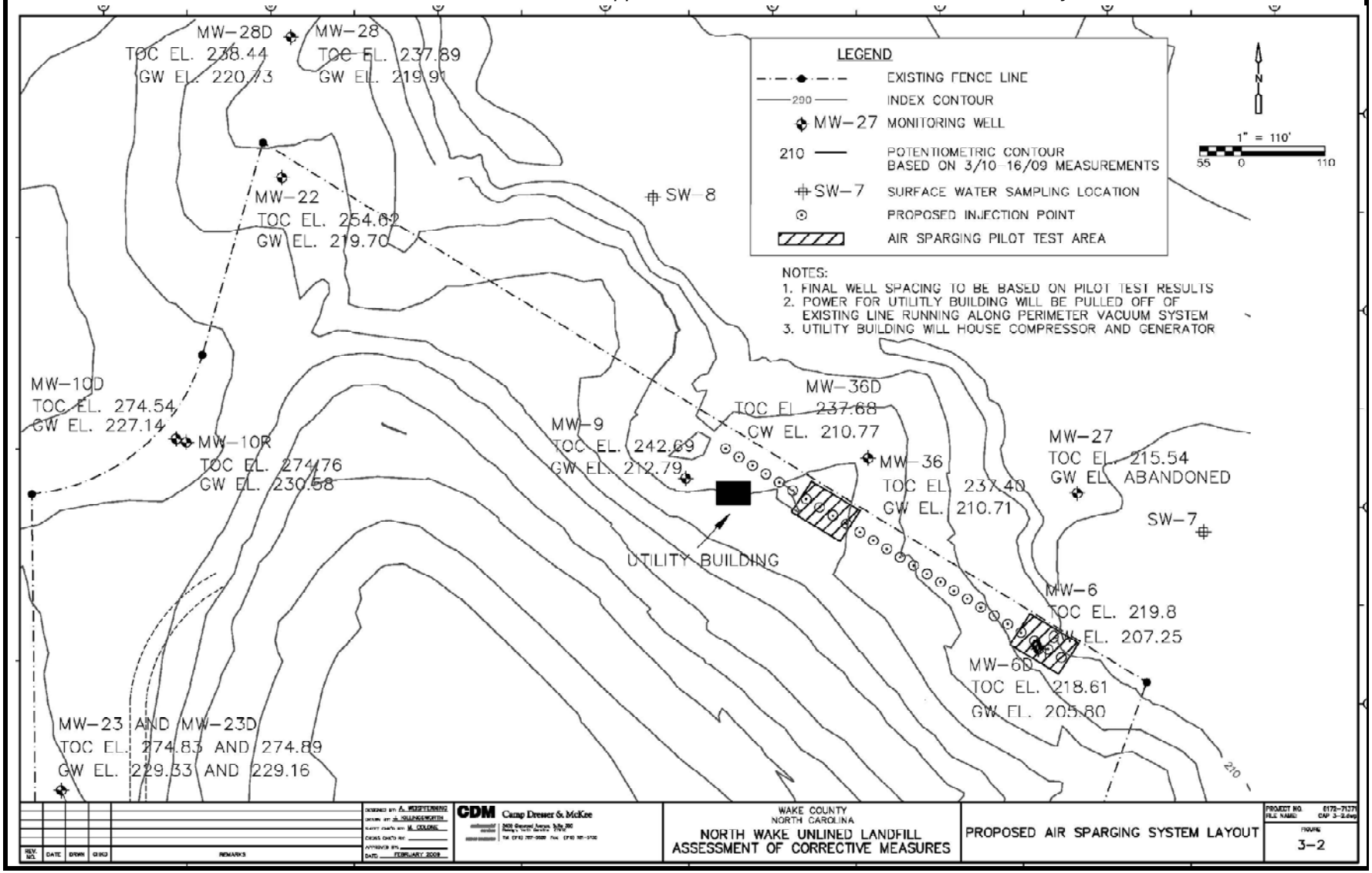
NAMES OF WORK CREW MEMBERS	COMPANY or DIVISION	SUPERVISORY TRAINED?	PROJECT OR SITE RESPONSIBILITIES	Tasks On Site?
Mat Colone	ERD	Level C	Project/Task Manager	None
Dan Forbes	ERD	Level C	Site Geologis/H&S Coordinator	1,2
Aaron Weispfenning	ERD	Level C	Site Engineer	1,2
Nicholas Fuller	ERD	Level C	Site Technician	2
SAEDACCO (Drilling Sub)	SAEDACCO		Subcontractor	1

BACKGROUND REVIEW: (X) Complete ( ) Incomplete

HEALTH AND SAFETY PLAN FORM | *This document is for the exclusive* | **CDM (Camp Dresser & McKee)**

CDM Health and Safety Program | *use of CDM and its subcontractors* | **PROJECT DOCUMENT #: 1**

SITE MAP: *Show Exclusion, Contamination Reduction, and Support Zones. Indicate Evacuation and Reassembly Points*



HEALTH AND SAFETY PLAN FORM **CDM Health and Safety Program**	*This document is for the exclusive use of CDM and its subcontractors*	**CDM (Camp Dresser & McKee)** **PROJECT DOCUMENT #: 1**

HISTORY: *Summarize conditions that relate to hazard. Include citizen complaints, spills, previous investigations or agency actions, known injuries, etc.*

In November 1996, Wake County began disposal of municipal solid waste in the lined portion of the North Wake Subtitle D Landfill. A low permeability cap was installed to close the Unlined Landfill. A methane gas recovery system was installed in the waste, and has been operational since November 1997. Due to landfill gas migration beyond the limits of waste, a permanent landfill gas migration control system was installed along the western, northern and eastern perimeter of the landfill, inside the landfill property boundary. At the request of the Solid Waste Section (SWS), additional groundwater assessment wells (MW-36/-36d) were installed to the north of MW-9 and MW-6/6d in order to assess for offsite contaminant migration. Following installation and sampling of MW-36/36d, the North Wake Unlined Landfill Assessment of Corrective Measures Report was submitted to the SWS in June 2009 in accordance with Rule .1635. This report identified potential corrective measures to meet the requirements of Rule .1636. Due to the low-level of contamination and nature of contaminants, it was recommended that Wake County pursue MNA and institutional controls paired with in situ remediation by air sparging as the preferred remedy. Pilot test wells will be installed to determine the radius of influence and configuration of the well spacing for the air sparging system.

WASTE TYPES: (X) Liquid ( ) Solid ( ) Sludge ( ) Gas ( ) Unknown ( ) Other, specify:

WASTE CHARACTERISTICS: *Check as many as applicable.*

(X) Corrosive (X) Flammab ( ) Radioactive
(X) Toxic (X) Volatile ( ) Reactive
( ) Inert Gas ( ) Unknown
( ) Other: _____

WORK ZONES:

Exclusion Zone (EZ): Exclusion will vary according to the location property. Near a drill rig this zone is 1.5 times the mast height.
Contaminant Reduction Zone (CR): Upwind and at least 10 feet from the EZ.
Support Zone: Clean area will be upwind of the work area.

HAZARDS OF CONCERN: *Check as many as applicable.*

(X) Heat Stress CDM Guideline (X) Noise CDM Guideline
( ) Cold Stress (X) Inorganic Chemicals
( ) Explosive/Flammable (X) Organic Chemicals
( ) Oxygen Deficient ( ) Motorized Traffic
( ) Radiological (X) Heavy Machinery
( ) Biological (X) Slips & Falls CDM Guideline
( ) Other: _____
( ) Other: _____

FACILITY'S PAST AND PRESENT DISPOSAL METHODS AND PRACTICES:

Investigative derived waste from previous investigations has been disposed of onsite by spreading soil cuttings from drilling activities and development/purge water over the ground surface. These practices will be continued during the work outlined in this plan.

This plan incorporates CDM's procedure for: *(Click on the relevant topics to download the hazard guideline. Delete irrelevant topics.)*

Housekeeping
Manual Material Handling
Electrical Safety
Excavations
Working Safely Around Drill Rigs
Tools and Power Equipment
Working Around Heavy Equipment
Hazardous Waste Site Decontamination
Hazardous Waste Site Controls

HEALTH AND SAFETY PLAN FORM **CDM Health and Safety Program**	*This document is for the exclusive use of CDM and its subcontractors*	**CDM (Camp Dresser & McKee)** **PROJECT DOCUMENT #: 1**

DESCRIPTION AND FEATURES: *Include principal operations and unusual features (containers, buildings, dikes, power lines, hillslopes, rivers, etc.)*

The North Wake Solid Waste Facility is located at 9029 Deponie Drive in Raleigh, Wake County, North Carolina. The property consists of closed Unlined, Subtitle D, and C&D landfills. In addition, there is a recycling convenience center at the landfill entrance. The Subtitle D and C&D landfills are currently being redeveloped as part of the North Wake Landfill Reuse Project. The landfills will be used as parks that will be open to the public. The Unlined Landfill is located north of the Subtitle D landfill and will not be open to the public. The Unlined Landfill is surrounded by a chain-link fence and is only accessible through a locking gate. The Unlined Landfill is bordered by residential homes to the north and west. Mallinkrodt Inc., currently owned by Covidien, is an industrial facilty to the east that manufactures pharmaceutical ingredients. The industrial facility and Unlined Landfill are seperated by wooded areas and grassy fields.

SURROUNDING POPULATION: (X) Residential (X) Industrial ( ) Commercial ( ) Rural ( ) Urban OTHER:

HAZARDOUS MATERIAL SUMMARY: ***Highlight or bold waste types and estimate amounts by category.***

CHEMICALS: *Amount/Units:*	**SOLIDS:** *Amount/Units:*	**SLUDGES:** *Amount/Units:*	**SOLVENTS:** *Amount/Units:*	**OILS:** *Amount/Units:*	**OTHER:** *Amount/Units:*
Acids	Flyash	Paints	Ketones	Oily Wastes	Laboratory
Pickling Liquors	Mill or Mine Tailings	Pigments	**Aromatics**	Gasoline	Pharmaceutical
Caustics	Asbestos	Metals Sludges	**Hydrocarbons**	Diesel Oil	Hospital
Pesticides	Ferrous Smelter	POTW Sludge	Alcohols	Lubricants	Radiological
Dyes or Inks	Non-Ferrous Smelter	Distillation Bottoms	**Halogenated (chloro, bromo)**	Polynuclear Aromatics	Municipal
Cyanides	Metals	Aluminum	Esters	PCBs	Construction
Phenols	Dioxins		Ethers	Heating Oil	Munitions
Halogens					
Other - *specify*	Other - *specify*	Other - *specify*	Other - *specify*	Other - *specify*	Other - *specify*

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KNOWN CONTAMINANTS		HIGHEST OBSERVED CONCENTRATION	PEL/TLV *ppm or mg/m3 (specify)*	IDLH *ppm or mg/m3 (specify)*	Warning Concentration *(in ppm)*	SYMPTOMS & EFFECTS OF ACUTE EXPOSURE	PHOTO IONIZATION POTENTIAL
Benzene	GW	**6.1 ppb**	0.5 ppm	500 ppm	61 ppm	Eye & nose irritation, headache, giddiness, nausea, fatigue	9.25
Dichlorobenzene (skin)	GW	**7.4 ppb**	10 ppm	150 ppm	0.7 ppm	Nose, eye irritation, skin blister, headaches, nausea, jaundice	9.10
1,1-Dichloroethane	GW	**61 ppb**	100 ppm	3,000 ppm	120 ppm	Skin irritation, drowsiness	11.10
1,1-Dichloroethane	GW	**61 ppb**	100 ppm	3,000 ppm	120 ppm	Skin irritation, drowsiness	11.10
Methylene chloride	GW	**180 ppb**	25 ppm	2,300 ppm	160 ppm	Weakness, tingling & numbness, vertigo, nausea	11.35
Tetrachloroethylene	GW	**7 ppb**	25 ppm	150 ppm	47 ppm	Irritated eyes, nose, throat, flushed face & neck, dizziness	9.32
Trichloroethylene	GW	**19 ppb**	50 ppm	1,000 ppm	82 ppm	Vertigo, visual disturbance, headache, drowsiness	9.45
Vinyl chloride	GW	**4.01 ppb**	1 ppm	Carc.	NA	Weakness, stomach pain, cancer	10.00

NA = Not Available **NE = None Established** **U = Unknown** Verify your access to an MSDS for each chemical you will use at the site.

S = Soil SW = Surface Water T = Tailings W = Waste TK = Tanks SD = Sediment
A = Air GW = Ground Water SL = Sludge D = Drums L = Lagoons OFF = Off-Site

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	SPECIFIC TASK DESCRIPTIONS	Disturbing the Waste?	TASK - SPECIFIC HAZARDS	HAZARD & SCHEDULE
1	Perform oversight of air sparge well and system installation. Includes pilot and permenant system installation.	**Intrusive** Non-intrusive	Heat stress, heavy machinery, motorized traffic, organic/inorganic chemicals, slips, trips, falls, biological hazards.	Medium Hazard Jun-10
2	Conduct groundwater sampling of all wells on and off site. Bailers or peristaltic/bladder pumps may be used.	**Intrusive** Non-intrusive	Heat stress, organic/inorganic chemicals, slips, trips, falls, biological hazards, splashing of contaminated water.	Low Hazard Jun-10
3		Intrusive Non-intrusive		
4		Intrusive Non-intrusive		
5		Intrusive Non-intrusive		
6		Intrusive Non-intrusive		

SPECIALIZED TRAINING REQUIRED:

SPECIAL MEDICAL SURVEILLANCE REQUIREMENTS:

OVERALL HAZARD EVALUATION: ( ) High (**XX**) Medium ( ) Low ( ) Unknc *(Where tasks have different hazards, evaluate each.)*

JUSTIFICATION: Working around a drill rig can be dangerous. All work will be performed outdoors. Ticks and heat stress are hazards to be aware of.

FIRE/EXPLOSION POTENTIAL: ( ) High ( ) Medium (**X**) Low ( ) Unknown

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PROTECTIVE EQUIPMENT: *Specify by task. Indicate type and/or material, as necessary. Group tasks if possible. Use copies of this sheet if needed.*

BLOCK A

TASKS: **1 - 2** - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10
LEVEL: A - B - C - **D** - Modified
(**X**) Primary ( ) Contingency

Respiratory: (**X**) Not needed
( ) SCBA, Airline:
( ) APR:
( ) Cartridge:
( ) Escape Mask:
( ) Other:

Head and Eye: ( ) Not needed
(**X**) Safety Glasses:
( ) Face Shield:
(**X**) Goggles:
(**X**) Hard Hat:
( ) Other:

Boots: ( ) Not needed
(**X**) Steel-Toe ( ) Steel Shank
( ) Rubber ( ) Leather
( ) Overboots:

Prot. Clothing: (**X**) Not needed
( ) Encapsulated Suit:
( ) Splash Suit
( ) Apron:
(**XX**) Tyvek Coverall or
( ) Saranex Coverall
(**XX**) Cloth Coverall:
( ) Other:

Gloves: ( ) Not needed
( ) Undergloves:
(**X**) Gloves: Nitrile
( ) Overgloves:

Other: specify below
(**X**) Tick Spray
( ) Flotation Device If Over Water
(**X**) Hearing Protection
(**X**) Sun Screen

BLOCK B

TASKS: 1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10
LEVEL: A - B - C - D - Modified
( ) Primary ( ) Contingency

Respiratory: ( ) Not needed
( ) SCBA, Airline:
( ) APR:
( ) Cartridge:
( ) Escape Mask:
( ) Other:

( ) Safety Glasses:
( ) Face Shield:
( ) Goggles:
( ) Hard Hat:
( ) Other:

( ) Not needed
( ) Steel-Toe ( ) Steel Shank
( ) Rubber ( ) Leather
( ) Overboots: Latex

Prot. Clothing: ( ) Not needed
( ) Encapsulated Suit:
( ) Splash Suit
( ) Apron:
( ) Tyvek Coverall or
( ) Saranex Coverall
( ) Cloth Coverall:
( ) Other:

Gloves: ( ) Not needed
( ) Undergloves:
( ) Gloves:
( ) Overgloves:

Other: specify below
( ) Tick Spray
( ) Flotation Device If Over Water
( ) Hearing Protection
( ) Sun Screen

BLOCK C

TASKS: 1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10
LEVEL: A - B - C - D - Modified
( ) Primary ( ) Contingency

Respiratory: ( ) Not needed
( ) SCBA, Airline:
( ) APR:
( ) Cartridge:
( ) Escape Mask:
( ) Other:

( ) Safety Glasses:
( ) Face Shield:
( ) Goggles:
( ) Hard Hat:
( ) Other:

Boots: ( ) Not needed
( ) Steel-Toe ( ) Steel Shank
( ) Rubber ( ) Leather
( ) Overboots:

Prot. Clothing: ( ) Not needed
( ) Encapsulated Suit:
( ) Splash Suit
( ) Apron:
( ) Tyvek Coverall
( ) Saranex Coverall
( ) Cloth Coverall:
( ) Other:

Gloves: ( ) Not needed
( ) Undergloves:
( ) Gloves:
( ) Overgloves:

Other: specify below
( ) Tick Spray
( ) Flotation Device
( ) Hearing Protection
( ) Sun Screen

BLOCK D

TASKS: 1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10
LEVEL: A - B - C - D - Modified

Respiratory: ( ) Not needed
SCBA, Airline:
APR:
Cartridge:
Escape Mask:
( ) Other:

( ) Safety Glasses:
( ) Face Shield:
( ) Goggles:
( ) Hard Hat:
( ) Other:

( ) Not needed
( ) Steel-Toe ( ) Steel Shank
( ) Rubber ( ) Leather
( ) Overboots:

Prot. Clothing: ( ) Not needed
( ) Encapsulated Suit:
( ) Splash Suit
( ) Apron:
( ) Tyvek Coverall
( ) Saranex Coverall
( ) Cloth Coverall:
( ) Other:

Gloves: ( ) Not needed
( ) Undergloves:
( ) Gloves:
( ) Overgloves:

Other: specify below
( ) Tick Spray
( ) Flotation Device
( ) Hearing Protection
( ) Sun Screen

Exit Area

Un-used

Un-used

This health and safety plan form constitutes hazard analysis per 29 CFR 1910.132

HEALTH AND SAFETY PLAN FORM	*This document is for the exclusive*	**CDM (Camp Dresser & McKee)**
CDM Health and Safety Program	*use of CDM and its subcontractors*	**PROJECT DOCUMENT #: 1**

MONITORING EQUIPMENT: *Specify by task. Indicate type as necessary. Attach additional sheets if needed.*

INSTRUMENT	**TASK**	**ACTION GUIDELINES**		**COMMENTS**
Combustible Gas Indicator	1-2-3-4-5-6-7-8	0-10% LEL 10-25% LEL >25% LEL 21.0% O2 <21.0% O2 <19.5% O2	*No explosion hazard* *Potential explosion hazard; notify SHSC* *Explosion hazard; interrupt task/evacuate* *Oxygen normal* *Oxygen deficient; notify SHSC* *Interrupt task/evacuate*	(**X**) Not Needed
Radiation Survey Meter	1-2-3-4-5-6-7-8	3 x Background: >2mR/hr:	*Notify HSM* *Establish REZ*	(**X**) Not Needed
Photoionization Detector _____eV Lamp Type ____	**1-2**-3-4-5-6-7-8	*Specify:*	0 to 1 ppm: Level D 1 to 20 ppm: Level D, use detector tubes >20 ppm: Leave area. Call HSM	( ) Not Needed Measure the organic vapor exposure continuously during intrusive operations like monitoring well installation/groundwater sampling
Flame Ionization Detector Type_____	1-2-3-4-5-6-7-8	*Specify:*		(**X**) Not Needed
Single Gas Type__Benzene_____ Type____Vinyl Chloride_____	1-2-3-4-5-6-7-8	*Specify:*	<0.5 ppm: Level D >0.5 ppm: Leave area. Call HSM	(**X**) Not Needed
Respirable Dust Monitor Type_____ Type_____	1-2-3-4-5-6-7-8	*Specify:*	If team observes visible concentrations of airborne dust or dry, windy conditions that stir dust up, team will leave area.	(**X**) Not Needed
Other *Specify:* Type_____ Type_____	1-2-3-4-5-6-7-8	*Specify:*	If team notices unusual odors or irritation of the eye or throat, they will leave the area.	(**X**) Not Needed
Other *Specify:* Type_____ Type_____	1-2-3-4-5-6-7-8	*Specify:*		(**X**) Not Needed

HEALTH AND SAFETY PLAN FORM **CDM Health and Safety Program**	*This document is for the exclusive use of CDM and its subcontractors*	**CDM (Camp Dresser & McKee)** **PROJECT DOCUMENT #: 1**

DECONTAMINATION PROCEDURES

ATTACH SITE MAP INDICATING EXCLUSION, DECONTAMINATION, & SUPPORT ZONES AS PAGE TWO

Personnel Decontamination *Summarize below or attach diagram;*	**Sampling Equipment Decontamination** *Summarize below or attach diagram;*	**Heavy Equipment Decontamination** *Summarize below or attach diagram;*
Level D protective clothing removal will be done in the following manner:	Reusable sampling equipment should be cleaned in the following manner:	Heavy machinery will be cleaned prior to use and after each operation
Equipment drop Hard hat removal Boot cover removal (if applicable) Glove removal Hand and face wash	Gross mechanical removal of dirt Detergent-in-water wash Tap water rinse Deionized water rinse Air dry	Wire brush to remove soil Clean with high pressure stream Water rinse Store in a non-contaminated area **Contractor will be responsible to decontaminate their equipment**
( ) Not Needed	( ) Not Needed	( ) Not Needed
Containment and Disposal Method	**Containment and Disposal Method**	**Containment and Disposal Method**
Investigation derived waste will be spread over the ground surface.		

HAZARDOUS MATERIALS TO BE BROUGHT ONSITE

Preservatives		*Decontamination*		*Calibration*	
(**X**) Hydrochloric Acid	( ) Zinc Acetate	(**X**) Alconox ™	( ) Hexane	(**X**) 100 ppm isobutylene	( ) Hydrogen Sulfide
(**X**) Nitric Acid	( ) Ascorbic Acid	(**X**) Liquinox ™	( ) Isopropanol	( ) Methane	( ) Carbon Monoxide
( ) Sulfuric Acid	( ) Acetic Acid	( ) Acetone	( ) Nitric Acid	( ) Pentane	(**X**) pH Standards
( ) Sodium Hydroxide	( ) Other:	( ) Methanol	( ) Other:	( ) Hyrogen	(**X**) Conductivity Std
		( ) Mineral Spirits		( ) Propane	( ) Other:

HEALTH AND SAFETY PLAN FORM *This document is for the exclusive* **CDM (Camp Dresser & McKee)**

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EMERGENCY CONTACTS

Water Supply	
Site Telephone	678-777-4480
EPA Release Report #:	800 / 424 - 8802
CDM 24-Hour Emergency #:	CED 732 / 539 - 8128
Facility Management	919-518-0274
Other (specify)	
CHEMTREC Emergency #:	800 / 424 - 9300

EMERGENCY CONTACTS	NAME	PHONE
Health and Safety Manager	Chris Marlowe	732 / 590 - 4632
Project Manager	Mat Colone	919-787-5620
Site Safety Coordinator	Dan Forbes	919-787-5620
Client Contact	Thomas Esqueda	(919) 856-7444
Other *(specify)*		
Environmental Agency		
State Spill Number	North Carolina	(800) 858-0368
Fire Department		911
Police Department		911
State Police		911
Health Department	Wake County	919-250-4516
Poison Control Center	Nationwide	800 / 222 - 1222
Occupational Physician	Kenneth Chase	800 / 777 - WOHA

SAFETY NARRATIVE: *Summarize below*

Work will not be performed in thunderstorms or associated bad weather. Prior to purging wells or collecting water levels, field personnel will open well and let vent to release any potential vapor that may have accumulated.

CDM staff may rely on instruments operated by contractor personnel only upon HSM approval SHSC will designate evacuation routes at the morning safety meeting. Teams will cease work if they see lightning or thunder storms in the area.

If work team observes hazards for which they have not prepared, they will withdraw from the area and call the health and safety manager. CDM personnel will maintain a safe distance from drilling operations and observe health and safety guidelines for working around heavy equipment and /or drill rigs.

MEDICAL EMERGENCY		PHONE
Hospital Name:	Duke Raleigh Hospital	(919) 954-3000
Hospital Address	3400 Wake Forest Road	Raleigh, NC 27609

Name of Contact at Hospital:

Name of 24-Hour Ambulance:

Route to Hospital:

1. Head southeast on Deponie Dr toward Durant Rd 0.3 mi
2. Turn left at Durant Rd 1.6 mi
3. Turn right at Capital Blvd/US-1 S 6.3 mi
4. Merge onto I-440 W/US-1 S via the ramp to Sanford 1.1 mi
5. Take exit 10 for Wake Forest Rd 0.2 mi
6. Turn right at Wake Forest Rd 0.3 mi
7. Take the 2nd right onto Executive Dr

Total Drive Time: 18 minutes

Prepared by Daniel Forbes Date 2/17/2010

HSC Signature Date

HSM Signature Date Feb 17, 2010

Distance to Hospital 9.8 Miles

HEALTH AND SAFETY PLAN SIGNATURE FORM

CDM Health and Safety Plan

All site personnel must sign this form indicating receipt of the H&SP. Keep this original on site. It becomes part of the permanent project files. Send a copy to the Health and Safety Manager (HSM).

SITE NAME/NUMBER: N Wake Landfill / 919-518-0274

DIVISION/LOCATION: STH/RAL

CERTIFICATION:

I understand, and agree to comply with, the provisions of the above referenced H&SP for work activities on this project. I agree to report any injuries, illnesses or exposure incidents to the site Health and Safety Coordinator (SHSC). I agree to inform the SHSC about any drugs (legal and illegal) that I take within three days of site work.

PRINTED NAME	SIGNATURE	DATE