PREPARED FOR:
GRANVILLE COUNTY
SOLID WASTE DEPARTMENT
P.O. BOX 906

BUTNER LANDFILL
PERMIT NO. 39-02

CORRECTIVE ACTION PLAN

May 2014

PREPARED BY:

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This Corrective Action Plan (CAP) was prepared in accordance with the requirements of 15A NCAC 13B.1637 and generally accepted standards of environmental practice for the exclusive use of and reliance upon by the referenced client for specific application to the referenced site. No other warranty is either expressed or implied.

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Conclusions presented in this report are based upon a review of available information, results of our field studies, results of chemical analyses, and professional judgment. Our conclusions do not reflect variations in subsurface groundwater quality that might exist between or beyond sampling points or between specific sampling events.

To the best of our knowledge, information provided by others is true and accurate, unless otherwise noted.

G. Van Ness Burbach, Ph.D., P.G.
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CORRECTIVE ACTION PLAN
Butner Landfill, Permit No. 39-02

EXECUTIVE SUMMARY

On behalf of Granville County, Joyce Engineering (JOYCE) prepared this Corrective Action Plan (CAP) for the Butner Landfill (facility). This CAP has been prepared in accordance with 15A NCAC 13B.1636 of the North Carolina Solid Waste Management Rules (NCSWMR) and in response to the Groundwater Protection Standard (GPS) exceedances of benzene in groundwater monitoring well MW-2R at the facility.

In May 2013, Granville County submitted an *Assessment of Corrective Measures* (ACM) for the Butner Landfill. Possible remedial alternatives were evaluated by first identifying those remedial alternatives applicable to the constituents-of-concern (i.e., benzene) and the impacted media (groundwater) at the landfill, and then screening applicable alternatives based on a rapid assessment screening matrix designed to identify those remedial alternatives most applicable based on available site information. Based on the evaluation and criteria presented in the NCSWMR, Granville County selected the following remedial alternatives to be retained and evaluated in more detail:

- Monitored Natural Attenuation;
- Phytoremediation;
- Constructed Wetlands;
- Air Sparging;
- Permeable Reactive Barrier;
- Enhanced Bioremediation;
- Landfill Gas Control; and
- Pump and Treat.

Further evaluation of the above potential remedial strategies suggested that Monitored Natural Attenuation (MNA) plus phytoremediation would be the most cost-effective remedy that meets the requirements set forth in 15A NCAC 13B.1636. A public meeting to present the results of the ACM was conducted in Oxford, North Carolina on September 3rd, 2013, and the County selected MNA plus Phytoremediation as the remedy for the Butner Landfill. An application for a Corrective Action Permit Amendment was submitted to DENR, and the DENR approved the amendment and the selected remedy in a letter dated October 30, 2013.

This CAP presents MNA plus phytoremediation as the selected remedy for groundwater remediation at the Butner Landfill, and lays out plans to implement this remedy, as well as contingency plans in case the selected remedy proves ineffectual. This CAP also includes a monitoring plan to be conducted as part of the Corrective Action Program. The selected remedy is believed to be protective of human health and the environment, capable of attaining the GPS for the solid waste constituents experiencing GPS exceedances, and compliant with standards for managing wastes.

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CORRECTIVE ACTION PLAN
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1.0 INTRODUCTION

On behalf of Granville County, Joyce Engineering (JOYCE) prepared this *Corrective Action Plan* (CAP) for the Butner Landfill (facility). This CAP has been prepared in accordance with 15A NCAC 13B.1636 of the North Carolina Solid Waste Management Rules (NCSWMR) and in response to the Groundwater Protection Standard (GPS) exceedances of benzene in groundwater monitoring well MW-2R at the facility.

1.1 Site Background

The Butner Landfill is a closed municipal solid waste (MSW) landfill, located off State Route 1004 near the town of Butner, in Granville County, North Carolina (Figure 1). The Butner facility started receiving waste prior to May 1973. Permit Number 39-02 was issued from the State of North Carolina on March 3, 1982. The facility stopped receiving waste in August 1998. A small recycling center and transfer station are operated by the County of Granville at the entrance of the closed landfill.

The facility's monitoring well network was upgraded in 1994 when the site's existing up-gradient and down-gradient wells were replaced and three more down-gradient wells were added. The current compliance network consists of the following six monitoring wells: MW-1R (facility background well), MW-2R, MW-3R, MW-4, MW-5, and MW-6. An additional well, NES-1, was installed as part of a Nature and Extent Study on November 14, 2007. Monitoring well construction details are summarized in Table 1, and the well locations are shown on Drawing 1.

In accordance with the NCSWMR, the Butner Landfill entered an Assessment Monitoring Program in December of 1997 as a result of detections of volatile organic compounds and pesticides above NC-2L Groundwater Standards. An ACM was initiated in 2003 and then suspended by North Carolina Department of Environment and Natural Resources (DENR) because there had been no more NC-2L exceedances. The Nature and Extent Study (NES) and ACM recommenced in 2007, when apparent volatile organic compound (VOC) exceedances of the NC-2L Standards began to appear; however, they were again suspended when it was determined that the apparent exceedances were not statistically significant increases (SSIs) above background.

Due to detections of benzene above its GPS during the December 2012 semiannual sampling event and subsequent verification sampling events, Granville County completed and submitted an ACM in May 2013. A public meeting to present the results of the ACM was conducted in Oxford, North Carolina on September 3rd, 2013, and the County selected MNA plus Phytoremediation as the groundwater remedy for the Butner Landfill. An application for a Corrective Action Permit Amendment was submitted to DENR, and the DENR approved the

amendment and the selected remedy in a letter dated October 30, 2013. An extension to the due date for this CAP to May 28, 2014 was approved by DENR by email on November 25, 2013.

1.2 Aquifer Characteristics

The water table under the area of investigation was encountered in the unconfined aquifer that is mostly in the transition zone that consists of saprolite and highly fractured bedrock. The saturated portion of the uppermost aquifer beneath the study area is vertically continuous to bedrock. Groundwater in the saprolite feeds the fractures in the bedrock and is discharged into creeks south of the landfill. Groundwater flow at deeper levels within the fractured bedrock is controlled by fracture orientation and connectivity. This unconfined aquifer is pervasive across the site and the water table generally mimics the surface topography.

Depth to groundwater is measured in all compliance monitoring wells at the site prior to each sampling event. Depth to water typically ranges from 2 to 3 feet below top of casing (ft-toc) in wells MW-2R and MW-3R; 8-14 ft-toc in MW-4, MW-5, and MW-6; and 42-48 ft-toc in MW-1R. Historical water level data are presented in Table 2. The groundwater potentiometric surface contours shown in Drawing 1 are based on data from the February 2014 sampling event. Groundwater flow beneath the facility is predominantly to the south and southeast.

1.2.1 Groundwater Flow

Aquifer hydraulic properties and groundwater flow velocity calculations are included in Table 3. Horizontal gradients for the flow paths shown on Drawing 1 ranged from 0.0496 to 0.0555 ft/ft, with an average of approximately 0.0526 ft/ft. This value is consistent with previous estimates.

Linear groundwater flow velocities were computed using the modified Darcy equation: $\boldsymbol{V = Ki/n_e}$, where **V** = average linear velocity (feet/day), $\boldsymbol{K}$ = hydraulic conductivity (feet/day), $\boldsymbol{i}$ = horizontal hydraulic gradient, and $\boldsymbol{n_e}$ = effective porosity. The average of hydraulic conductivities ($\boldsymbol{K}$ = 2.18×10^{-05} cm/sec = 6.18×10^{-02} feet/day) from slug-tests conducted in 1994 (GAI, 1994) was used in these calculations (Table 3). The average effective porosity ($\boldsymbol{n_e}$ = 18%) based on 90% of reported total porosity for soils (GAI, 1994) (Table 3). Although the regolith and bedrock are hydraulically connected, the effective porosity generally decreases with depth into the underlying fractured bedrock. The modified Darcy equation makes the simplifying assumption of a homogeneous and isotropic aquifer. The calculated linear groundwater velocities range from approximately 6.2 to 7.0 feet/year, and the average estimated linear groundwater flow velocity under the facility was calculated at approximately 6.6 feet/year.

Because of our conservative estimate of effective porosity, actual groundwater velocities may be significantly less than those calculated. Also, the linear velocity equation and resulting rates make the simplified assumptions of a homogeneous and isotropic aquifer. Actual velocities may vary significantly in the heterogeneous, anisotropic conditions believed to exist at this site.

1.2.2 Vertical Gradients

Monitoring wells MW-2R and MW-3R represent a nested pair of wells with different screened intervals. MW-2R is screened from 1.5-16.5 feet below ground surface (ft-bgs), and MW-3R is screened from 23.65-33.65 ft-bgs, giving a vertical distance between screen midpoints of 19.64 feet. The groundwater elevation is typically higher in MW-2R than in MW-3R, indicating a downward vertical hydraulic gradient. The February 24, 2014 water level measurements indicated a groundwater elevation of 329.68 feet above mean sea level (ft-amsl) in MW-2R, and 329.17 ft-amsl in MW-3R. This gives us a calculated downward gradient of 0.026 ft/ft between these two wells, indicating a weak downward component to groundwater flow.

1.3 Contaminant Distribution

Based on recent groundwater sampling at the facility, there appears to be one plume and associated area of concern (AOC) for the Butner Landfill. The AOC is located hydraulically downgradient of the waste disposal area in the vicinity of MW-2R. Drawing 2 presents an isoconcentration map for the benzene plume based on the February 2014 sample event data. The groundwater surface contours shown on Drawing 1 indicate that groundwater flow from this area is southward, toward drainage features located along the southern edge of the site. Surface water drainage from the site is predominately to an unnamed tributary of Picture Creek, which is also considered to be a groundwater discharge feature. Flow in the unnamed tributary along the southern edge of the site is to the west.

Table 4 presents a summary of NC Appendix I and II constituents which have been detected at quantifiable concentrations above North Carolina Solid Waste Section Limits (SWSL) in the groundwater at the facility. Only benzene in MW-2R is present at a concentrations greater than the regulatory GPS [1 microgram per liter (µg/L)] as defined in NCSWMR §.1634.g. A few other organic constituents have been historically detected in MW-2R, MW-3R, and MW-4; however, they have generally been detected at low concentrations below the SWSL and/or below the GPS. In the most recent (February 2014) data, only two other organic constituents were detected at concentrations above the SWSL: 1,4-dichlorobenzene in MW-2R and MW-3R, and chlorobenzene in MW-2R.

Chart 1 presents a plot of the benzene concentrations versus time in all monitoring wells where it has been detected (MW-2R, MW-3R, and MW-4). There were no benzene detections prior to December 2006, possibly due to a higher quantitation limit and the fact that estimated detections below the quantitation limit were not reported prior to December 2006. From December 2006 to present, benzene in MW-2R has fluctuated between 1µg/L and 2 µg/L with no clear trend. From December 2007 to present, benzene in MW-3R has fluctuated between 0.3 µg/L and 0.7 µg/L, and benzene in MW-4 has fluctuated between non-detect and 0.4 µg/L; however, no benzene was detected in either MW-3R or MW-4 during the February 2014 event.

An isoconcentration map for benzene based on data from the February 2014 sampling event is included as Drawing 2. The vertical extent of the plume is defined by well MW-3R, which is

located next to MW-2R, but with a deeper screened interval. MW-2R is screened from 1.5-16.5 feet below ground surface (ft-bgs), and MW-3R is screened from 23.7-33.7 ft-bgs. Benzene has not been detected above its NC 2L standard in MW-3R; therefore, the vertical extent of the exceedance is constrained to the zone above the screened interval of MW-3R; that is to say, to about 20 ft-bgs.

Table 5 presents historical surface water data. Surface water samples S-1 and S-2 have shown no detections of VOCs (except for some blank-qualified detections of acetone), including benzene, in the last three years of semiannual sampling, and there has never been an exceedance of NC 2B surface water standards. This adds further control for the downgradient extent of the plume. Furthermore, since the creek is considered a groundwater discharge feature, it is expected to act as a natural barrier to southward migration of the plume.

Based on the most recent data, only benzene in MW-2R is present at a concentration greater than its GPS of 1 µg/L. As shown on the benzene isoconcentration map (Drawing 2), the extent of the plume is limited and contained within the facility boundary. Chart 1 shows a trend chart for benzene concentrations vs. time in all wells where it has been detected. There is no discernable trend in the benzene concentrations in MW-2R, or the other wells. These data indicate that the geometric distribution of the plume and the concentrations in the plume are stable.

1.4 Site Conceptual Model

1.4.1 Site Geology

The Butner Landfill is located in the Carolina Slate Belt of the Piedmont Physiographic Province of North Carolina, near the northern edge of the Triassic Durham Basin. The Carolina Slate Belt geologic province is characterized by a rolling topography with a thick mantle of saprolite overlying Late Proterozoic and Paleozoic igneous and metamorphic bedrock. The Carolina Slate Belt is comprised of 550 to 650 million year old, metamorphosed sedimentary and volcanic rocks, intruded by granitic rocks. Granitic and felsic metavolcanic rocks have been observed in float and borings. Jurassic age diabase dikes have also been observed in the vicinity of the site and diabase outcrops in the creek along the southeastern portion of the site.

A geologic map of the area has been included as Figure 2 (Rhodes, et al, 2012). The geologic map indicates that the Butner Landfill is located in an area mapped as "Zfgms/Zgms – Granodiorite tonalite of the Stem and Moriah plutons," the description of which is given below:

> Zgms – Granodiorite tonalite of the Stem and Moriah plutons: Leucocratic (CI=5-15), light tan gray white, bluish-gray white, or pinkish-white, medium to coarse phaneritic, hypidiomorphic to xenomorphic granular granodiorite and tonalite. This unit combines the previously mapped Zstg unit in the Stem (Blake and others, 2009) and eastern Lake Michie Quadrangles and the Moriah pluton of McConnell (1974) in the western portion of the Lake Michie Quadrangle. Major minerals include plagioclase, alkali feldspar, and quartz with lesser amounts of biotite and amphibole, interpreted to be hornblende. Plagioclase is highly sericitized and in lesser amount saussuritized, especially in calcic-rich phenocryst cores. Alkali feldspar typically displays granophyric texture in thin section. If present, biotite is commonly recrystallized to chlorite while hornblende may be recrystallized to chlorite, epidote, and actinolite-opaque mineral.

> Metamorphosed trondhjemite and monzonite pods are present and may represent dikes or differentiated portions of the pluton. Locally becomes granitic in the western portion surrounding Lake Michie. Outcrops locally contain enclaves of microdiorite of the Zdim and Zdib units. Locally, mm- to cm-scale granite dikes crosscut granodiorite. Wortman et al. (2000) report a 613.4 +2.8/-2 Ma U-Pb zircon date from granite and a 613.9 +1.6/-1.5 Ma U-Pb zircon date from diorite sampled from the Moriah pluton in the western portion of the Lake Michie Quadrangle. Aggregates of white mica, quartz, plagioclase, and orthoclase highlight steeply dipping foliation and dip-parallel lineation domains inferred to be highly fractured and/or phyllonitic and protomylonitic high strain zones (Zfgms). This unit is correlative to the Zmpf unit of Bradley and others (2011) in the adjacent Rougemont 7.5-minute Quadrangle.

In addition, the geologic map (Rhodes, et al, 2012) indicates a diabase (Jd) intrusion under the southeastern corner of the facility, described as follows:

> Jd – Diabase: Black to greenish black, fine to medium phaneritic or aphanitic, dense, consists primarily of plagioclase, augite and may contain olivine. Occurs as dikes and sills and is typically seen as spheriodally weathered stream boulders and cobbles. Weathered surfaces are generally brownish to grayish in color. Red station location indicates outcrop or boulders of diabase.

1.4.2 Site Hydrogeology

The depth to groundwater in the Piedmont is highly variable depending on soil thickness and subsurface fractures. Groundwater can occur in substantial volumes where soils are very thick, but typically groundwater is found in minimal volumes in bedrock, primarily restricted to fractures. The water table under the area of investigation was encountered in the unconfined aquifer that is mostly in the transition zone that consists of saprolite and highly fractured bedrock. Groundwater in the saprolite feeds the fractures in the bedrock and is discharged into creeks south of the landfill. Although the regolith and bedrock are hydraulically connected, the effective porosity generally decreases with depth into the underlying fractured bedrock. Groundwater flow at deeper levels within the fractured bedrock is controlled by fracture orientation and connectivity. This unconfined aquifer is pervasive across the site and the water table generally mimics the surface topography.

Historical water level data are presented in Table 2, and aquifer hydraulic properties and groundwater flow velocity calculations are presented in Table 3. A groundwater potentiometric surface map is presented in Drawing 1. Depth to the groundwater table ranges from at or near the ground surface near MW-2R and MW-3R to greater than 40 feet near MW-1R. Groundwater flow beneath the facility is predominantly to the south and southeast. The average estimated linear groundwater flow velocity under the facility was calculated at approximately 6.6 feet/year based on a modified Darcy equation (see Section 1.2 for a more detailed discussion).

Based on the above-described geologic and hydrogeologic information, the groundwater flow regime on this site is well-constrained and predictable. Migration of groundwater contaminants are expected to follow the general groundwater flow paths shown on Drawing 1. The creek which crosses the southeastern corner of the facility property, downgradient of the plume, is a groundwater discharge feature and, therefore, a hydrologic divide that should prevent migration of the plume beyond it. Also, there is a diabase dike roughly coinciding with the creek which

could also act as a barrier to groundwater flow off of the property. There are no known preferred pathways that could significantly affect plume migration or the effectiveness of the groundwater monitoring network to monitoring plume migration.

1.5 Regulatory Status

In accordance with NCSWMR, the Butner Landfill entered an Assessment Monitoring Program in December of 1997 as a result of detections of volatile organic compounds and pesticides above NC-2L Groundwater Standards. An ACM was initiated in 2003, and then suspended by North Carolina Department of Environment and Natural Resources (DENR) because there had been no more NC-2L exceedances. The Nature and Extent Study (NES) and ACM recommenced in 2007, when apparent volatile organic compound (VOC) exceedances of the NC-2L Standards began to appear; however, they were again suspended when it was determined that the apparent exceedances were not statistically significant increases (SSIs) above background.

In accordance with 15A NCAC 13B.1635, Granville County submitted an *Assessment of Corrective Measures* (ACM) for the Butner Landfill in May 2013. Possible remedial alternatives were evaluated by first identifying those remedial alternatives applicable to the constituents-of-concern (i.e., benzene) and the impacted media (groundwater) at the landfill, and then screening applicable alternatives based on a rapid assessment screening matrix designed to identify those remedial alternatives most applicable based on available site information. Based on the evaluation and criteria presented in the NCSWMR, Granville County selected the following remedial alternatives to be evaluated in more detail:

- Monitored Natural Attenuation;
- Phytoremediation;
- Constructed Wetlands;
- Air Sparging;
- Permeable Reactive Barrier;
- Enhanced Bioremediation;
- Landfill Gas Control; and
- Pump and Treat.

In accordance with 15A NCAC 13B.1635(4)(d), Granville County held a public meeting on September 3, 2013, to discuss the results of the ACM. The public meeting was advertised in a local newspaper on August 1, 2013, and public notices were sent to other local media. The public comment period began on August 1, 2013, and ended on September 4, 2013. The County did not receive any comments during the required public meeting and public comment period.

Table 6 shows the Corrective Action Screening Matrix from the ACM. Further evaluation of the above potential remedial strategies suggested that Monitored Natural Attenuation (MNA) plus phytoremediation would be the most cost-effective remedy and will meet the requirements set forth in 15A NCAC 13B.1636. The County selected MNA plus Phytoremediation as the groundwater remedy for the Butner Landfill. An application for a Corrective Action Permit

Amendment was submitted to DENR, and the DENR approved the amendment and the selected remedy in a letter dated October 30, 2013.

2.0 CONTAMINANT CHARACTERIZATION

2.1 Contaminants of Concern

Currently, the only contaminant of concern (COC) is benzene, which has been detected in exceedance of its GPS in MW-2R. Benzene is a colorless liquid or gas with a sweet-smelling odor. The vapor pressure of benzene is characteristic of the rapid evaporation of aromatic hydrocarbons into air. Benzene is highly flammable. The origin of benzene can be from both natural and human processes and activities. Benzene naturally occurs in crude oil and is found in refined petroleum products such as gasoline. Benzene can be released in volcanic activity, forest fires, or even cigarette smoke. Benzene is used to make other chemicals, which are in turn used in the production of some plastics, resins, nylon and other synthetic fibers, some types of rubber, lubricants, dyes, detergent, solvents, drugs, and pesticides. Benzene is slightly soluble in water.

The primary human exposure pathway for benzene is via inhalation. Dermal absorption is poor. Reactive metabolites such as benzene oxide have been implicated in the mechanisms of benzene toxicity. Health effects and symptoms of acute exposure to benzene include drowsiness, dizziness, delirium, loss of consciousness, respiratory arrest, and/or death. Health effects of chronic exposure include anemia and leukemia. Benzene is a known human carcinogen and clastogen, but is not considered to be a reproductive toxicant.

2.2 Contaminant Source Confirmation

There are two possible sources of the above-listed contaminant of concern. The first is leaching of constituents from waste in the closed, unlined MSW landfill into the groundwater as a result of percolation of rainwater through the waste. The second is partitioning of VOC's in landfill gas into the groundwater, either within a well, or in the capillary fringe where vapors in the vadose zone come into contact with groundwater near a well. Impact from leachate is expected to only impact groundwater down-gradient of the landfill. Impacts detected upgradient or side-gradient from the landfill are most-likely indicative of gas impacts; however, gas can also affect down-gradient wells. There are no other known on-site or off-site sources.

2.3 Source Control Measures

The unlined MSW Butner landfill ceased accepting waste in August of 1998 and began Closure and Post Closure Requirements as outlined in NCSWMR §.1627(c)(1) regarding the installation of a cap system over the waste. According to the Rule, existing MSW landfills are required to install a low permeability cap system that is designed to minimize infiltration and erosion. The cap system was constructed with earthen material and was completed in 1998. Following the installation of the cap system, passive landfill gas vents were installed. No additional source control measures are planned at this time.

2.4 Groundwater End Use

The facility does not have any direct use of the groundwater or surface water at the site. According to the Granville County's GIS records, all of the land surrounding the Butner Landfill, with the exception of a small sewer pump station, is state owned, undeveloped, protected wildlife land. The only onsite supply well was abandoned in May 2007. The closest downgradient private property is approximately ½ mile away. Currently, a municipal water supply serves the landfill and surrounding area.

Neither the aquifer nor surface water in the vicinity of the facility is considered to be a primary source of potable drinking water. There are no known potable water supply wells or potable surface water intakes within at least ½ mile of the Butner landfill. Lake Butner, a water supply lake, is located approximately 3000 feet northwest of the facility (Figure 1); however, there is a hydraulic divide between the site and the lake, and groundwater flow from the site is toward the south, away from the lake.

2.5 Sensitive Receptor Pathways

Numerous surface water features, including intermittent, ephemeral, and perennial drainages, man-made drainage ditches, and three man-made sediment basins, are located at or near the Butner County Landfill. The landfill is bound to the south by an unnamed tributary of the Picture Creek. The landfill is bound to the west by a man-made drainage ditch that runs along the side of Butner Road. All of the drainages on the site eventually flow into the unnamed tributary of the Picture Creek.

Historically, two surface water points [SW-1 (upgradient) and SW-2 (downgradient)] have been sampled semiannually in conjunction with the groundwater sampling at the Butner Landfill. Historical surface water sampling data (Table 5) indicate that groundwater discharge into the creek has not significantly impacted the surface water; therefore, the surface water does not constitute a sensitive receptor pathway risk. Even if the plume migrated to impact the surface water, dilution would quickly reduce the concentrations to below detectable levels.

As a part of every semiannual monitoring event, JOYCE has instituted a visual inspection program in order to detect potential releases. This inspection program involves field personnel making the following observations:

- Observation of stressed biological community (e.g., dead or dying vegetation);
- Indications of leachate impact (e.g., seeps, impacted surface water);
- Observations of erosion; and
- Negative changes around the waste facility.

Flora and fauna on or above the ground surface are at minimal risk, because there have been no confirmed detections of the COC in the downstream surface water samples. Organisms suspected to be living in the subsurface at the site are at potential risk; however, soil

microorganisms are known to use the organic acids and by-products of the degradation process of the groundwater plumes as a food source; therefore, the potential risk to the environment from the impacted groundwater is considered to be low. There is no evidence of distressed vegetation or obvious impacts to wildlife as a result of exposure to the contaminant plume associated with the AOC.

The on-site receptor pathways will be through direct contact with contaminated groundwater by personnel involved in sampling monitoring wells on the site. Personnel engaged in these activities are well-trained in sampling techniques, personal protective equipment, and incident response so as to minimize the potential for unsafe exposure.

2.6 Background Concentrations

Statistical comparisons of baseline monitoring data to compliance data are part of the required compliance demonstration (Rule .1632(g), (h), and (i)). Monitoring well MW-1R is designated as the background well for the facility. This well replaced the previous background well (MW-1) beginning with the April 1994 sampling event. It is located approximately 450 feet north of the limits of waste. Facility background data used to evaluate the groundwater monitoring data include all data collected for wells MW-1R from April 1994 to present. Results from historical sampling events indicate only the presence of naturally occurring metals in MW-1R; no benzene has been detected in MW-1R. The historical concentrations of constituents in the background wells are included in Table 4.

2.7 Groundwater Protection Standards (GPS)

In accordance with the NCSWMR §.1634.g, the regulatory GPS for constituents detected in the groundwater for this site are equal to the 15-NCAC-2L.0202 (NC 2L) Groundwater Standards for each constituent, with the following three exceptions: 1) for constituents which have no official NC 2L standard, the DENR-SWS has established GWPS values; 2) for constituents with NC 2L standards below the Solid Waste Section Limits (SWSL), the GPS is the SWSL; and 3) if the statistical background value for a constituent is greater that the NC 2L, GWPS, or SWSL, the background value can be considered the GPS, with DENR approval. A list of all NC Appendix I and II constituents and their respective NC 2L Standards and/or GWPS values is included in Appendix A of this report.

Constituents with historical NC 2L exceedances in compliance wells since the current monitoring network was implemented in 1999 include benzene and 1,4-dichlorobenzene. 1,4-Dichlorobenzene has been detected consistently in MW-2R, but has not been detected above its NC 2L since December 2009. Benzene has been consistently detected above its GPS in MW-2R since December 2006. Prior to the April 2011 revision of the NCSWMR, a constituent detection had to represent a statistically significant exceedance of the NC 2L Standard in order to trigger corrective action. After the April 2011 revision, any exceedance of a GPS triggers corrective action.

2.8 Surface Water Quality Standards (SWQS)

The surface water quality standards (SWQS) for constituents detected in the groundwater for this site are equal to the 15-NCAC-2B (NC-2B) Surface Water Standards for Water Supply-classified surface waters. For any detected constituent without a listed NC-2B standard, the SWQS will be considered equal to the SWSL. A list of all NC-2B Surface Water Standards is included in Appendix B of this report. The landfill is bordered to the east and southeast by an unnamed tributary to the Picture Creek, which is classified "C", for waters protected for secondary recreation, aquatic life, and wildlife. To date, there have been no SWQS exceedances for this site.

2.9 Media of Concern

Benzene has been detected in one exposure medium at the landfill: groundwater. Groundwater beneath the landfill property appears to have been impacted by leachate that originates from the unlined landfill and/or by the migration of landfill gas.

Soil is not considered to be an exposure medium, since the constituent-of-concern concentrations in the soil are expected to be very low outside of the landfill waste footprint, where impacts from leachate may be occurring. Outside of the waste footprint, impacts to soil are expected only from landfill gas and volatile emissions from groundwater. Since the potential risk associated with vadose zone emissions of soil gas should be less than the risk associated with dermal contact and ingestion of impacted soils, soil is not considered as an exposure medium. Similarly, landfill gas is not considered to be an exposure medium, since quarterly compliance monitoring results indicate that methane concentrations in soil are generally below the regulatory limit of 5% methane by volume.

Surface water is not considered to be an exposure medium. Surface water samples that are collected semiannually, downgradient from the waste cell, from an unnamed tributary of the Picture Creek to the southeast and southwest of the disposal area have not contained concentrations of benzene above laboratory detection limits.

3.0 SELECTED AND APPROVED REMEDY / TECHNICAL APPROACH

3.1 Assessment of Corrective Measures and Selection of Remedy

The purpose of the ACM (JOYCE, 2013) was to identify technologies that are realistic, potential remedies for the reported release at the landfill. Selection of realistic remedies was driven by site conditions and characteristics of the COCs reported at the facility. The ACM identified only one COC, benzene, which is in exceedance of its GPS in only one well, MW-2R. The extent of the plume is well constrained, both horizontally and vertically, and does not extend off of the facility property, nor is it considered likely to do so in the foreseeable future. The adjacent property downgradient of the plume is owned by the State of North Carolina. There are no known water supply wells, surface water intakes, or other potentially sensitive receptors threatened by the plume.

There are numerous technologies available that can remediate groundwater contaminated with dissolved-phase VOCs; however, the selection of a successful remedy is based on the geologic and hydrogeologic conditions underlying the facility, and the potential risks associated with the release. Additionally, the type and size of the source (one that can be removed versus one that cannot be removed) and the urgency of the remedial effort, or aggressiveness, are considered when selecting a remedy. The need for an aggressive or non-aggressive remedy is usually controlled by the risk(s) associated with the release (i.e., a high risk may dictate an aggressive remedy while a low risk may dictate a less aggressive, more cost effective remedy). Additionally, the use of more than one remedy may be required to meet regulatory standards.

Due to the above considerations, as well as the remedy selection criteria set forth in NCSWMR § .1636.b, and the remedy implementation criteria presented in § .1637.d, a screening matrix (Table 6) was used to objectively rate available and proven remedial technologies capable of attaining approved groundwater protection standards. Upon reviewing the screening results, the remedial options that scored 35 or higher were retained for further consideration. The following eight remedial technologies are considered to be the most applicable and/or appropriate for this facility based on the screening results.

- Monitored Natural Attenuation (MNA);
- Phytoremediation;
- Constructed Wetlands;
- Air Sparging (AS);
- Permeable Reactive Barrier (PRB);
- Control of Landfill Gas (LFG);
- Enhanced Bioremediation (EB); and
- Pump-and-Treat (P&T).

The two highest-scoring remedial technologies were MNA and phytoremediation. MNA and phytoremediation meet the requirements set forth in 15A NCAC 13B.1636(b). Based on the results of the ACM, Granville County selected MNA plus phytoremediation as the most appropriate and cost-effective remedy for the site. This remedy was approved by the DENR in a letter dated October 30, 2013.

3.2 MNA Evaluation

MNA consists of monitoring natural attenuation processes (both biological and physical), and is a proven remedial alternative for sites where biological processes are documented and a more aggressive remedy is not required (i.e., the plume does not pose an immediate or substantial risk and it has not migrated off-site). The physical attenuation processes (dispersion, dilution, adsorption, vaporization, abiotic degradation, precipitation, etc.) are important parts of MNA; however, with long-term sources, it is primarily the biological processes (biodegradation by

naturally occurring bacteria) that result in the transformation and/or destruction of organic contaminants in the soil, surface water, and groundwater.

Natural attenuation processes occur nearly everywhere, but to varying degrees of effectiveness depending on the types and concentrations of contaminants present and the physical, chemical, and biological characteristics of the soil and groundwater. According the US-EPA OSWER Directive 9200.4-17P (EPA, 1999), natural attenuation processes may reduce the potential risk posed by site contaminants in three ways:

1. Transformation of contaminant(s) to a less toxic form through destructive processes such as biodegradation or abiotic transformations;
2. Reduction of contaminant concentrations whereby potential exposure levels may be reduced; and
3. Reduction of contaminant mobility and bioavailability through sorption onto the soil or rock matrix.

Under an MNA remedial alternative, a site is monitored at regular intervals to demonstrate that biodegradation and demobilization processes (or indicators thereof) are occurring at a rate sufficient to prevent potential exposures, and that the dissolved-phase contaminants are not migrating to a receptor. It may also include measurements of contaminant concentrations in soil, groundwater, or soil gas; measurements of bioactivity indicators such as carbon dioxide production or oxygen consumption; and measurements of inorganic MNA indicators such as pH, redox potential, sulfide, and organic carbon content.

MNA is most widely used for sites with aromatic and chlorinated organic compounds. For aromatic hydrocarbons like benzene, the primary and most efficient mode of biodegradation is aerobic; although aromatic hydrocarbons can also degrade anaerobically (Aburto, 2009; Musat, 2008; Jindrová,et al, 2002). Many microorganisms, including bacteria and fungi, are capable of degrading organic pollutants like benzene. Biodegradation is based on two processes: growth and cometabolism. In a growth process, organic pollutants are used as the sole source of carbon and energy by the microorganisms, and the process results in complete degradation of organic pollutants. Cometabolism refers to processes whereby an organic compound is metabolized in the presence of a growth substrate which is the primary carbon and energy source (Fritsche and Hofrichter, 2008).

During the May 2013 semiannual sampling event, natural attenuation indicator parameters were measured in selected wells, including MW-1R, MW-2R, MW-3R, MW-4, and NES-1. MW-1R is the facility's upgradient background well, MW-2R, MW-3R, and MW-4 are located within the contaminant plume, and NES-1 is located beyond and downgradient of the plume. Table 7 summarizes the natural attenuation indicator parameter data obtained for this event, as well as historical indicator parameter data from the site. The laboratory report, chain-of-custody, and field data forms for the May 2013 natural attenuation indicator parameter data are included in Appendix C of this report.

Evaluation of the indicator parameters indicates some significant differences in the groundwater chemistry within the plume and outside of the plume. Conductivity is higher and ORP is lower in the center of the plume (MW-2R) than in the background well (MW-1R) or the down-gradient well (NES-1). Similarly, dissolved oxygen is lower and dissolved CO_2 is higher in MW-2R than in MW-1R or NES-1. Ferrous iron, alkalinity, and chloride are also higher in MW-2R than in MW-1R or NES-1. All of these differences can be attributed to heightened biological activity inside the plume than outside of it, which is indicative that natural attenuation is occurring. In general, the data indicate conditions conducive to anaerobic degradation of benzene and other VOCs.

Typically, indicator parameter data for contaminant plumes containing chlorinated hydrocarbons are evaluated in accordance with the United States Environmental Protection Agency's (EPA's) *Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Groundwater* (US-EPA, 1998). Since there are no chlorinated hydrocarbons with GPS exceedances at this facility, this evaluation does not apply, and so was not performed.

The evaluation of indicator parameter data and historical observations of the plume indicate that biodegradation is occurring beneath the facility at a rate that will prevent additional migration of contaminants beyond the property line and will reduce concentrations of constituents-of-concern to concentrations below GPS within the delineated plume with time. An evaluation of the risks posed to human health and the environment suggests that there is low risk due to the fact that groundwater contamination is contained within the facility property boundary, the adjoining property downgradient of the plume is all state-owned undeveloped land, and there are no known receptors. We conclude that MNA is an appropriate remedial measure for the Butner Landfill facility. A *Water Quality Monitoring Plan*, including MNA monitoring, is presented in Section 4.0 of this report.

The EPA's BIOSCREEN Natural Attenuation Decision Support System (Newell, et al, 1996, 1997) will be used as a screening model to evaluate MNA at the Butner Landfill facility. BIOSCREEN is an easy-to-use screening model which simulates remediation through natural attenuation (RNA) of dissolved hydrocarbons at petroleum fuel release sites. The model is designed to simulate biodegradation by both aerobic and anaerobic reactions. It was developed for the Air Force Center for Environmental Excellence (AFCEE) Technology Transfer Division at Brooks Air Force Base by Groundwater Services, Inc., Houston, Texas. The software, programmed in the Microsoft Excel spreadsheet environment and based on the Domenico analytical solute transport model, has the ability to simulate advection, dispersion, adsorption, and aerobic decay as well as anaerobic reactions, which have been shown to be the dominant biodegradation processes at many petroleum release sites. BIOSCREEN includes three different model types:

1) Solute transport without decay,
2) Solute transport with biodegradation modeled as a first-order decay process (simple, lumped-parameter approach),

3) Solute transport with biodegradation modeled as an "instantaneous" biodegradation reaction.

BIOSCREEN modeling was run for the Butner Landfill using both the “no decay” and the “first order decay” options using known site parameters and the results from the February 2014 sampling event as input. The results of the BIOSCREEN modeling, including both input and output, are presented in Appendix D.

3.3 Phytoremediation Evaluation

Phytoremediation is the use of plants to remove, transfer or stabilize contaminants in soil or groundwater. Plants may remove contaminants from groundwater from either direct plant uptake and metabolization or by microbial degradation in the root zone. Contaminants in groundwater can be removed when plant-produced enzymes break down contaminants that enter the plant during transpiration (phytodegredation). Another method by which plants can enhance groundwater quality is by phytoaccumulation, which is the process of uptake and storage of contaminants in the root systems. Plants may also uptake contaminants and transpire them through the leaves (phytovolatization). Finally, plants can provide secretions that enhance microbial activity in the root zone that aid in the breakdown of contaminants (ITRC, 1999). Phytoremediation via direct uptake of groundwater contaminants has been demonstrated to be a very efficient removal mechanism for aromatic hydrocarbons, such as those observed at the site.

Generally the octanol-water partition coefficient (log K_{ow}) of organic contaminants must be between 1.0 and 3.5 (moderately hydrophobic organic chemicals) to be susceptible to uptake by plants. Hydrophobic chemicals (log K_{ow}>3.5) are bound too strongly to roots and soil to be translocated within the plants. Water-soluble chemicals (log K_{ow}<1.0) are neither sufficiently sorbed to roots nor actively transported through plant membranes (Briggs, et. al., 1982). The log K_{ow} of benzene is 2.13, within the range to be susceptible to phytoremediation.

Root contact is a primary limitation on phytoremediation applicability. Remediation via plants requires that the contaminants be in contact with the root zone of the plants. Either the plants must be able to extend roots to the contaminants, or the contaminated media must be moved to within range of the plants. Rhizodegradation, which is the breakdown of an organic contaminant in soil through microbial activity that is enhanced by the presence of the root zone, is the most effective mode of phytoremediation for petroleum hydrocarbons (US-EPA, 2000).

The groundwater is extremely shallow (1-3 feet, or less) in the vicinity of MW-2R and in most of the area of the plume, and GPS exceedances of benzene are constrained to approximately the upper 20 feet of the aquifer. This puts most if not all of the plume within reach of the root systems of large trees, like poplars and sweet gums, and the shallower parts of the plume will be within reach of even the shallower root systems of grasses and shrubs. Typically, phytoremediation as a remedial technology includes selection of a plant species, planting the selected species, and possibly harvesting the plants at some time in the future; however, at this

site, we believe that phytoremediation is already taking place with existing flora and site conditions.

A survey of tree species, health, and maturity already present within the plume area was conducted on April 22, 2014. The tree survey covered the south side of the landfill between the edge of waste and the creek. Drawing 3 shows the results of the tree survey. Some of the areas downgradient of the landfill were logged in 2010, and these areas are collectively labeled "Area 1" on Drawing 3. The logged areas had reportedly been replanted with pines after logging. At the time of the tree survey, the logged areas had no mature trees and the impact of logging was still clearly evident; however, new growth had begun and there were numerous sweet gum saplings (3-6 feet tall) observed, as well as some pine saplings which could have been from the reported re-planting.

There are still areas of mature trees downgradient of the landfill. Most importantly, the main area of the plume between MW-2R and the creek was not logged in 2010 and is still well-wooded with many mature trees. This area is labeled "Area 2" on Drawing 3. The tree survey found that approximately 70% of the mature trees in Area 2 were American sweet gums (Liquidambar styraciflua), with about 10% tulip poplars (Liriodendron tulipifera) and 10% blue beech (Carpinus caroliniana). The remaining 10% included black maple, white cedar, and loblolly pine. Area 3 on Drawing 3 is another area that was not logged and which contains mature trees. Area 3 contains approximately 50% tulip poplars, 20% American sweet gum, and 15% each of black maple and loblolly pine. There were also abundant herbaceous plants observed in Areas 2 and 3.

There were several areas of apparent wetlands observed in the area between the landfill and the creek at the time of the tree survey. Some apparent wetlands in the logged areas (Area 1) appeared to be recently developed as a result of water accumulating in ruts and low areas left after the logging; however, there were also apparent wetland areas observed in Area 2 between MW-2R and the creek. The apparent wetlands in Area 2 appear to be natural and more mature than those in Area 1.

The trees and other plants present on site are expected to effectively metabolize and/or transpire observed groundwater contamination, and rhizodegradation in the root zone is expected to further remediate the groundwater. Poplars have been well-studied in phytoremediation applications (Gordon, et al, 1997; Ferro, et al, 1999), and are one of the most commonly recommended trees for phytoremediation of VOCs, metals, and radionuclides. Sweet gum trees have less documentation; however, they have also been used successfully in similar phytoremediation applications (Negri and Hinchman, 2000). Other trees and herbaceous plants in and downgradient of the plume are also likely to contribute to phytoremediation. Furthermore, wetlands are among the most biologically active ecosystems, and are considered to have high potential for phytoremediation of VOCs and other contaminants (Williams, 2002). The presence of wetlands downgradient of the plume is expected to enhance phytoremediation at this site.

The fact that the COC for this site, benzene, is highly susceptible to phytoremediation, coupled with the fact that there are adequate trees and other plants as well as wetlands in the vicinity of and downgradient of the plume, make phytoremediation a viable remedial technology for this facility. Since adequate florae are already present, phytoremediation will require little or no capital expenditure or significant ongoing maintenance.

3.4 Remedy Evaluation Factors

According to 15A NCAC 13B.1636, the owner/operator is required to consider the following remedy evaluation factors when preparing the CAP.

3.4.1 Long-Term and Short-Term Effectiveness [15A NCAC 13B.1636(c)(1)]

According to 15A NCAC 13B.1636(c)(1), the County is required to evaluate the long-term and short-term effectiveness and protectiveness of the potential remedy, along with the degree of certainty that the remedy will prove successful based on consideration of several factors. The required evaluation factor is presented in *italics* followed by our response.

1. *Magnitude of reduction of existing risks.*

   Existing risk at the facility is limited to environmental professionals and/or County employees participating in compliance groundwater monitoring activities. Specifically, the sampling and handling of contaminated groundwater from within groundwater contamination plumes beneath the facility create risk. Natural attenuation lowers this risk by reducing concentrations of COCs within the contaminant plume over time.

2. *Magnitude of residual risks in terms of likelihood of further releases due to wastes remaining following implementation of a remedy;*

   Natural attenuation and phytoremediation will not prevent further releases of COCs from the waste unit; however, natural attenuation appears to be occurring beneath the facility at a rate that will prevent migration of the COCs beyond the property boundary at concentrations exceeding their respective GPS. Wastes anticipated to be produced by this remedy will be limited to purge water associated with performing groundwater monitoring events at the facility. The purge water will be discharged to the ground surface and allowed to naturally infiltrate to the water table. It is anticipated that the process of purging and temporarily containerizing the purge water will cause the COCs to volatilize; therefore, the infiltrating purge water is expected to contain lower concentrations of VOCs than currently in the groundwater.

3. *The type and degree of long-term management required, including monitoring, operation, and maintenance;*

   MNA and phytoremediation will not require long-term operation and maintenance activities, except for increased groundwater monitoring for MNA and periodic evaluations of the trees in the area of concern for phytoremediation. Long-term monitoring of facility compliance wells and performance/sentinel wells will be required. The monitoring plan for the facility is provided in Section 4.0. The monitoring plan will be implemented upon approval of this CAP, and will be completed when no NCSWMR Appendix II constituents have been detected in groundwater above GPS for three consecutive years, or upon determining that natural attenuation is not providing appropriate remediation for the facility. If the latter is determined, the contingency measures discussed in Section 6.0 may be implemented.

4. *Short-term risks that might be posed to the community, workers, or the environment during implementation of such a remedy, including potential threats to human health and the environment associated with excavation, transportation, and redisposal or containment;*

   Short-term risk associated with MNA is limited to environmental professionals and/or County employees participating in MNA groundwater monitoring activities. Specifically, the sampling and handling of contaminated groundwater from monitoring wells constructed within groundwater contamination plumes create risk; however, the potential for human exposure to landfill contaminants by environmental personnel and/or County employees will be low as long as standard health and safety procedures are followed during sampling activities.

5. *Time until full protection is achieved;*

   A schedule for achievement of the final remedial objective (COC levels below the GPS at all points within the plume beyond the point of compliance) is dependent upon the rate and duration of continued leaching of contaminants from the landfill. Any prediction of a timeframe for achievement of concentration levels below the GPS at this time would be an estimate based on available data and professional judgment. Natural attenuation and phytoremediation will be monitored in accordance with the monitoring plan (Section 4.0), will be implemented upon approval of this CAP, and will be completed when no NCSWMR Appendix II constituents have been detected in groundwater above GPS for three consecutive years, or upon determining that natural attenuation is not providing appropriate remediation for the facility.

6. *Potential for exposure of humans and environmental receptors to remaining wastes, considering the potential threat to human health and the environment associated with excavation, transportation, redisposal, or containment;*

MNA activities will be performed by environmental personnel trained to minimize their exposure to COCs by using appropriate personal protective equipment and by avoiding contact with contaminated groundwater and vapors.

Facility workers do not come in contact with groundwater from the plumes of contamination during day-to-day landfill operations. The general public is not expected to come in contact with contaminated media since access to the contaminated media is restricted.

7. *Long-term reliability of the engineering and institutional controls; and*

   Natural attenuation and phytoremediation are proven remedies for facilities similar to the Butner Landfill (i.e., a facility with low contaminant concentrations and low risk associated with the delineated contamination). In addition, historical data suggest that natural attenuation is occurring at a rate that will prevent off site migration of the delineated contaminant plume. As leaching of VOCs from the landfill decreases over time, natural attenuation plus phytoremediation is expected to reduce concentrations of COCs, eventually to below their respective GPS. MNA plus phytoremediation is considered a reliable remedy to meet clean-up goals at the facility.

8. *Potential need for replacement of the remedy.*

   Replacement of MNA plus phytoremediation as the facility remedy may be performed upon determining that the remedy is not preventing migration of constituents-of-concern beyond the property boundaries into the adjacent property. This will be determined by monitoring groundwater sampling locations (NES-1) downgradient of the impacted monitoring wells in accordance with the methods described in Section 4.0. In the event that future monitoring indicates that natural attenuation plus phytoremediation is inadequate for controlling the plume, the contingency remedies discussed in Section 6.0 may be implemented.

3.4.2 Controlling the Source [15A NCAC 13B.1636(c)(2)]

According to 15A NCAC 13B.1636(c)(2), the County is required to evaluate the effectiveness of the remedy in controlling the source to reduce further releases based on consideration of the following factors. The required evaluation factor is presented in *italics* followed by our response.

1. *The extent to which containment practices will reduce further releases; and*

   MNA plus phytoremediation will not reduce further releases; however, natural attenuation plus phytoremediation is expected to prevent releases from migrating beyond the facility property boundary into the adjacent property.

2. *The extent to which treatment technologies may be used.*

   MNA plus phytoremediation use natural processes to treat releases of solid waste constituents. The historical data indicate that natural attenuation is occurring beneath the facility at a rate that will likely prevent migration of solid waste constituents beyond the facility property boundary at concentrations exceeding GPS and will eventually reduce concentrations of COCs to levels below their respective GPS.

3.4.3 Remedy Implementation [15A NCAC 13B.1636(c)(3)]

According to 15A NCAC 13B.1636(c)(3), the County is required to evaluate the ease or difficulty of implementing a potential remedy based on consideration of the following types of factors. The required evaluation factor is presented in *italics* followed by our response.

1. *Degree of difficulty associated with constructing the technology;*

   Natural attenuation and phytoremediation are already occurring beneath the facility; therefore, MNA and phytoremediation will be easily implemented upon amending the facility permit to include this CAP.

2. *Expected operational reliability of the technologies;*

   Natural attenuation is considered a reliable remedy for facilities that are experiencing contaminant plumes with low level concentrations of solid waste constituents, contaminant plumes contained within the facility boundary and/or demonstrated to be stable or shrinking in size), and/or low levels of risk associated with the delineated groundwater contaminant plumes. Phytoremediation adds additional operational reliability and requires little additional operational expense. MNA and phytoremediation are reliable remedies for reported contamination at the landfill. A monitoring plan is included in Section 4.0 of this report as part of this remedy. The monitoring plan provides factors to determine whether natural attenuation and phytoremediation continue to be successful remedies.

3. *Need to coordinate with and obtain necessary approvals and permits from other agencies;*

   None of the proposed remediation activities will require approvals or permits from other agencies.

4. *Availability of necessary equipment and specialists; and*

   Natural attenuation and phytoremediation processes are monitored by readily available laboratory and field procedures.

5. *Available capacity and location of needed treatment, storage, and disposal services.*

   No treatment, storage, or disposal services are required to implement MNA and phytoremediation at the Butner Landfill.

3.4.4 Owner/Operator Capability [15A NCAC 13B.1636(c)(4)]

According to 15A NCAC 13B.1636(c)(2), the County is required to evaluate the practicable capability of the owner or operator, including a consideration of the technical and economic capability of the owner/operator, to construct and/or maintain the proposed remedy.

MNA is the monitoring of the natural processes already occurring beneath the facility and requires only ongoing groundwater monitoring. Similarly, phytoremediation is a naturally occurring process and requires only periodic monitoring of the health of the flora in the area of concern. The County will likely retain a qualified environmental consulting firm to perform all groundwater monitoring and reporting activities associated with the landfill. The County anticipates continuing its use of environmental consulting firms to perform activities associated with this remedy. In addition, the County has budgeted for additional monitoring requirements associated with this remedy. Therefore, the County is capable of performing MNA and phytoremediation.

3.4.5 Community Concerns [15A NCAC 13B.1636(c)(5)]

According to 15A NCAC 13B.1636(c)(5), the County is required to evaluate the degree to which community concerns are addressed by the potential remedy.

In accordance with 15A NCAC 13B.1635(d), Granville County held a public meeting on September 3, 2013, to discuss the results of the ACM. The public meeting was advertised in a local newspaper on August 1, 2013, and public notices were sent to other local media. The public comment period began on August 1, 2013, and ended on September 4, 2013. The County did not receive any comments during the required public meeting and public comment period.

4.0 WATER QUALITY MONITORING PLAN

The following *Water Quality Monitoring Plan* (WQMP) will replace the existing monitoring plan for the facility. This WQMP was prepared in accordance with the North Carolina Solid Waste Management Regulations (NCSWMR). It will serve as the guidance document for collecting and analyzing semiannual groundwater samples for the Assessment Monitoring Program in accordance with 15A NCAC 13B.1634, and to evaluate the effectiveness of corrective measures implemented at the facility during the course of the Corrective Action Program in accordance with 15A NCAC 13B.1637(a)(1).

The corrective action monitoring portion of this WQMP will be implemented during the Corrective Action Program, until constituents detected in groundwater are below the GPS within the plume for three consecutive years. If the facility's post-closure care period is still in effect at the time this WQMP is terminated, the facility will be monitored in accordance with the requirements of the NCSWMR (i.e., under the Detection Monitoring Program and/or Assessment Monitoring Program, as appropriate) until the end of the post-closure care period. Alternatively, if the post-closure care period ends before the WQMP is suspended; the post-closure care period will be extended until such time as GPS are not exceeded for three consecutive years.

4.1 Groundwater Monitoring History & Status

4.1.1 Groundwater Monitoring History

- **April 1994** – Current Monitoring Well Network installed.
- **Dec. 1997 -** The facility entered Assessment Monitoring.
- **June 2003** – NC-2L exceedances for heptachlor in MW-2R and MW-3R initiated an ACM.
- **Dec. 2004 & June 2005** – There were no NC-2L exceedances, so DENR agreed to put the ACM on hold pending future monitoring results. At first, DENR said the facility needed deed restrictions on adjoining property owned by the County, but this was apparently based on false information (the County did not own the property) so the requirement for deed restrictions was dropped.
- **Dec. 2006** – Benzene in MW-2R and 1,4-dichlorobenzene in MW-2R and MW-3R detected above NC-2L standards.
- **June 14, 2007 -** Granville County and JOYCE met with DENR to discuss a strategy for performing a Nature and Extent Study (NES) and an ACM.
- **Nov. 2007** – Nature & Extent well NES-1 was installed downgradient of MW-2R & MW-3R.
- **Dec. 2007** – NES & MNA sampling event on selected wells.
- **Dec. 2008** – Organic results above the NC-2L standards were determined to not represent statistically significant exceedances, so corrective action and ACM were suspended with the concurrence of the DENR and in accordance with the NCSWMR.
- **Dec**. **2012 –** Benzene detections above the NC-2L in MW-2R initiated the ACM.
- **May 17, 2013** – ACM addressing the benzene detections above the NC 2L in MW-2R submitted to DENR.
- **June 27, 2013** – ACM approved by NC DENR.
- **September 3, 2013** – Public meeting and selection of remedy.
- **October 30, 2013** – DENR approval of remedy.
- **November 25, 2013** – DENR granted an extension of the deadline for submittal of the CAP to May 28, 2014.

4.1.2 Regulatory Status

The site is currently in an Assessment Monitoring Program and groundwater and surface water monitoring at the Butner Landfill is completed semiannually in accordance with NCSWMR §.1634. The first semiannual event is generally performed in the first quarter of each calendar year and the second semiannual event is generally performed in the third quarter of each calendar year. Groundwater samples are collected and analyzed for all NCSWMR Appendix I and Appendix II constituents during the first semiannual sampling event and for all constituents listed in Appendix I plus previously detected Appendix II constituents during the second semiannual sampling event. Surface water samples are collected and sampled for Appendix I constituents during both sampling events.

4.2 Compliance Monitoring Program

4.2.1 Groundwater Monitoring Program

Six active groundwater monitoring wells comprise the compliance monitoring network at the Butner Landfill. The current compliance network consists of the following monitoring wells: MW-1R (facility background well), MW-2R, MW-3R, MW-4, MW-5, and MW-6. An additional well, NES-1, was installed as part of a Nature and Extent Study on November 14, 2007. NES-1 will be added to the compliance network as a sentinel well with implementation of this CAP. The locations of these wells are shown on Drawing 1 and well construction data for these wells are summarized in Table 1.

Existing Monitoring Well Network

Monitoring Well	Date Installed	Classification	Monitoring Program	Total Depth from TOC (ft)	Lithology of Screened Interval
MW-1R	4/21/94	Background	Assessment/ Selected MNA	45.1	Saprolite
MW-2R	4/12/94	Compliance/ Performance	Assessment/ MNA	19.0	Saprolite
MW-3R	4/14/94	Compliance/ Performance	Assessment/ MNA	37.2	Bedrock
MW-4	4/18/94	Compliance	Assessment	31.5	Bedrock
MW-5	4/18/94	Compliance	Assessment	23.4	Saprolite
MW-6	4/19/94	Compliance	Assessment	31.7	Saprolite/Bedrock
NES-1	11/14/07	Sentinel	COCs/MNA	33.0	Saprolite/Bedrock

Groundwater compliance samples are collected and analyzed for all NCSWMR Appendix I and Appendix II constituents during the first semiannual sampling event and for all constituents listed in Appendix I plus previously detected Appendix II constituents during the second semiannual sampling event.

4.2.2 Surface Water Monitoring Program

Two surface water samples have been collected semiannually since September 1994 at the Butner Landfill. The points SW-1 and SW-2 are located respectively upstream and downstream of the facility, along an unnamed tributary of Picture Creek. The locations of these sampling points are shown on Drawing 1. Surface water samples are collected and sampled for Appendix I constituents during both semiannual sampling events. Historical groundwater analytical results are included in Table 4.

4.3 Corrective Action Monitoring

4.3.1 Corrective Action Wells

The groundwater monitoring well network shall consist of compliance wells, performance wells, and sentinel wells. The performance wells are used to prove the MNA is working at the landfill, and the sentinel wells are used to monitor the plume movement toward adjacent properties and receptors. The groundwater monitoring well network shall have the ability to provide data on the horizontal and vertical extents of the groundwater plume.

With the implementation of this CAP, MW-2R and MW-3R will become performance wells as well as compliance wells, and NES-1 will become a sentinel well. In addition to the compliance monitoring parameters, the background well (MW-1R) and performance wells will also be analyzed for MNA performance parameters (see Section 4.3.2) during both semiannual events. The sentinel well, NES-1, will be sampled for the COCs and MNA parameters during the baseline period (see Section 4.3.2 below).

4.3.2 Baseline Sampling and MNA Performance Parameters

An initial baseline period of monitoring is needed to establish the effectiveness of MNA as a remedial option. The site background well, the performance wells, and the sentinel well shall be sampled for all MNA performance parameters on a semiannual basis for at least two calendar years (four semiannual sampling events) to establish baseline trends. MNA parameter data collected from the site prior to approval of the CAP may also be used as part of the baseline evaluation.

The MNA performance parameters provide insight into the microbial and biogeochemical reactions and processes that are occurring within the subsurface. The baseline sampling shall include the following MNA performance parameters. Some of these parameters will be analyzed in the field at the time of sampling while others will be collected for laboratory analysis, as indicated in parentheses below.

- Nitrate (lab)
- Sulfate (lab)
- Sulfide (lab)
- Methane (lab)
- pH (field)
- Temperature (field)
- Conductivity (field)
- Turbidity (field)

- Ethene, Ethane (lab)
- TOC/BOD/COD (lab)
- Alkalinity (lab)
- Chloride (lab)
- Dissolved Hydrogen (lab)
- Volatile Fatty Acids (lab)
- ORP (field)
- Ferrous Iron (field)
- Dissolved CO_2 (field)
- Dissolved Oxygen (field)

After the four baseline sampling events have been completed, the MNA data will be evaluated to determine the effectiveness of each of the MNA parameters in evaluating the MNA process on this site. If, after the baseline period, it is determined that some of MNA parameters are not needed to adequately characterize and evaluate the MNA process, the County may petition the DENR to cease or reduce the frequency of analyses for those MNA parameters. At a minimum, the performance wells will continue to be sampled semiannually for temperature, pH, specific conductance, oxidation reduction potential, dissolved oxygen, nitrate, sulfate, and chloride for as long as the CAP is in effect. After the baseline period, the site background well, MW-1R, may be analyzed for only those MNA parameters that require comparison to a background value for evaluation.

The sentinel well, NES-1, will function to monitor for migration of the contaminant plume off of the subject property, rather than for evaluation of MNA; therefore, after the baseline period, the sentinel well will no longer be sampled for MNA performance parameters. The sentinel well will be sampled for the facility's COCs, which currently includes only benzene. If, in the future, new exceedances result in additional COCs, the additional COCs will be added to the analytes list for the sentinel well.

4.4 Sampling Protocols

4.4.1 Groundwater Sampling Methodology

Groundwater samples will be collected in accordance with Solid Waste Management Rules 15A NCAC 13B .1630 through .1633 and guidance provided in the *Draft North Carolina Water Quality Monitoring Guidance Document for Solid Waste Facilities; Solid Waste Section, Division of Solid Waste Management; Department of Environment, Health and Natural Resources* (March 1995). Details of well purging, sample withdrawal, and decontamination methods, as well as chain-of-custody procedures are outlined below.

Static water elevations and the total well depth will be measured to the nearest 0.01 of a foot in each well prior to the sampling of each well. An electronic water level meter will be used for the measurements. The distance from the top of the well casing to the water surface and to the bottom of the well will be measured using the tape attached to the probe. Reference elevations of the proposed wells have been obtained from a North Carolina registered land surveyor.

A low-yield well (one that is incapable of yielding three well volumes within a reasonable time) will be purged so that water is removed from the bottom of the screened interval. Low-yield

wells will be evacuated to dryness once. Within 24 hours of purging, the first sample will be field tested for pH, temperature, and specific conductance. Samples will then be collected and containerized in the order of the parameters' volatilization sensitivity (i.e., volatile organics then total metals).

A high-yield well (one that is capable of yielding more than three well volumes during purging) will be purged so that water is drawn down from the uppermost part of the water column to ensure that fresh water from the formation will move upward in the screen. At no time will a well be evacuated to dryness if the recharge rate causes the formation water to vigorously cascade down the sides of the screen, which could cause an accelerated loss of volatiles.

A minimum of three well volumes will be evacuated from high-yield wells prior to sampling. A well volume is defined as the water contained within the well casing and pore spaces of the surrounding filter pack. The well volume will be calculated using the following formulas:

$$V_c = (d_c^2/4) \times 3.14 \times h_w \times (7.48 \text{ gallons/cubic foot})$$

$$V_c \text{ (gallons)} = 0.163 \times h_w \text{ (for a 2-inch well)}$$

where:

V_c = volume in the well casing in gallons
d_c = casing diameter in feet (d_c = 0.167 for a 2-inch well)
h_w = height of the water column in feet (i.e., well depth minus depth to water)

The purge volume will be a minimum of 3 times the calculated well volume.

Each well will be evacuated (purged) and sampled with a disposable bailer or a sampling pump. The bailer or pump will be lowered gently into the well to minimize the possibility of causing degassing of the water. If sampled with a pump, flow rates will be regulated to minimize turbidity and degassing of the water.

All equipment used for sampling will be handled in such a manner to ensure that the equipment remains decontaminated prior to use. In between wells and following completion of the field sampling, water level meters, sampling pumps, or any other reusable sampling equipment will be properly decontaminated. Clean disposable gloves will be worn by sampling personnel and changed between wells.

The upgradient/background well will be sampled first, followed by the downgradient wells. The order of sampling of the downgradient wells will be evaluated each sampling event to provide a sequence going from less contaminated to more contaminated, if applicable, based on the previous sampling event.

Field measurements of temperature, pH, and specific conductance will be made before sample collection. The direct reading equipment used at each well will be calibrated according to the manufacturer's specifications prior to each sampling event. Groundwater samples will be

collected and containerized in the order of the volatilization sensitivity (i.e., VOCs first, followed by the metals).

Pre-preserved sample containers will be supplied by the laboratory. The VOC vials will be filled in such a manner that no headspace remains after filling. Immediately upon collection, all samples will be placed in coolers on ice where they will be stored prior to/and during transit to the laboratory.

In between wells and following completion of the field sampling, the electronic depth meter will be decontaminated using the following procedure.

1) Phosphate-free soap and distilled water wash;
2) Distilled water rinse;
3) Air dry.

Samples collected will be properly containerized, packed into pre-cooled coolers, and either hand-delivered or shipped via overnight courier to the laboratory for analysis. The chain-of-custody program will allow for tracing of possession and handling of samples from the time of field collection through laboratory analysis. The chain-of-custody program will include sample labels and seals, field logs, and chain-of-custody record, and laboratory log.

Labels sufficiently durable to remain legible when wet will contain the following information:

- Job and sample identification;
- Monitoring well number or other location;
- Date and time of collection;
- Name of collector;
- Parameter to be analyzed; and
- Preservative, if applicable.

The shipping container will be sealed to ensure that the samples have not been disturbed during transport to the laboratory. If the sample cannot be analyzed because of damage or disturbance, whenever possible, the damaged sample will be replaced during the same compliance period.

The field log will contain sheets documenting the following information:

- Identification of the well;
- Well depth;
- Static water level depth;
- Presence of immiscible layers, odors or other indications of potential contamination;
- Purge volume (given in gallons or number of bailers);
- Time well was purged;
- Date and time of collection;
- Well sampling sequence;
- Field analysis data and methods;
- Field observations on sampling event;
- Name of collector(s); and

- Climatic conditions (temperature, precipitation).

The chain-of-custody record is required to establish the documentation necessary to trace sample possession from time of collection to time of receipt at destination. A chain-of-custody record will accompany each individual shipment. The record will contain the following information:

- Sample destination and transporter;
- Sample identification numbers;
- Signature of collector;
- Date and time of collection;
- Sample type;
- Identification of well;
- Number of sample containers in shipping container;
- Parameters requested for analysis;
- Signature of person(s) involved in the chain of possession;
- Inclusive dates of possession; and
- Internal temperature of shipping container upon opening (noted by the laboratory).

A copy of the completed chain-of-custody sheet will accompany the shipment and will be returned to the shipper with the analytical results. The chain of custody record will also be used as the analysis request sheet.

A field/equipment blank will be collected and analyzed during each sampling event to verify that the sample collection and handling processes have not affected the integrity of the field samples. The field/equipment blank will be prepared in the field from lab pure water (Type II reagent grade water) supplied by the laboratory. One field/equipment blank will be prepared for each sampling event. The field/equipment blank will be generated by exposing the lab pure water to the sampling environment and sampling equipment/media in the same manner as actual field samples being collected. The lab will provide appropriate sample containers for generation of the field/equipment blank(s). The field/equipment blank will be subjected to the same analysis(es) as the groundwater samples. As with all other samples, the time(s) of the field/equipment blank collection will be recorded so that the sampling sequence is documented. The field/equipment blank monitors for contamination from the sampling equipment/media, or from cross-contamination that might occur between samples and sample containers as they are opened and exposed to the sampling environment.

Whenever groundwater samples are being collected for volatiles analysis, a trip blank will be generated by the laboratory prior to shipment of sampling containers and coolers to the field. The same lab pure water as above shall be used. The trip blank shall be transported with the empty sampling containers to the field, but will not be opened at any time prior to analysis at the laboratory. The trip blank will accompany the groundwater samples in the cooler(s) back to the laboratory and will be analyzed by the same volatile methods as the associated field samples. The trip blank monitors for potential cross-contamination that might occur between samples or that may be a result of the shipping environment.

Detectable levels of contaminants found in the field/equipment blanks or trip blanks will not be used to correct the groundwater data, but will be noted accordingly. Contaminants present in trip blanks or field/equipment blanks at concentrations within an order of magnitude of those observed in the corresponding groundwater samples may be cause for resampling.

4.4.2 Surface Water Sampling Methodology

Surface water samples will be collected from flowing water at the designated sample locations in conjunction with the semiannual groundwater sampling events. Surface water can be sampled either by: 1) collecting the sample using a properly-decontaminated graduated dipper and filling laboratory-prepared sample containers from the dipper; or 2) by dipping laboratory-prepared sample containers directly into the stream flow. If using the direct sampling method, great care should be taken to not overflow containers containing preservatives to prevent loss of preservative. Use of an unpreserved laboratory container to collect the sample and then carefully dispense it into the preserved container is acceptable. For unpreserved containers, it is preferable to completely submerge the closed container, removing the lid underwater, and then replacing the lid when the container is full before removing it from the water; however, this method is only acceptable if there is sufficient depth of flowing water. No matter what method is used to collect samples, great care should be taken to not disturb creek bed sediment during sampling, and to obtain samples from the least turbid location available. Downstream samples should be collected first and upstream samples second. Samplers should wear clean, dedicated sampling gloves at all times while collecting or handling samples. Field parameters, including temperature, pH, and turbidity, shall be monitored at each sample location using the same sample collection technique used to collect the laboratory samples, as appropriate. Sampling techniques and protocols describe above for groundwater, including sample labeling, field log entry, and chain-of-custody procedures, shall also be followed for surface water samples.

4.4.3 Sample Analytical Requirements

4.4.3.1 Analytical Requirements

Analysis of groundwater and surface water samples from the facility will be conducted by a laboratory certified by the DENR for the required analytical methods. Analyses will be performed in accordance with U.S. EPA SW-846 methods. Both groundwater and surface water samples will be analyzed for the constituents listed in NCSWMR Appendix I. In addition, field analyses for temperature, pH, and specific conductance will be performed for each sample. Appendix A includes a table of all Appendix I and Appendix II constituents with their respective analytical methods, CAS numbers, DENR Solid Waste Section Limits (SWSL), 15A NCAC 2L (NC-2L) groundwater standards, and Solid Waste Section groundwater protection standards (GWPS). Appendix B includes a summary of 15A NCAC 2B (NC-2B) Surface Water Standards.

4.4.3.2 Reporting and Record Keeping

The laboratory analytical results will be submitted to the Solid Waste Section at least semiannually. The following measurements, analytical data, calculations, and other relevant groundwater monitoring records will be kept throughout the active life of the facility and the post-closure care period:

- Records of all groundwater quality data;
- Associated sample collection field logs and measurements, such as static water level measured in compliance wells at the time of sample collection; and
- Notices and reports of GPS exceedances, reporting or data error, missing data, etc.

4.5 Comparison to GPS

Constituents detected in the samples collected from either the compliance network or the sentinel well shall be compared to the appropriate Groundwater Protection Standard (GPS) for that constituent in accordance with NCSWMR §.1634.g. The comparison will be performed using a value-to-value procedure. If a suspect GPS exceedance is noted during the value-to-value comparison, a confirmation sample may be collected. The results from a confirmation sample will be compared to the GPS in a value-to-value comparison, or the value may be statistically compared to background.

In most cases, the GPS will be equal to the Groundwater Standard established for a given constituent in 15A NCAC 2L.0202 (NC-2L Standards). For constituents without listed NC-2L Standards, the groundwater protection standards (GWPS) established by the DENR Solid Waste Section may be used. In the event that a site-specific statistical background value can be established for a given constituent which is higher than the NC-2L standard, GWPS, or other appropriate listed standard, the background may be used as the GPS with DENR approval.

4.6 Statistical Analyses

With the April 2011 revision to the NCSWMR, routine statistical comparison to background for all detected constituents is no longer required; however, statistical analyses may be used to establish an alternate GPS for constituents with the approval of the DENR if desired by the facility. The following guidelines will be used to determine statistical background values.

The background data are to be evaluated through the use of Parametric Prediction Limits, Parametric Tolerance Intervals, Non-Parametric Prediction Limits, or Poisson Prediction Limits as appropriate. Tests for normality, outliers, Aitchison's adjustment, tolerance intervals, or prediction limits are to be included as appropriate based on the background data.

The statistical test by which downgradient data are compared to facility background data is based upon the nature of the data and the number of data values that are less than the laboratory limit of detection. All statistical tests are evaluated at the 0.05 level of significance, 95% confidence

level, and are conducted as one-tailed tests. These methods and the criteria for their use are discussed below.

4.6.1 Treatment of Censored Data

Generally, background data are censored as follows. When less than or equal to 15% of the background data values are less than the applicable reporting limit (SWSL), any data reported less than the SWSL will be treated as one-half the SWSL.

4.6.2 Assumption of Normality

Prior to conducting statistical tests that are based on the assumption of normally distributed data, normality of the background data is evaluated using the Shapiro-Wilk statistic (W). Normality is assessed at the 95% confidence level. In the event that the raw data fail to follow a normal distribution, the data are transformed using a base-10 logarithm. The transformed data are then tested for normality using the Shapiro-Wilk statistic. In the event that the log-transformed data also fail to follow a normal distribution, a non-parametric approach is applied.

4.6.3 Parametric Upper Tolerance Limit

In some cases the background data consist of a minimum of eight independent data values and less than or equal to 15% of the background data values are less than the RL for a given analyte. The downgradient values are then compared to the parametric upper tolerance limit in accordance with the procedure summarized in the US-EPA guidance document, *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance* (US-EPA, 2009).

4.6.4 Aitchison's Adjusted Parametric Upper Prediction Limit

In those cases where the background data consist of a minimum of eight independent data values and more than 15%, but less than or equal to 50%, of the background data values are less than the RL for a given analyte, the mean and standard deviation are adjusted. This is done in accordance with the procedure described by Aitchison and summarized in the USEPA guidance document (USEPA, 1992). After the adjustments are made, the downgradient values are compared to the Aitchison's adjusted parametric upper prediction limit in accordance with the procedures summarized in the USEPA guidance document (USEPA, 1992).

4.6.5 Non-parametric Upper Tolerance Limit

In those cases where more than 50%, but less than or equal to 90%, of the background data values are less than the RL for a given analyte or the background data fail to follow a normal or log-normal distribution, downgradient values are compared to the non-parametric upper tolerance limit. This procedure is done in accordance with the procedures summarized in the USEPA guidance document (USEPA, 1992).

4.6.6 Poisson Upper Prediction Limit

In those cases where more than 90% of the background data values are less than the RL for a given analyte, the downgradient values are compared to the Poisson upper prediction limit. These comparisons are made in accordance with the procedure summarized in the USEPA guidance document (USEPA, 1992).

4.6 Surface Water Monitoring

Surface water at the facility is currently monitored semiannually in conjunction with the groundwater sampling events. Samples are collected from two surface water monitoring points, SW-1 and SW-2. SW-1 and SW-2 are located respectively upstream and downstream of the facility along an unnamed tributary of Picture Creek. Surface water samples will be collected and analyzed for the NCSWMR Appendix I list of constituents during both semiannual monitoring events. The results will be compared to 15A NCAC 2B (NC-2B) Surface Water Standards or EPA National Criteria in a value-to-value comparison. See Section 4.4.2 for surface water sampling methodology.

4.7 Ability to Effectively Monitor Releases

Based on the hydrogeologic data available for the Butner Landfill, no geological or hydrological conditions have been identified which will interfere with effective monitoring of groundwater beneath the facility. The existing monitoring network is considered adequate to monitor this facility. This Water Quality Monitoring Plan will be effective in providing detection of any release of landfill constituents to the uppermost aquifer beneath the facility as well as monitoring of existing releases, so as to be protective of public health and the environment.

5.0 EVALUATION OF EFFECTIVENESS AND REPORT SUBMITTALS

5.1 Physical and Chemical Changes in Aquifer Conditions

Data obtained from the semiannual sampling events, including groundwater elevation and flow, groundwater field and indicator parameters, and constituent concentrations will be evaluated with regard to the physical and chemical conditions in the uppermost aquifer at the site. Any significant changes in the conditions in the aquifer will be reported with recommendations on corrective actions, changes in the monitoring program, or other appropriate responses.

5.2 Physical and Chemical Changes in Plume Characteristics

Data obtained from the performance and sentinel wells will be used to annually re-evaluate the risk posed by the residual plume. Evaluation of the analytical results from the sentinel well will be used to determine the need for additional sentinel wells or for implementation of an alternative remedy. The analytical results from the sentinel well will be compared to the GPS using a value-to-value comparison method or a statistical comparison method as detailed in

Section 4.5. Granville County may elect to conduct a confirmation sampling event if the laboratory data are suspected to be inaccurate.

If constituent-of-concern concentrations are observed to be less than the established GPS in the sentinel well, no action will be required, and the routine compliance and corrective action monitoring will continue until the remedial objective is achieved and the Corrective Action Program is suspended.

In the event that contaminant concentrations in the sentinel well exceed GPS and are confirmed by sampling and/or statistical comparisons as discussed in Section 4.5, the County may install additional sentinel well(s), as needed, between the existing sentinel well and the receptors of interest. Analytical data obtained from the additional sentinel well(s) will be used to re-evaluate the risk from the plume.

In the event that risk to human health or the environment is deemed unacceptable, then alternative remedial methods as discussed in the ACM (JOYCE, 2013) may be implemented in the affected area. An affected area is defined as the area in the immediate vicinity of the affected well(s), not to exceed one-half of the distance to the sentinel well(s) on either side of the affected sentinel well. Once contaminant concentrations in the sentinel well(s) are below established GPS, then this additional portion of the remedy will be complete.

5.3 Refining the Site Conceptual Model

Any new information that comes to the attention of the facility, either from the data collected on site or other sources, which impacts the site conceptual model will be reported and evaluated. This includes data on site or regional geology, hydrogeology, or other aspects of the site conceptual model. The site conceptual model will be refined in response to the new information as needed and appropriate.

5.4 Evaluation of Remedy Effectiveness

The MNA plus phytoremediation remedy will be evaluated based on analytical results obtained from the performance wells MW-2R, MW-3R, and MW-4. Data obtained from these wells will be tracked using trend graphs to evaluate the effectiveness of the MNA remedy. An EPA-approved MNA screening model, such as BIOSCREEN (or similar software), which includes mass flux measurements, will be used to evaluate MNA effectiveness after each baseline event and annually thereafter; and the screening results will be included in the corresponding semiannual reports. A mass-balance assessment will also be completed to demonstrate an appropriate balance between source loading and plume attenuation capacity. Plume stability (chemical, biological, and physical) will be evaluated along specific flow lines within the plume and along the plume boundary.

After the baseline sampling data have been collected, the data will be evaluated to determine which of the MNA parameters are needed to track the progress of MNA within the plume.

Recommendations for a long-term MNA parameter list for the facility will be submitted to DENR for approval. After the long term list is approved, the MNA data will be evaluated semiannually to determine the continuing effectiveness of MNA at this facility. If it is determined that MNA plus phytoremediation is no longer effectively controlling the plume and that this presents an unacceptable risk to human health or the environment, alternate remedies may be implemented as described in the ACM (JEI, 2013) (see Section 6.0).

At least annually, a survey will be conducted of the trees in the vicinity of and immediately downgradient of the contaminant plume. The tree survey will include identification of existing species, a qualitative evaluation of the health and maturity of the trees, and an assessment of any changes in the tree population since the previous survey, especially as they may impact the effectiveness of phytoremediation as a remedy for the site. An example Tree Survey Form is included in Appendix E.

5.5 Corrective Action Program Reporting

The routine compliance monitoring for this site shall continue to be reported semiannually in accordance with NCSWMR §1634 (Assessment Monitoring Program) and the WQMP for the facility (See Section 4.0). The additional data gathered for the performance and sentinel wells, as well as results of BIOSCREEN modeling, mass-balance assessment, and evaluation of plume stability, will be included in the semiannual reports. Annual phytoremediation tree survey results will be reported in the next semiannual report due after the survey is performed.

In addition to the semiannual groundwater reports, the performance criteria for the MNA plus phytoremediation remedy will be evaluated and the results will be presented to the DENR every five years in a Corrective Action Evaluation Report (CAER). The first CAER will be due within 90 days of receipt of final analytical results for the baseline sampling period, with subsequent CAER's due every five years thereafter. The CAER may provide recommended modifications to the CAP, recommendations to initiate alternative remedies, recommendations to suspend CAP monitoring, or other actions, as appropriate. The CAER shall include, at a minimum, a summary report, data tables, laboratory reports (if not previously submitted), groundwater elevation contour maps, isoconcentration contour maps, cross sections showing groundwater elevations and isoconcentration contours, an evaluation of the effectiveness of the corrective action, and graphs illustrating trends of key indicator parameters and/or constituents from key/representative monitoring stations.

In the event that a GPS exceedance is confirmed in one or more sentinel well samples based on routine monitoring results, Granville County will notify DENR in writing of: (1) the confirmed exceedance; and (2) the County's intended course of action to address the GPS exceedance.

After the remedial objectives of the CAP have been obtained for the required time period, Granville County will notify the DEQ of its intent to suspend the monitoring requirements of the CAP and of its intent to revert to Assessment or Detection Monitoring, as appropriate.

6.0 CONTINGENCY PLAN

6.1 Contingency Remedies

In addition to monitoring groundwater, this CAP includes a contingency plan in the event that MNA plus phytoremediation is shown to be ineffective at controlling migration of the contaminant plume. The contingency plan consists of in-situ or ex-situ treatment of the groundwater to enhance biodegradation and to prevent or remediate the off-site migration of impacted groundwater with GPS exceedances. If required, the treatment activities will be one or both of the following:

- Construction of a man-made wetland area downgradient of MW-2R; or
- Installation of an air-sparging system in the vicinity of MW-2R.

Additional active remedies may also be used to fulfill the remedial objectives, with approval of DENR. Prior to implementing one or more of these additional remedies, a pilot study may be performed, if appropriate, to aid in design of the remedy and/or to evaluate whether it will be effective. If evaluation of the data indicates that the chosen additional remedy may not be effective, a different remedy will be proposed, or the proposed design of the remedy may be revised as appropriate. If alternate remedial measures are required, a report justifying the alternate measure(s) and outlining an implementation plan and schedule for the remedial measures will be submitted to the DENR at least 30 days prior to implementation.

6.2 Triggering Events

The following events will trigger implementation of the Contingency Plan:

- Constituents-of-concern are detected above their respective GPS in sentinel well NES-1 and it is determined that such exceedances represent an unacceptable risk to human health or the environment. In the event of a GPS exceedance in the sentinel well, the facility may conduct an additional sampling event to confirm the exceedance. If the exceedance is confirmed, the facility will submit a plan and schedule for implementation of an alternate remedy to the DENR.
- A CAER determines that MNA and phytoremediation are not adequately controlling or remediating the contaminant plume and that this results in an unacceptable risk to human health or the environment. The CAER will include a plan and schedule for implementation of an alternate remedy.

The Contingency Plan will be implemented upon approval by DENR of the proposed alternate remedy and implementation schedule. After an alternative remedy is implemented, samples will be obtained from the affected sample location(s) within an appropriate timeframe to confirm that the remedy is working as designed in accordance with the approved plan and schedule.

The performance criteria will consist of a value-to-value comparison of the analytical data from the affected well(s) to the GPS for detected constituents. If the comparison indicates that the concentrations of the COCs have been reduced to less than the GPS, the alternative remedy will be considered complete, and the routine MNA monitoring will resume until the Corrective Action Program is suspended. If the comparison indicates that the COCs are still present at concentrations that exceed the GPS beyond the facility boundary and that such exceedances represent an unacceptable risk to human health or the environment, sampling of the affected sentinel well(s) will continue to be conducted on a semiannual basis until the constituent-of-concern concentrations are below the GPS.

If, after six semiannual alternative remedy monitoring events, the COCs are still present at concentrations that exceed the GPS, a re-evaluation of the alternative remedy and an appropriate adjustment or alteration of the remedy will be implemented upon DENR's approval. The alternative remedy implementation and confirmation sampling will continue as specified above until the COC concentrations decrease to less than the GPS in the affected sentinel well(s), unless the County is otherwise directed by DENR.

7.0 SCHEDULE AND MAINTENANCE

7.1 Schedule Considerations

According to 15A NCAC 13B.1636(d), the owner/operator is required to specify, as part of the selected remedy, a schedule for initiating and completing remedial activities. Such a schedule shall require the initiation of remedial activities within a reasonable period of time, taking into consideration the factors set forth in this section. The owner/operator shall consider the following factors in determining the schedule of remedial activities.

- Extent and nature of contamination [15A NCAC 13B.1636(d)(1)];
- Remedial technology capabilities [15A NCAC 13B.1636(d)(2)];
- Availability of treatment or disposal capacity for wastes during implementation of the remedy [15A NCAC 13B.1636(d)(3)];
- Desirability of utilizing technologies that are not currently available, but which may offer significant advantages over already available technologies in terms of effectiveness, reliability, safety, or ability to achieve remedial objectives [15A NCAC 13B.1636(d)(4)];
- Potential risks to human health and the environment from exposure to contamination prior to completion of the remedy [15A NCAC 13B.1636(d)(5)];
- Resource value of the aquifer including [15A NCAC 13B.1636(d)(6)]:
    - Current and future uses;
    - Proximity and withdrawal rates of users;
    - Groundwater quantity and quality;
    - The potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to the waste constituents;
    - The hydrological characteristics of the facility and surrounding land;

    - Groundwater removal and treatment costs; and
    - The cost and availability of alternate water supplies.
- Practical capability of owner/operator [15A NCAC 13B.1636(d)(7)]; and
- Other relevant factors [15A NCAC 13B.1636(d)(8)].

7.2 Timeline

Upon considering the above-mentioned factors and based on evaluation of data from the site, natural attenuation and phytoremediation are already occurring at this facility at a rate that will prevent the migration of solid waste constituents beyond the landfill property boundary at concentrations exceeding the GPS. Therefore, this portion of the proposed remedy is already in place at the landfill. A schedule for implementing this CAP is presented in Table 8, and discussed below.

The monitoring of this remedy will begin with the first regular semiannual sampling event scheduled for more than 30 days following approval of this CAP by DENR. The monitoring of natural attenuation processes will be performed in accordance with the WQMP presented in Section 4.0. The first CAER will be due 120 days after completion of the last (8th) sampling event for the MNA baseline sampling period, with subsequent CAER's due every five years thereafter.

Once contaminant concentrations at or beyond the relevant point of compliance as defined in 15A NCAC 13B.1631(a)(2) are below established GPS for three consecutive years, the corrective action will be considered complete. In accordance with 15A NCAC 13B.1637(f), a certification that corrective action has been completed in compliance with the requirements of 15A NCAC 13B.1637(e) will be submitted to DENR. If the facility is in the post-closure care period at the end of the Corrective Action Program, Assessment Monitoring will be continued.

7.3 Operations and Maintenance (O&M)

The facility shall establish a site-specific, routine monitoring system inspection schedule, the frequency of which shall be appropriate for the maintenance requirements of the MNA monitoring network. Inspection results shall be recorded and placed in the facility's Operating Record.

If results of tree surveys indicate additional plantings, fertilization, pest control, or similar maintenance of the trees needed for phytoremediation is required, such work will be scheduled and records of the work will be placed in the facility's Operating Record.

7.4 Safeguards and Safety

The facility shall establish site-specific health and safety guidelines for the monitoring system and monitoring activities, including installation and sampling of monitoring wells. The guidelines shall include security for the monitoring wells, such as locked protective casings

and/or access restrictions, as well as descriptions of appropriate personal protective equipment for routine and anticipated activities.

7.5 Modification of Corrective Action or Schedule

Any requests for modifications of the approved corrective action and/or the implementation schedule must be submitted in writing to the Solid Waste Section, and the requested modifications may not be implemented until approved in writing by the Division of Waste Management.

8.0 FINANCIAL ASSURANCE

A Post-Closure Cost Estimate for the Butner Landfill, including Corrective Action Costs, is included as Appendix F. This information will be used to update Granville County's financial assurance. Updated Financial Assurance information for the County will be submitted under separate cover.

9.0 COMPLETION OF CORRECTIVE ACTION

Once concentrations of the COCs are below established GPS at and beyond the relevant point of compliance as defined in 15A NCAC 13B.1631(a)(2) for three consecutive years, the corrective action will be considered complete. If the facility is in the post-closure care period at the end of the Corrective Action Program, Assessment Monitoring will be continued. After the remedial objectives of the CAP have been obtained for the required time period, Granville County will notify the DEQ of its intent to suspend the monitoring requirements of the CAP and of its intent to revert to Assessment or Detection Monitoring, as appropriate. In accordance with 15A NCAC 13B.1637(f), a certification that corrective action has been completed in compliance with the requirements of 15A NCAC 13B.1637(e) will be submitted to DENR.

10.0 REFERENCES

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11.0 ACRONYMS

ACM	Assessment of Corrective Measures (report)
AOC	Area of Concern
C&D	Construction and Demolition Waste
CAP	Corrective Action Plan (report)
CAER	Corrective Action Evaluation Report (report)
CPVC	Chlorinated Poly Vinyl Chloride
COC	Contaminant of Concern
DENR	North Carolina Department of Environment and Natural Resources
DL	Detection Limit (for laboratory data)
DO	Dissolved Oxygen
EPA	United States Environmental Protection Agency
GEU	Gas Extraction Unit
GPS	Groundwater Protection Standards
HASP	Site-specific Health and Safety Plan
HDPE	High-density Polyethylene
JEI	Joyce Engineering, Inc.
LFG	Landfill Gas
LEL	Lower Explosive Limit
MNA	Monitored Natural Attenuation
MSW	Municipal Solid Waste
MW	Monitoring Well
NC-2B	North Carolina Surface Water Standards found in 15A NCAC 2B.0101
NC-2L	North Carolina Groundwater Standards found in 15A NCAC 2L.0202
NCAC	North Carolina Administrative Code
NCSWMR	North Carolina Solid Waste Management Regulations (15A NCAC 13B.1600)
ND	Not Detected (for laboratory data)
NES	Nature and Extent Study (report)
O&M	Operations and Maintenance
OSHA	Occupational Health and Safety Association
PVC	Poly Vinyl Chloride
QL	Quantitation Limit (for laboratory data)
QRA	Quantitative Risk Assessment (report)
RA	Risk Assessment (report)
RL	Reporting Limit (for laboratory data)
SWQS	Surface Water Quality Standards
SWS	DENR Division of Waste Management, Solid Waste Section
SWSL	North Carolina Solid Waste Section Reporting Limits (for laboratory data)
VOC	Volatile Organic Compound
WQMP	Water Quality Monitoring Plan (report)

TABLES

TABLE 1:
MONITORING WELL CONSTRUCTION DETAILS

WELL ID		[4]LOCATION			Elevation (Ft-AMSL)						Other Information			
Permit #	Well #	Lat.	Long.	Surface Elevation	Top of Casing	Top of Screen	Bottom of Screen	Total Depth	[1]Water Level	Depth to Bedrock	[2]Geologic Unit	[3]Construction Date	Driller's Reg. #	Comments
39-02	MW-1R	N36º 09' 55.49"	W78º 45' 37.80"	461.01	461.01	420.01	405.01	405.01	420.01	431.01	Fractured Bedrock	4/21/1994	446	background well replacement
39-02	MW-2R	N36º 09' 38.57"	W78º 45' 34.97"	326.60	328.94	322.75	307.75	307.75	324.00	313.60	Weathered Bedrock	4/12/1994	446	compliance well replacement
39-02	MW-3R	N36º 09' 38.58"	W78º 45' 34.85"	328.77	330.95	302.94	292.94	292.94	325.77	315.77	Fractured Bedrock	4/14/1994	446	compliance well replacement
39-02	MW-4	N36º 09' 38.93"	W78º 45' 30.15"	338.97	340.92	322.54	307.54	307.54	329.17	325.97	Fractured Bedrock	4/18/1994	446	compliance well
39-02	MW-5	N36º 09' 39.35"	W78º 45' 23.77"	341.88	344.00	333.36	318.36	318.36	329.08	324.88	Fractured Bedrock	4/18/1994	446	compliance well
39-02	MW-6	N36º 09' 47.00"	W78º 45' 25.47"	360.80	362.80	343.17	328.17	328.17	349.10	339.60	Fractured Bedrock	4/19/1994	446	compliance well
39-02	NES-1	N36º 09' 35.65"	W78º 45' 31.59"	326.22	328.72	311.22	296.22	296.22	304.22	300.22	Fractured Bedrock	11/14/2007	2675	nature & extent well

Notes:

1. Water Level from T.O.C. , approx. 24 hours after drilling
2. Geology where well bore ends, documented as fractured metavolcanic bedrock of Carolina slate belt
3. Typical Montoring Well Construction, materials are 2 inch SCH40 PVC casing and screen with 0.010 inch slot, sand pack, bentonite seal, grout pad, & steel outer casing.
4. Locations from March 2013 survey

Montoring Well Summary data is from well construction records, GAI Consultants June 1994, & Joyce Engineering November 2007, and field observations.

TABLE 2:
HISTORICAL GROUNDWATER ELEVATIONS

	Background	Downgradient					
Well ID:	**MW-1R**	**MW-2R**	**MW-3R**	**MW-4**	**MW-5**	**MW-6**	**NES-1**
Well TOC Elev.:	460.51	331.60	330.96	340.80	343.88	362.53	328.40
Well Depth:	56.00	18.85	35.83	31.43	23.52	32.63	32.80
21-Aug-99	418.68	329.13	328.06	330.50	330.83	352.10	NI
16-Nov-99	419.75	325.38	324.51	331.53	334.33	352.97	NI
10-May-00	424.53	329.60	328.83	334.15	334.49	355.72	NI
26-Oct-00	419.21	329.26	328.15	331.33	330.94	352.78	NI
18-Apr-01	418.76	329.42	328.63	333.57	334.36	354.22	NI
26-Oct-01	412.53	329.04	327.94	330.57	330.23	350.92	NI
13-Jun-02	413.70	328.38	327.41	330.21	330.29	351.04	NI
19-Nov-02	413.40	329.25	328.35	331.57	337.17	350.94	NI
27-Jun-03	423.61	329.57	328.93	334.24	333.99	355.21	NI
29-Dec-03	420.23	329.70	329.11	334.49	334.78	354.92	NI
30-Jun-04	418.81	329.38	328.48	332.26	331.39	353.10	NI
28-Dec-04	418.02	329.50	328.91	333.45	334.14	355.14	NI
29-Jun-05	418.81	329.10	329.26	331.62	330.90	352.76	NI
29-Dec-05	413.38	329.29	328.71	332.78	334.27	351.52	NI
27-Jun-06	414.75	329.17	328.40	332.18	333.56	353.43	NI
28-Dec-06	415.54	329.40	328.86	333.57	335.24	354.02	NI
12-Jul-07	438.64	328.69	327.97	331.31	330.52	352.30	NI
18-Dec-07	412.59	328.94	328.08	330.32	327.92	347.90	306.54
8-Jul-08	414.52	329.20	326.00	331.46	330.85	351.03	NM
17-Dec-08	412.79	329.39	328.84	333.15	335.03	350.82	NM
9-Jul-09	417.16	329.17	329.48	332.30	331.36	352.17	310.12
16-Dec-09	418.11	329.55	329.09	334.57	336.94	352.87	NM
24-Jun-10	422.42	329.41	328.77	333.65	333.15	353.62	NM
13-Dec-10	415.96	329.49	328.85	332.81	330.34	350.08	NM
20-Jun-11	416.00	328.95	328.18	336.77	331.38	351.83	NM
5-Dec-11	412.94	329.31	328.65	332.32	329.51	349.87	NM
11-Jun-12	414.56	329.10	328.35	332.52	331.33	351.75	312.50
12-Dec-12	412.83	329.19	328.36	331.67	330.35	349.48	NM
1-May-13	415.69	329.65	329.13	334.49	335.15	353.63	317.11
5-Aug-13	417.97	329.02	328.41	333.32	332.83	353.01	NM
24-Feb-14	415.81	329.68	329.17	334.48	331.63	351.78	316.15

Notes:

TOC = top of casing

Water levels are measured from TOC.

NM = water level not measured.

NI = well not yet installed.

TABLE 3:
AQUIFER CHARACTERISTICS AND GROUNDWATER FLOW VELOCITIES

			February 24, 2014				
GRADIENT CALCULATION SEGMENT	FLOW LINE LENGTH (feet)	FLOW DIRECTION	GROUND-WATER ELEVATION (feet)	HORIZ. GRADIENT, **i** (ft/ft)	HYDRAULIC CONDUCTIVITY, **K** (ft/day)	EFFECTIVE POROSITY $\mathbf{n_e}$	LINEAR VELOCITY, **V** (ft/year)
i_1	1325	ESE	410 340	0.0528	6.18E-02	0.18	6.63
i_2	1614	SE	400 320	0.0496	6.18E-02	0.18	6.22
i_3	1621	SSE	410 320	0.0555	6.18E-02	0.18	6.96
			Average	0.0526		Average	6.60

Notes:
Hydraulic conductivity (K) value is the average of results from slug-tests conducted in 1994 (GAI, 1994).
Effective Porosity based on average of 90% of reported Total Porosity (GAI, 1995) for soils, or 10% (estimated) for fractured rock.
Linear flow velocity = Ki/n (modified Darcy equation).

TABLE 4:
HISTORICAL CONSTITUENTS IN GROUNDWATER

Analyte	Sample Date	DL	RL	MW-1R	MW-2R	MW-3R	MW-4	MW-5	MW-6	NES-1S	Field Blanks
INORGANICS											
Antimony	8-Sep-94	NR	30	ND	ND	ND	ND	ND	ND	NI	NS
	1-Dec-94	NR	30	ND	ND	ND	ND	ND	ND	NI	NS
	9-Feb-95	NR	30	ND	ND	ND	ND	ND	ND	NI	NS
	2-Mar-95	NR	30	ND	ND	ND	ND	ND	ND	NI	NS
	15-Nov-95	NR	30	ND	ND	ND	ND	ND	ND	NI	NS
	28-May-96	NR	30	ND	ND	ND	ND	ND	ND	NI	NS
	22-Nov-96	NR	30	ND	ND	ND	ND	ND	ND	NI	NS
	17-Jun-97	NR	30	ND	ND	ND	ND	ND	ND	NI	NS
	1-Dec-97	NR	30	ND	ND	ND	ND	ND	ND	NI	NS
	20-May-98	NR	30	ND	ND	ND	ND	ND	ND	NI	NS
	19-Nov-98	NR	30	ND	ND	ND	ND	ND	ND	NI	NS
	21-Jul-99	NR	30	ND	ND	ND	ND	ND	ND	NI	NS
	16-Nov-99	NR	30	ND	ND	ND	ND	ND	ND	NI	NS
	10-May-00	NR	30	ND	80.0	38.0	32.0	33.0	31.0	NI	NS
	26-Oct-00	NR	30	30.0	ND	ND	ND	ND	ND	NI	NS
	18-Apr-01	NR	30	ND	ND	ND	ND	ND	ND	NI	NS
	27-Oct-01	NR	30	ND	ND	ND	ND	ND	ND	NI	NS
	13-Jun-02	NR	30	ND	ND	ND	ND	ND	ND	NI	NS
	19-Nov-02	NR	30	ND	ND	ND	ND	ND	ND	NI	NS
	27-Jun-03	NR	30	ND	ND	ND	ND	ND	ND	NI	NS
	30-Dec-03	NR	30	ND	ND	ND	ND	ND	ND	NI	ND
	30-Jun-04	NR	30	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-04	NR	30	ND	ND	ND	ND	ND	ND	NI	ND
	29-Jun-05	NR	30	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-05	NR	30	ND	ND	ND	ND	ND	ND	NI	ND
	28-Jun-06	NR	30	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-06	NR	6	ND	ND	ND	ND	ND	ND	NI	ND
	12-Jul-07	NR	6	ND	ND	ND	ND	ND	ND	NI	ND
GWPS = 1.4 ug/L (10/23/07)	19-Dec-07	NR	6	ND	ND	ND	ND	ND	ND	ND	ND
	8-Jul-08	NR	6	ND	ND	ND	ND	ND	ND	NS	ND
	17-Dec-08	2.6	6.0	ND	ND	ND	ND	ND	ND	NS	ND
	9-Jul-09	2.6	6.0	ND	ND	ND	ND	ND	ND	ND	ND
	16-Dec-09	2.6	6.0	ND	ND	ND	ND	ND	ND	NS	ND
NC 2B = NE (03/24/10)	24-Jun-10	2.6	6.0	ND	ND	ND	2.9 J	ND	ND	NS	ND
GWPS = 1 ug/L (8/1/10)	13-Dec-10	2.6	6.0	ND	ND	3.0 J	ND	2.8 J	ND	NS	ND
	20-Jun-11	5.0	6.0	ND	ND	ND	ND	6.0	ND	NS	ND
	5-Dec-11	5.0	6.0	ND	ND	ND	ND	ND	ND	NS	ND
	11-Jun-12	5.0	6.0	ND	ND	ND	ND	ND	ND	ND	ND
	12-Dec-12	5.0	6.0	ND	ND	ND	ND	ND	ND	NS	ND
	1-May-13	5.0	6.0	ND	ND	ND	ND	ND	ND	ND	ND
	5-Aug-13	5.0	6.0	ND	ND	ND	ND	ND	ND	NS	ND
	24-Feb-14	5.0	6.0	8.8	ND	ND	ND	ND	ND	ND	ND
Arsenic	8-Sep-94	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	1-Dec-94	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	9-Feb-95	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	2-Mar-95	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	15-Nov-95	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	28-May-96	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	22-Nov-96	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	17-Jun-97	NR	10	6.0 J	15.0	ND	ND	ND	ND	NI	NS
	1-Dec-97	NR	10	ND	5.0 J	ND	ND	ND	ND	NI	NS
	20-May-98	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	19-Nov-98	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	21-Jul-99	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	16-Nov-99	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	10-May-00	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	26-Oct-00	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	18-Apr-01	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	27-Oct-01	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	13-Jun-02	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	19-Nov-02	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	27-Jun-03	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	30-Dec-03	NR	10	ND	ND	ND	ND	ND	ND	NI	ND
	30-Jun-04	NR	10	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-04	NR	10	ND	ND	ND	ND	ND	ND	NI	ND
	29-Jun-05	NR	10	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-05	NR	10	ND	ND	ND	ND	ND	ND	NI	ND
	28-Jun-06	NR	10	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-06	NR	10	2.0 J	ND	ND	ND	ND	ND	NI	ND
	12-Jul-07	NR	10	ND	ND	ND	ND	ND	ND	NI	ND
NC 2L = 50 ug/L (10/23/07)	19-Dec-07	NR	10	ND	4.1 J	ND	ND	ND	ND	ND	ND
	8-Jul-08	NR	10	ND	4.9 J	ND	ND	ND	ND	NS	ND
	17-Dec-08	2.7	10.0	ND	ND	ND	ND	ND	ND	NS	ND
	9-Jul-09	2.7	10.0	ND	13.5	10.9	5.6 J	ND	4.0 J	ND	ND
	16-Dec-09	2.7	10.0	ND	10.6	6.4 J	5.0 J	ND	3.6 J	NS	ND
NC 2L = 10 ug/L (02/05/10)	24-Jun-10	2.7	10.0	ND	11.8	8.1 J	8.2 J	3.3 J	3.1 J	NS	ND
Resample >	12-Aug-10	2.7	10.0	NS	NS	7.2 J	NS	NS	NS	NS	ND
Resample >	31-Aug-10	2.7	10.0	NS	15.4	NS	NS	NS	NS	NS	ND
	13-Dec-10	2.7	10.0	ND	4.9 J	2.7 J	5.4 J	ND	ND	NS	ND
	20-Jun-11	5.0	10.0	ND	ND	ND	ND	ND	ND	NS	ND
	5-Dec-11	5.0	10.0	ND	ND	ND	ND	ND	ND	NS	ND
	11-Jun-12	5.0	10.0	ND	5.4 J	ND	ND	ND	ND	ND	ND
	12-Dec-12	5.0	10.0	ND	ND	ND	ND	ND	ND	NS	ND
	1-May-13	5.0	10.0	ND	ND	ND	ND	ND	ND	ND	ND
	5-Aug-13	5.0	10.0	ND	ND	5.6 J	ND	ND	ND	NS	ND
	24-Feb-14	5.0	10.0	ND	6.4 J	ND	ND	ND	ND	ND	ND

TABLE 4:
HISTORICAL CONSTITUENTS IN GROUNDWATER

Analyte	Sample Date	DL	RL	MW-1R	MW-2R	MW-3R	MW-4	MW-5	MW-6	NES-1S	Field Blanks
Barium	8-Sep-94	NR	500	ND	270	ND	ND	830	860	NI	NS
	1-Dec-94	NR	500	ND	ND	ND	ND	ND	ND	NI	NS
	9-Feb-95	NR	500	ND	ND	ND	ND	510	ND	NI	NS
	2-Mar-95	NR	500	ND	ND	ND	ND	ND	ND	NI	NS
	15-Nov-95	NR	500	ND	ND	ND	ND	ND	ND	NI	NS
	28-May-96	NR	500	ND	ND	ND	ND	ND	ND	NI	NS
	22-Nov-96	NR	500	ND	82.0	30.0	ND	15.0	ND	NI	NS
	17-Jun-97	NR	500	200	320	37.0	17.0	210	31.0	NI	NS
	1-Dec-97	NR	500	61.0	180	43.0	46.0	220	33.0	NI	NS
	20-May-98	NR	500	30.0	150	45.0	13.0	180	22.0	NI	NS
	19-Nov-98	NR	500	48.0	120	42.0	ND	380	12.0	NI	NS
	21-Jul-99	NR	500	ND	ND	ND	ND	ND	ND	NI	NS
	16-Nov-99	NR	500	ND	ND	ND	ND	ND	ND	NI	NS
	10-May-00	NR	500	ND	ND	ND	ND	ND	ND	NI	NS
	26-Oct-00	NR	500	ND	ND	ND	ND	ND	ND	NI	NS
	18-Apr-01	NR	500	ND	ND	ND	ND	ND	ND	NI	NS
	27-Oct-01	NR	500	ND	ND	ND	ND	ND	ND	NI	NS
	13-Jun-02	NR	500	ND	ND	ND	ND	ND	ND	NI	NS
	19-Nov-02	NR	500	ND	ND	ND	ND	ND	ND	NI	NS
	27-Jun-03	NR	500	ND	ND	ND	ND	ND	ND	NI	NS
	30-Dec-03	NR	500	ND	ND	ND	ND	ND	ND	NI	ND
	30-Jun-04	NR	500	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-04	NR	500	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-04	NR	500	ND	ND	ND	ND	ND	ND	NI	ND
	29-Jun-05	NR	500	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-05	NR	500	ND	ND	ND	ND	ND	ND	NI	ND
	28-Jun-06	NR	500	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-06	NR	100	5.2 J	120	64.9	1.5 J	64.1	1.8 J	NI	0.20 J
	12-Jul-07	NR	100	2.5 J	129	65.7 J	1.1 J	77.0 J	1.3 J	NI	ND
NC 2L = 2,000 ug/L (10/23/07)	19-Dec-07	NR	100	2.8 B	99.2	50.0 B	1.4 B	49.6 B	1.7 B	87.8	11.7
	8-Jul-08	NR	100	5.8 J	102	58.4 J	1.1 B	57.9 J	1.2 B	NS	0.29 J
	17-Dec-08	0.20	100	2.7 B	92.9 J	53.1 B	1.2 B	55.5 J	1.1 B	NS	10.7 J
	9-Jul-09	0.20	100	4.6 B	121	63.4 B	0.37 B	81.4 B	0.94 B	72.4 B	17.6 J
	16-Dec-09	0.20	100	2.9 B	108	62.8 B	0.61 B	56.8 B	0.87 B	NS	17.1 J
NC 2L = 700 ug/L (02/05/10)	24-Jun-10	0.20	100	2.5 B	115 B	61.1 B	1.6 B	93.5 B	1.4 B	NS	27.3 J
	13-Dec-10	0.20	100	4.3 B	122	67.9 J	1.3 B	90.6 J	1.5 B	NS	12.1 J
	20-Jun-11	5.0	100	ND	108	70.7 J	ND	84.7 J	ND	NS	ND
	5-Dec-11	5.0	100	ND	118	73.0 J	ND	90.6 J	ND	NS	ND
	11-Jun-12	5.0	100	ND	138	65.2 J	ND	76.4 J	ND	61.3 J	ND
	12-Dec-12	5.0	100	ND	113	64.7 J	ND	73.6 J	ND	NS	ND
	1-May-13	5.0	100	ND	118	69.1 J	ND	84.2 J	ND	81.2 J	ND
	5-Aug-13	5.0	100	ND	111	65.1 J	ND	95.6 J	ND	NS	ND
	24-Feb-14	5.0	100	ND	93.8 J	44.8 J	ND	139	ND	ND	ND
Beryllium	8-Sep-94	NR	2	ND	ND	ND	ND	ND	ND	NI	NS
	1-Dec-94	NR	2	ND	ND	ND	ND	4.0	ND	NI	NS
	9-Feb-95	NR	2	ND	ND	ND	ND	ND	ND	NI	NS
	2-Mar-95	NR	2	ND	ND	ND	ND	2.0	ND	NI	NS
	15-Nov-95	NR	2	ND	ND	ND	ND	ND	ND	NI	NS
	28-May-96	NR	2	ND	ND	ND	ND	6.0	ND	NI	NS
	22-Nov-96	NR	2	ND	ND	ND	ND	3.0	ND	NI	NS
	17-Jun-97	NR	2	2.0	3.0	ND	ND	1.0	ND	NI	NS
	1-Dec-97	NR	2	ND	ND	ND	ND	ND	ND	NI	NS
	20-May-98	NR	2	ND	ND	ND	ND	ND	ND	NI	NS
	19-Nov-98	NR	2	ND	ND	ND	ND	2.0	ND	NI	NS
	21-Jul-99	NR	2	ND	ND	ND	ND	ND	ND	NI	NS
	16-Nov-99	NR	2	ND	ND	ND	ND	ND	ND	NI	NS
	10-May-00	NR	2	ND	ND	ND	ND	ND	ND	NI	NS
	26-Oct-00	NR	2	ND	ND	ND	ND	ND	ND	NI	NS
	18-Apr-01	NR	2	ND	12.0	ND	ND	ND	ND	NI	NS
	27-Oct-01	NR	2	ND	ND	ND	ND	ND	ND	NI	NS
	13-Jun-02	NR	2	ND	ND	ND	ND	ND	ND	NI	NS
	19-Nov-02	NR	2	ND	ND	ND	ND	ND	ND	NI	NS
	27-Jun-03	NR	2	ND	ND	ND	ND	ND	ND	NI	NS
	30-Dec-03	NR	2	ND	ND	ND	ND	ND	ND	NI	ND
	30-Jun-04	NR	2	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-04	NR	2	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-04	NR	2	ND	ND	ND	ND	ND	ND	NI	ND
	29-Jun-05	NR	2	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-05	NR	2	ND	ND	ND	ND	ND	ND	NI	ND
	28-Jun-06	NR	2	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-06	NR	1	ND	ND	ND	ND	ND	ND	NI	ND
	12-Jul-07	NR	1	ND	ND	ND	ND	ND	ND	NI	ND
GWPS = 4 ug/L (10/23/07)	19-Dec-07	NR	1	ND	ND	ND	ND	ND	ND	ND	ND
	8-Jul-08	NR	1	ND	ND	ND	ND	ND	ND	NS	ND
	17-Dec-08	0.10	1.0	ND	ND	ND	ND	0.14 J	ND	NS	ND
	9-Jul-09	0.10	1.0	ND	0.18 J	0.22 J	0.17 J	ND	ND	0.23 J	ND
	16-Dec-09	0.10	1.0	ND	0.15 J	0.17 J	0.15 J	0.25 J	ND	NS	ND
NC 2B = 6.5 ug/L (02/05/10)	24-Jun-10	0.10	1.0	ND	ND	0.27 J	0.16 J	ND	ND	NS	ND
	13-Dec-10	0.10	1.0	ND	ND	ND	ND	ND	ND	NS	ND
	20-Jun-11	1.0	1.0	ND	ND	ND	ND	ND	ND	NS	ND
	5-Dec-11	1.0	1.0	ND	ND	ND	ND	ND	ND	NS	ND
	11-Jun-12	1.0	1.0	ND	ND	ND	ND	ND	ND	ND	ND
	12-Dec-12	1.0	1.0	ND	ND	ND	ND	ND	ND	NS	ND
	1-May-13	1.0	1.0	ND	ND	ND	ND	ND	ND	ND	ND
	5-Aug-13	1.0	1.0	ND	ND	ND	ND	ND	ND	NS	ND
	24-Feb-14	1.0	1.0	ND	ND	ND	ND	ND	ND	ND	ND

TABLE 4:
HISTORICAL CONSTITUENTS IN GROUNDWATER

Analyte	Sample Date	DL	RL	MW-1R	MW-2R	MW-3R	MW-4	MW-5	MW-6	NES-1S	Field Blanks
Cadmium	8-Sep-94	NR	1	ND	ND	ND	ND	ND	4.0	NI	NS
	1-Dec-94	NR	1	ND	ND	ND	ND	ND	ND	NI	NS
	9-Feb-95	NR	1	ND	ND	ND	ND	ND	ND	NI	NS
	2-Mar-95	NR	1	ND	ND	ND	ND	ND	ND	NI	NS
	15-Nov-95	NR	1	ND	ND	ND	ND	ND	ND	NI	NS
	28-May-96	NR	1	ND	ND	ND	ND	ND	ND	NI	NS
	22-Nov-96	NR	1	ND	ND	ND	ND	ND	ND	NI	NS
	17-Jun-97	NR	1	ND	3.0	1.0	ND	ND	ND	NI	NS
	1-Dec-97	NR	1	ND	2.0	ND	ND	ND	ND	NI	NS
	20-May-98	NR	1	ND	ND	ND	ND	ND	ND	NI	NS
	19-Nov-98	NR	1	ND	ND	ND	ND	ND	ND	NI	NS
	21-Jul-99	NR	1	ND	ND	ND	ND	ND	ND	NI	NS
	16-Nov-99	NR	1	ND	3.0	3.0	ND	2.0	ND	NI	NS
	10-May-00	NR	1	5.0	ND	ND	ND	ND	ND	NI	NS
	26-Oct-00	NR	1	ND	2.0	ND	ND	ND	ND	NI	NS
	18-Apr-01	NR	1	ND	11.0	ND	ND	ND	ND	NI	NS
	27-Oct-01	NR	1	ND	ND	ND	ND	ND	ND	NI	NS
	13-Jun-02	NR	1	ND	2.0	ND	ND	ND	ND	NI	NS
	19-Nov-02	NR	1	2.0	2.0	ND	ND	2.0	ND	NI	NS
	27-Jun-03	NR	1	ND	ND	ND	ND	ND	ND	NI	NS
	30-Dec-03	NR	1	ND	1.0	ND	ND	ND	ND	NI	ND
	30-Jun-04	NR	1	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-04	NR	1	ND	ND	ND	ND	ND	ND	NI	ND
	29-Jun-05	NR	1	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-05	NR	1	ND	ND	ND	ND	ND	ND	NI	ND
	28-Jun-06	NR	1	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-06	NR	1	ND	ND	ND	ND	ND	ND	NI	ND
	12-Jul-07	NR	1	ND	ND	ND	ND	ND	ND	NI	ND
NC 2L = 1.75 ug/L (10/23/07)	19-Dec-07	NR	1	ND	ND	ND	ND	ND	ND	ND	ND
	8-Jul-08	NR	1	ND	ND	ND	ND	ND	ND	NS	ND
	17-Dec-08	0.50	1.0	ND	ND	ND	ND	ND	ND	NS	ND
	9-Jul-09	0.50	1.0	ND	1.4	ND	ND	ND	ND	ND	ND
	16-Dec-09	0.50	1.0	ND	ND	ND	ND	ND	ND	NS	ND
NC 2L = 2 ug/L (02/05/10)	24-Jun-10	0.50	1.0	ND	ND	ND	ND	ND	ND	NS	ND
	13-Dec-10	0.50	1.0	ND	ND	ND	ND	ND	ND	NS	ND
	20-Jun-11	1.0	1.0	ND	ND	ND	ND	ND	ND	NS	ND
	5-Dec-11	1.0	1.0	ND	ND	ND	ND	ND	ND	NS	ND
	11-Jun-12	1.0	1.0	ND	ND	ND	ND	ND	ND	ND	ND
	12-Dec-12	1.0	1.0	ND	ND	ND	ND	ND	ND	NS	ND
	1-May-13	1.0	1.0	ND	ND	ND	ND	ND	ND	ND	ND
	5-Aug-13	1.0	1.0	ND	ND	ND	ND	ND	ND	NS	ND
	24-Feb-14	1.0	1.0	ND	ND	ND	ND	ND	ND	ND	ND
Chromium	8-Sep-94	NR	10	8.0	44.0	ND	6.0	48.0	80.0	NI	NS
	1-Dec-94	NR	10	14.0	ND	ND	ND	18.0	ND	NI	NS
	9-Feb-95	NR	10	14.0	ND	ND	10.0	ND	ND	NI	NS
	2-Mar-95	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	15-Nov-95	NR	10	13.0	13.0	ND	ND	ND	ND	NI	NS
	28-May-96	NR	10	33.0	ND	ND	ND	ND	ND	NI	NS
	22-Nov-96	NR	10	3.0	ND	ND	ND	ND	3.0	NI	NS
	17-Jun-97	NR	10	57.0	43.0	ND	3.0	2.0	6.0	NI	NS
	1-Dec-97	NR	10	29.0	ND	ND	ND	ND	ND	NI	NS
	20-May-98	NR	10	10.0	3.0	ND	ND	12.0	ND	NI	NS
	19-Nov-98	NR	10	17.0	3.0	ND	ND	5.0	ND	NI	NS
	21-Jul-99	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	16-Nov-99	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	10-May-00	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	26-Oct-00	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	18-Apr-01	NR	10	ND	12.0	ND	ND	ND	ND	NI	NS
	27-Oct-01	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	13-Jun-02	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	19-Nov-02	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	27-Jun-03	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	30-Dec-03	NR	10	ND	ND	ND	ND	ND	ND	NI	ND
	30-Jun-04	NR	10	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-04	NR	10	ND	ND	ND	ND	ND	ND	NI	ND
	29-Jun-05	NR	10	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-05	NR	10	ND	ND	ND	ND	ND	ND	NI	ND
	28-Jun-06	NR	10	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-06	NR	10	ND	ND	ND	ND	ND	ND	NI	ND
	12-Jul-07	NR	10	ND	ND	ND	ND	ND	ND	NI	ND
NC 2L = 50 ug/L (10/23/07)	19-Dec-07	NR	10	ND	2.0 B	ND	ND	ND	ND	1.1 B	1.4 J
	8-Jul-08	NR	10	ND	0.54 J	0.58 J	ND	ND	ND	NS	ND
	17-Dec-08	0.40	10.0	0.73 J	1.8 J	0.96 J	ND	0.96 J	0.70 J	NS	ND
	9-Jul-09	0.40	10.0	1.2 J	2.4 J	1.1 J	1.6 J	0.68 J	0.53 J	4.8 J	ND
	16-Dec-09	0.40	10.0	1.3 J	ND	ND	ND	0.95 J	ND	NS	ND
NC 2L = 10 ug/L (02/05/10)	24-Jun-10	0.40	10.0	1.1 B	3.5 B	2.8 B	2.4 B	1.2 B	1.4 B	NS	0.71 J
	13-Dec-10	0.40	10.0	2.5 J	1.3 J	1.8 J	0.69 J	0.57 J	1.2 J	NS	ND
	20-Jun-11	5.0	10.0	ND	ND	ND	ND	ND	ND	NS	ND
	5-Dec-11	5.0	10.0	ND	ND	ND	ND	ND	ND	NS	ND
	11-Jun-12	5.0	10.0	ND	8.6 J	ND	ND	ND	ND	ND	ND
	12-Dec-12	5.0	10.0	ND	5.2 J	ND	ND	ND	ND	NS	ND
	1-May-13	5.0	10.0	ND	ND	ND	ND	ND	ND	ND	ND
	5-Aug-13	5.0	10.0	ND	ND	ND	ND	ND	ND	NS	ND
	24-Feb-14	5.0	10.0	ND	ND	ND	ND	ND	ND	ND	ND

TABLE 4:
HISTORICAL CONSTITUENTS IN GROUNDWATER

Analyte	Sample Date	DL	RL	MW-1R	MW-2R	MW-3R	MW-4	MW-5	MW-6	NES-1S	Field Blanks
Cobalt	8-Sep-94	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	1-Dec-94	NR	10	11.0	ND	13.0	16.0	22.0	ND	NI	NS
	9-Feb-95	NR	10	20.0	14.0	ND	48.0	39.0	ND	NI	NS
	2-Mar-95	NR	10	16.0	21.0	ND	29.0	121.0	ND	NI	NS
	15-Nov-95	NR	10	20.0	21.0	ND	ND	27.0	ND	NI	NS
	28-May-96	NR	10	30.0	16.0	ND	ND	122	ND	NI	NS
	22-Nov-96	NR	10	6.0	13.0	ND	4.7	93.0	ND	NI	NS
	17-Jun-97	NR	10	130	38.0	ND	6.0	45.0	3.0	NI	NS
	1-Dec-97	NR	10	32.0	21.0	ND	12.0	36.0	4.0	NI	NS
	20-May-98	NR	10	15.0	16.0	2.0	9.0	100	3.0	NI	NS
	19-Nov-98	NR	10	21.0	16.0	2.0	7.0	180	3.0	NI	NS
	21-Jul-99	NR	10	ND	16.0	ND	ND	100	ND	NI	NS
	16-Nov-99	NR	10	ND	15.0	ND	ND	38.0	ND	NI	NS
	10-May-00	NR	10	ND	17.0	ND	ND	61.0	ND	NI	NS
	26-Oct-00	NR	10	ND	15.0	ND	ND	ND	ND	NI	NS
	18-Apr-01	NR	10	ND	27.0	ND	ND	74.0	ND	NI	NS
	27-Oct-01	NR	10	ND	12.0	ND	ND	47.0	ND	NI	NS
	13-Jun-02	NR	10	ND	14.0	ND	ND	251	ND	NI	NS
	19-Nov-02	NR	10	ND	10.0	ND	ND	57.0	ND	NI	NS
	27-Jun-03	NR	10	ND	15.0	ND	ND	75.0	ND	NI	NS
	30-Dec-03	NR	10	ND	17.0	ND	ND	52.0	ND	NI	ND
	30-Jun-04	NR	10	ND	16.0	ND	ND	31.0	ND	NI	ND
	29-Dec-04	NR	10	ND	11.0	ND	ND	46.0	ND	NI	ND
	29-Jun-05	NR	10	ND	11.0	ND	ND	43.0	ND	NI	ND
	29-Dec-05	NR	10	ND	12.0	ND	ND	30.0	ND	NI	ND
	28-Jun-06	NR	10	ND	ND	ND	ND	72.5	ND	NI	ND
	29-Dec-06	NR	10	ND	11.4	ND	ND	37.5	ND	NI	ND
	12-Jul-07	NR	10	ND	11.8	ND	2.7	58.4	ND	NI	ND
GWPS = 70 ug/L (10/23/07)	19-Dec-07	NR	10	2.5 B	ND	ND	2.0 B	103	2.6 B	8.0 B	1.8 J
	8-Jul-08	NR	10	10.3 B	12.1 B	2.0 B	9.0 B	130	4.8 B	NS	6.2 J
	17-Dec-08	0.60	10.0	2.1 B	11.8 B	2.3 B	3.6 B	43.7	1.6 B	NS	2.5 J
	9-Jul-09	0.60	10.0	ND	6.2 J	ND	ND	100	ND	2.2 J	ND
	16-Dec-09	0.60	10.0	ND	4.7 J	ND	ND	6.6 J	ND	NS	ND
	24-Jun-10	0.60	10.0	ND	16.3	ND	ND	25.0	ND	NS	ND
GWPS = 1 ug/L (10/23/07)	13-Dec-10	0.60	10.0	2.5 B	15.5	ND	ND	{129}	{ND}	NS	1.6 {1.0 J} J
	20-Jun-11	5.0	10.0	ND	14.2	ND	ND	81.8	ND	NS	ND
	5-Dec-11	5.0	10.0	ND	12.7	ND	ND	146	ND	NS	ND
Resample >	25-Jan-12	5.0	10.0	NS	NS	NS	NS	47.5	NS	NS	ND
	11-Jun-12	5.0	10.0	ND	14.2	ND	ND	101	ND	ND	ND
	12-Dec-12	5.0	10.0	ND	11.3	ND	ND	113	ND	NS	ND
	1-May-13	5.0	10.0	ND	24.3	ND	ND	34.0	ND	ND	ND
	5-Aug-13	5.0	10.0	ND	24.7	ND	ND	50.9	ND	NS	ND
	24-Feb-14	5.0	10.0	ND	18.4	ND	ND	9.6 J	ND	ND	ND
Copper	8-Sep-94	NR	200	ND	ND	ND	ND	ND	660	NI	NS
	1-Dec-94	NR	200	ND	ND	ND	ND	ND	ND	NI	NS
	9-Feb-95	NR	200	ND	ND	ND	ND	ND	ND	NI	NS
	2-Mar-95	NR	200	ND	ND	ND	ND	ND	ND	NI	NS
	15-Nov-95	NR	200	ND	ND	ND	ND	ND	ND	NI	NS
	28-May-96	NR	200	ND	ND	ND	ND	ND	ND	NI	NS
	22-Nov-96	NR	200	ND	ND	32.0	13.0	100	ND	NI	NS
	17-Jun-97	NR	200	34.0	350	13.0	37.0	28.0	77.0	NI	NS
	1-Dec-97	NR	200	19.0	72.0	14.0	88.0	15.0	34.0	NI	NS
	20-May-98	NR	200	12.0	48.0	380	41.0	53.0	28.0	NI	NS
	19-Nov-98	NR	200	10.0	ND	410	28.0	53.0	14.0	NI	NS
	21-Jul-99	NR	200	ND	ND	ND	ND	ND	ND	NI	NS
	16-Nov-99	NR	200	ND	ND	ND	ND	ND	ND	NI	NS
	10-May-00	NR	200	ND	ND	ND	ND	ND	ND	NI	NS
	26-Oct-00	NR	200	ND	ND	ND	ND	ND	ND	NI	NS
	18-Apr-01	NR	200	ND	ND	ND	ND	ND	ND	NI	NS
	27-Oct-01	NR	200	ND	ND	ND	ND	ND	ND	NI	NS
	13-Jun-02	NR	200	ND	ND	ND	ND	ND	ND	NI	NS
	19-Nov-02	NR	200	ND	ND	ND	ND	ND	ND	NI	NS
	27-Jun-03	NR	200	ND	ND	ND	ND	ND	ND	NI	NS
	30-Dec-03	NR	200	ND	ND	ND	ND	ND	ND	NI	ND
	30-Jun-04	NR	200	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-04	NR	200	ND	ND	ND	ND	ND	ND	NI	ND
	29-Jun-05	NR	200	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-05	NR	200	ND	ND	ND	ND	ND	ND	NI	ND
	28-Jun-06	NR	200	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-06	NR	10	ND	ND	11.3	5.50 J	10.4	1.90 B	NI	0.60 J
	12-Jul-07	NR	10	ND	ND	13.4	7.90	2.6 J	ND	NI	ND
NC 2L = 1,000 ug/L (10/23/07)	19-Dec-07	NR	10	2.0 B	ND	8.6 B	3.8 B	7.0 B	0.73 B	5.8 B	9.8
	8-Jul-08	NR	10	0.64 J	ND	12.1	3.7 J	8.5 J	ND	NS	ND
	17-Dec-08	0.30	10.0	0.80 J	13.6	10.2	3.9 J	11.9	0.37 J	NS	ND
	9-Jul-09	0.30	10.0	ND	ND	6.3 J	ND	5.7 J	ND	8.8 J	ND
	16-Dec-09	0.30	10.0	ND	ND	9.2 J	1.6 J	5.7 J	ND	NS	ND
	24-Jun-10	0.30	10.0	ND	ND	10	1.2 J	5.1 J	ND	NS	ND
	13-Dec-10	0.30	10.0	1.1 B	ND	13.6	5.8 J	5.6 J	0.59 B	NS	0.49 J
	20-Jun-11	5.0	10.0	ND	ND	15.3	8.1 J	8.7 J	ND	NS	ND
	5-Dec-11	5.0	10.0	ND	ND	16.9	10.0 J	7.6 J	ND	NS	ND
	11-Jun-12	5.0	10.0	ND	10.7	12.2	6.3 J	7.4 J	ND	ND	ND
	12-Dec-12	5.0	10.0	ND	ND	11.6	8.5 J	10.4	ND	NS	ND
	1-May-13	5.0	10.0	ND	ND	13.6	5.8 J	9.6 J	ND	ND	ND
	5-Aug-13	5.0	10.0	ND	ND	14.3	ND	10.2	ND	NS	ND
	24-Feb-14	5.0	10.0	ND	ND	12.2	ND	5.1 J	ND	ND	ND

TABLE 4:
HISTORICAL CONSTITUENTS IN GROUNDWATER

Analyte	Sample Date	DL	RL	MW-1R	MW-2R	MW-3R	MW-4	MW-5	MW-6	NES-1S	Field Blanks
Lead	8-Sep-94	NR	10	ND	13.0	ND	ND	30.0	36.0	NI	NS
	1-Dec-94	NR	10	11.0	ND	ND	ND	36.0	ND	NI	NS
	9-Feb-95	NR	10	ND	ND	ND	10.0	37.0	ND	NI	NS
	2-Mar-95	NR	10	ND	ND	ND	ND	44.0	ND	NI	NS
	15-Nov-95	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	28-May-96	NR	10	ND	ND	ND	ND	42.0	ND	NI	NS
	22-Nov-96	NR	10	ND	ND	ND	ND	13.0	ND	NI	NS
	17-Jun-97	NR	10	20.0	29.0	ND	ND	13.0	ND	NI	NS
	1-Dec-97	NR	10	8.0	14.0	ND	5.0	14.0	ND	NI	NS
	20-May-98	NR	10	ND	6.0	ND	6.0	21.0	ND	NI	NS
	19-Nov-98	NR	10	5.0	ND	ND	ND	58.0	ND	NI	NS
	21-Jul-99	NR	10	ND	12.0	14.0	ND	ND	ND	NI	NS
	16-Nov-99	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	10-May-00	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	26-Oct-00	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	18-Apr-01	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	27-Oct-01	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	13-Jun-02	NR	10	11.0	ND	ND	ND	ND	ND	NI	NS
	19-Nov-02	NR	10	ND	ND	ND	ND	12.0	ND	NI	NS
	27-Jun-03	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	30-Dec-03	NR	10	ND	ND	ND	ND	ND	ND	NI	ND
	30-Jun-04	NR	10	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-04	NR	10	ND	ND	ND	ND	ND	ND	NI	ND
	29-Jun-05	NR	10	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-05	NR	10	ND	ND	ND	ND	ND	ND	NI	ND
	28-Jun-06	NR	10	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-06	NR	10	ND	ND	ND	ND	ND	2.1 J	NI	ND
	12-Jul-07	NR	10	ND	ND	ND	ND	ND	ND	NI	ND
NC 2L = 15 ug/L (10/23/07)	19-Dec-07	NR	10	ND	ND	ND	ND	ND	ND	ND	ND
	8-Jul-08	NR	10	ND	ND	ND	ND	ND	ND	NS	ND
	17-Dec-08	4.0	10.0	ND	ND	ND	ND	ND	ND	NS	ND
	9-Jul-09	4.0	10.0	ND	ND	ND	ND	ND	ND	ND	ND
	16-Dec-09	4.0	10.0	ND	ND	ND	ND	ND	ND	NS	ND
	24-Jun-10	4.0	10.0	ND	ND	ND	ND	ND	ND	NS	ND
	13-Dec-10	4.0	10.0	ND	ND	ND	ND	ND	ND	NS	ND
	20-Jun-11	5.0	10.0	ND	ND	ND	ND	ND	ND	NS	ND
	5-Dec-11	5.0	10.0	ND	ND	ND	ND	ND	ND	NS	ND
	11-Jun-12	5.0	10.0	ND	ND	ND	ND	ND	ND	ND	ND
	12-Dec-12	5.0	10.0	ND	ND	ND	ND	ND	ND	NS	ND
	1-May-13	5.0	10.0	ND	ND	ND	ND	ND	ND	ND	ND
	5-Aug-13	5.0	10.0	ND	ND	ND	ND	ND	ND	NS	ND
	24-Feb-14	5.0	10.0	ND	ND	ND	ND	ND	ND	ND	ND
Mercury*	1-Dec-97	NR	0.5	ND	ND	ND	ND	ND	ND	NI	NS
	19-Nov-98	NR	0.5	ND	ND	ND	ND	ND	ND	NI	NS
	16-Nov-99	NR	0.5	ND	0.59	0.65	0.65	0.76	ND	NI	NS
	10-May-00	NR	0.5	NS	ND	ND	ND	ND	NS	NI	NS
	26-Oct-00	NR	0.5	NS	ND	ND	ND	ND	NS	NI	NS
	18-Apr-01	NR	0.5	NS	ND	ND	ND	ND	NS	NI	NS
	13-Jun-02	NR	0.5	NS	ND	ND	ND	ND	NS	NI	NS
	27-Jun-03	NR	0.5	NS	ND	ND	ND	ND	NS	NI	NS
	30-Dec-03	NR	0.5	NS	NS	NS	NS	NS	NS	NI	NS
	30-Jun-04	NR	0.5	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-04	NR	NR	NS	NS	NS	NS	NS	NS	NI	NS
	29-Jun-05	NR	0.5	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-05	NR	NR	NS	NS	NS	NS	NS	NS	NI	NS
	28-Jun-06	NR	2	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-06	NR	NR	NS	NS	NS	NS	NS	NS	NI	NS
	12-Jul-07	NR	0.2	ND	ND	ND	ND	ND	ND	NI	ND
NC 2L = 1.05 ug/L (10/23/07)	19-Dec-07	NR	NR	NS	NS	NS	NS	NS	NS	ND	NS
	8-Jul-08	NR	0.2	ND	ND	ND	ND	ND	ND	NS	ND
	17-Dec-08	NR	NR	NS	NS	NS	NS	NS	NS	NS	NS
	9-Jul-09	0.070	0.2	ND	ND	ND	ND	ND	ND	NS	ND
	16-Dec-09	NR	NR	NS	NS	NS	NS	NS	NS	NS	NS
NC 2L = 1 ug/L (02/05/10)	24-Jun-10	0.070	0.20	ND	ND	ND	ND	ND	0.098 J	NS	ND
	13-Dec-10	NR	NR	NS	NS	NS	NS	NS	NS	NS	NS
	20-Jun-11	0.10	0.20	ND	ND	ND	ND	ND	ND	NS	ND
	5-Dec-11	NR	NR	NS	NS	NS	NS	NS	NS	NS	NS
	11-Jun-12	0.10	0.20	ND	ND	ND	ND	ND	ND	ND	ND
	12-Dec-12	NR	NR	NS	NS	NS	NS	NS	NS	NS	NS
	1-May-13	0.10	0.20	ND	ND	ND	ND	ND	ND	NS	ND
	5-Aug-13	NR	NR	NS	NS	NS	NS	NS	NS	NS	NS
	24-Feb-14	0.10	0.20	ND	ND	ND	ND	ND	ND	ND	ND

TABLE 4:
HISTORICAL CONSTITUENTS IN GROUNDWATER

Analyte	Sample Date	DL	RL	MW-1R	MW-2R	MW-3R	MW-4	MW-5	MW-6	NES-1S	Field Blanks
Nickel	8-Sep-94	NR	50	ND	ND	ND	ND	ND	ND	NI	NS
	1-Dec-94	NR	50	ND	ND	ND	ND	ND	ND	NI	NS
	9-Feb-95	NR	50	ND	72	ND	ND	ND	ND	NI	NS
	2-Mar-95	NR	50	ND	100	ND	ND	ND	ND	NI	NS
	15-Nov-95	NR	50	ND	61.0	ND	ND	ND	ND	NI	NS
	28-May-96	NR	50	ND	85.0	ND	ND	ND	ND	NI	NS
	22-Nov-96	NR	50	ND	72.0	ND	ND	ND	ND	NI	NS
	17-Jun-97	NR	50	75	98.0	ND	ND	ND	ND	NI	NS
	1-Dec-97	NR	50	ND	89.0	ND	ND	ND	ND	NI	NS
	20-May-98	NR	50	ND	91.0	ND	ND	ND	ND	NI	NS
	19-Nov-98	NR	50	ND	83.0	ND	ND	ND	ND	NI	NS
	21-Jul-99	NR	50	ND	109	ND	ND	ND	ND	NI	NS
	16-Nov-99	NR	50	ND	122	ND	ND	ND	ND	NI	NS
	10-May-00	NR	50	ND	104	ND	ND	ND	ND	NI	NS
	26-Oct-00	NR	50	ND	93.0	ND	ND	ND	ND	NI	NS
	18-Apr-01	NR	50	ND	107	ND	ND	ND	ND	NI	NS
	27-Oct-01	NR	50	ND	92.0	ND	ND	ND	ND	NI	NS
	13-Jun-02	NR	50	ND	98.0	ND	ND	ND	ND	NI	NS
	19-Nov-02	NR	50	ND	74.0	ND	ND	ND	ND	NI	NS
	27-Jun-03	NR	50	ND	85.0	ND	ND	ND	ND	NI	NS
	30-Dec-03	NR	50	ND	100	ND	ND	ND	ND	NI	ND
	30-Jun-04	NR	50	ND	120 (81.0)	ND	ND	ND	ND	NI	ND
	29-Dec-04	NR	50	ND	100	ND	ND	ND	ND	NI	ND
	29-Jun-05	NR	50	ND	150 (92.0)	ND	ND	ND	ND	NI	ND
	29-Dec-05	NR	50	ND	96.0	ND	ND	ND	ND	NI	ND
	28-Jun-06	NR	50	ND	88.7	ND	ND	ND	ND	NI	ND
	29-Dec-06	NR	50	ND	94.7	30.1	14.2	8.9 J	ND	NI	ND
	12-Jul-07	NR	50	ND	99.0	30.6 J	13.9 J	13.7 J	ND	NI	ND
NC 2L = 100 ug/L (10/23/07)	19-Dec-07	NR	50	ND	83.4	23.7	11.0	18.3	ND	11.4	ND
	8-Jul-08	NR	50	ND	76.0	28.1 J	11.5 J	27.0 J	ND	NS	ND
	17-Dec-08	1.7	50.0	ND	75.5	27.8 J	12.2 J	11.0 B	ND	NS	2.4 J
	9-Jul-09	1.7	50.0	2.2 J	93.5	29.4 J	11.7 J	23.2 J	ND	13.1 J	ND
	16-Dec-09	1.7	50.0	ND	81.2	28.2 J	11.8 B	2.6 B	ND	NS	3.0 J
	24-Jun-10	1.7	50.0	ND	76.3	19.7 J	9.0 J	7.0 J	4.5 J	NS	ND
	13-Dec-10	1.7	50.0	ND	83.0	23.5 J	6.8 B	20.7 J	ND	NS	2.7 J
	20-Jun-11	5.0	50.0	ND	78.8	30.1 J	11.2 J	15.3 J	ND	NS	ND
	5-Dec-11	5.0	50.0	ND	89.1	32.8 J	11.7 J	24.3 J	ND	NS	ND
	11-Jun-12	5.0	50.0	ND	91.8	28.9 J	10.0 J	17.3 J	ND	ND	ND
	12-Dec-12	5.0	50.0	ND	91.8	29.2 J	9.3 J	21.1 J	ND	NS	ND
	1-May-13	5.0	50.0	ND	89.6	31.9 J	10.4 J	5.7 J	ND	ND	ND
	5-Aug-13	5.0	50.0	ND	87.9	28.1 J	9.0 J	8.4 J	ND	NS	ND
	24-Feb-14	5.0	50.0	ND	83.1	16.7 J	10.4 J	ND	ND	ND	ND
Selenium	8-Sep-94	NR	20	ND	ND	ND	ND	ND	ND	NI	NS
	1-Dec-94	NR	20	ND	ND	ND	ND	ND	ND	NI	NS
	9-Feb-95	NR	20	ND	ND	ND	ND	ND	ND	NI	NS
	2-Mar-95	NR	20	ND	ND	ND	ND	ND	ND	NI	NS
	15-Nov-95	NR	20	ND	ND	ND	ND	ND	ND	NI	NS
	28-May-96	NR	20	ND	ND	ND	ND	ND	ND	NI	NS
	22-Nov-96	NR	20	ND	ND	ND	ND	ND	ND	NI	NS
	17-Jun-97	NR	20	ND	ND	ND	ND	ND	ND	NI	NS
	1-Dec-97	NR	20	ND	ND	ND	ND	ND	ND	NI	NS
	20-May-98	NR	20	ND	ND	ND	ND	ND	ND	NI	NS
	19-Nov-98	NR	20	ND	ND	ND	ND	ND	ND	NI	NS
	21-Jul-99	NR	20	ND	ND	ND	ND	36.0	ND	NI	NS
	16-Nov-99	NR	20	ND	ND	ND	ND	ND	ND	NI	NS
	10-May-00	NR	20	ND	ND	ND	ND	ND	ND	NI	NS
	26-Oct-00	NR	20	ND	ND	ND	ND	ND	ND	NI	NS
	18-Apr-01	NR	20	ND	ND	ND	ND	ND	ND	NI	NS
	27-Oct-01	NR	20	ND	ND	ND	ND	ND	ND	NI	NS
	13-Jun-02	NR	20	ND	ND	ND	ND	ND	ND	NI	NS
	19-Nov-02	NR	20	ND	ND	ND	ND	ND	ND	NI	NS
	27-Jun-03	NR	20	ND	ND	ND	ND	ND	ND	NI	NS
	30-Dec-03	NR	20	ND	ND	ND	ND	ND	ND	NI	ND
	30-Jun-04	NR	20	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-04	NR	20	ND	ND	ND	ND	ND	ND	NI	ND
	29-Jun-05	NR	20	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-05	NR	20	ND	ND	ND	ND	ND	ND	NI	ND
	28-Jun-06	NR	20	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-06	NR	10	ND	ND	ND	ND	ND	ND	NI	ND
	12-Jul-07	NR	10	ND	ND	ND	ND	ND	ND	NI	ND
NC 2L = 50 ug/L (10/23/07)	19-Dec-07	NR	10	ND	11.5	ND	ND	ND	ND	ND	ND
	8-Jul-08	NR	10	ND	ND	ND	ND	ND	ND	NS	ND
	17-Dec-08	3.8	10	4.8 B	5.1 B	4.8 B	ND	ND	ND	NS	4.9 J
	9-Jul-09	3.8	10	ND	ND	4.2 J	ND	ND	ND	ND	ND
	16-Dec-09	3.8	10	ND	ND	ND	5.1 J	ND	ND	NS	ND
NC 2L = 20 ug/L (02/05/10)	24-Jun-10	3.8	10	ND	ND	ND	ND	ND	ND	NS	ND
	13-Dec-10	3.8	10	ND	ND	ND	ND	ND	ND	NS	ND
	20-Jun-11	10.0	10	ND	ND	ND	ND	ND	ND	NS	ND
	5-Dec-11	10.0	10	ND	ND	ND	ND	ND	ND	NS	ND
	11-Jun-12	10.0	10	ND	ND	ND	ND	ND	ND	ND	ND
	12-Dec-12	10.0	10	ND	ND	ND	ND	ND	ND	NS	ND
	1-May-13	10.0	10	ND	ND	ND	ND	ND	ND	ND	ND
	5-Aug-13	10.0	10	ND	ND	ND	ND	ND	ND	NS	ND
	24-Feb-14	10.0	10	ND	ND	ND	ND	ND	ND	ND	ND

TABLE 4:
HISTORICAL CONSTITUENTS IN GROUNDWATER

Analyte	Sample Date	DL	RL	MW-1R	MW-2R	MW-3R	MW-4	MW-5	MW-6	NES-1S	Field Blanks
Silver	8-Sep-94	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	1-Dec-94	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	9-Feb-95	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	2-Mar-95	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	15-Nov-95	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	28-May-96	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	22-Nov-96	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	17-Jun-97	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	1-Dec-97	NR	10	ND	8.0	ND	ND	ND	3	NI	NS
	20-May-98	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	19-Nov-98	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	21-Jul-99	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	16-Nov-99	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	10-May-00	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	26-Oct-00	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	18-Apr-01	NR	10	ND	15.0	ND	ND	ND	ND	NI	NS
	27-Oct-01	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	13-Jun-02	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	19-Nov-02	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	27-Jun-03	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	30-Dec-03	NR	10	ND	ND	ND	ND	ND	ND	NI	ND
	30-Jun-04	NR	10	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-04	NR	10	ND	ND	ND	ND	ND	ND	NI	ND
	29-Jun-05	NR	10	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-05	NR	10	ND	ND	ND	ND	ND	ND	NI	ND
	28-Jun-06	NR	10	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-06	NR	10	ND	ND	ND	ND	ND	ND	NI	ND
	12-Jul-07	NR	10	ND	ND	ND	ND	ND	ND	NI	ND
NC 2L = 17.5 ug/L (10/23/07)	19-Dec-07	NR	10	ND	0.57 J	0.60 J	0.55 J	ND	0.33 J	ND	ND
	8-Jul-08	NR	10	ND	2.7 J	2.3 J	1.1 J	0.22 J	0.69 J	NS	0.12 J
	17-Dec-08	0.10	10.0	0.13 J	1.8 J	1.4 J	0.85 J	0.12 J	0.51 J	NS	ND
	9-Jul-09	0.10	10.0	ND	0.84 J	0.63 J	0.45 J	ND	0.11 J	ND	ND
	16-Dec-09	0.10	10.0	0.12 J	2.0 J	1.6 J	1.0 J	0.12 J	0.52 J	NS	ND
NC 2L = 20 ug/L (02/05/10)	24-Jun-10	0.10	10.0	ND	0.38 J	0.33 J	0.35 J	ND	ND	NS	ND
	13-Dec-10	0.10	10.0	0.15 B	1.3 J	0.99 J	0.45 B	{ND}	{ND}	NS	0.21 {0.19 J} J
	20-Jun-11	5.0	10.0	ND	ND	ND	ND	ND	ND	NS	ND
	5-Dec-11	5.0	10.0	ND	ND	ND	ND	ND	ND	NS	ND
	11-Jun-12	5.0	10.0	ND	ND	ND	ND	ND	ND	ND	ND
	12-Dec-12	5.0	10.0	ND	ND	ND	ND	ND	ND	NS	ND
	1-May-13	5.0	10.0	ND	ND	ND	ND	ND	ND	ND	ND
	5-Aug-13	5.0	10.0	ND	ND	ND	ND	ND	ND	NS	ND
	24-Feb-14	5.0	10.0	ND	ND	ND	ND	ND	ND	ND	ND
Thallium	8-Sep-94	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	1-Dec-94	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	9-Feb-95	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	2-Mar-95	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	15-Nov-95	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	28-May-96	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	22-Nov-96	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	17-Jun-97	NR	10	ND	3.0	ND	ND	ND	ND	NI	NS
	1-Dec-97	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	20-May-98	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	19-Nov-98	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	21-Jul-99	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	16-Nov-99	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	10-May-00	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	26-Oct-00	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	18-Apr-01	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	27-Oct-01	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	13-Jun-02	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	19-Nov-02	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	27-Jun-03	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	30-Dec-03	NR	10	ND	ND	ND	ND	ND	ND	NI	ND
	30-Jun-04	NR	10	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-04	NR	10	ND	10 J (ND)	ND	ND	ND	ND	NI	ND
	29-Jun-05	NR	10	ND	22.0 (30.0)	13.0 (24.0)	ND	ND	ND	NI	ND
	29-Dec-05	NR	10	ND	23.0	20.0	ND	ND	ND	NI	ND
	28-Jun-06	NR	10	ND	25.7	12.6	ND	ND	ND	NI	ND
	29-Dec-06	NR	6	ND	ND	ND	ND	ND	ND	NI	ND
	12-Jul-07	NR	5.5	ND	ND	ND	ND	ND	ND	NI	ND
GWPS = 0.28 ug/L (10/23/07)	19-Dec-07	NR	5.5	ND	4.0 J	ND	ND	ND	ND	ND	ND
	8-Jul-08	NR	5.5	ND	ND	ND	ND	ND	ND	NS	ND
	17-Dec-08	3.0	5.5	ND	3.2 J	3.2 J	ND	ND	ND	NS	ND
	9-Jul-09	3.0	5.5	ND	ND	ND	4.1 J	ND	ND	ND	ND
	16-Dec-09	3.0	5.5	ND	ND	ND	ND	ND	ND	NS	ND
	24-Jun-10	3.0	5.5	ND	ND	5.2 J	3.1 J	ND	ND	NS	ND
GWPS = 0.2 ug/L (10/1/10)	13-Dec-10	3.0	5.5	ND	ND	7.7	ND	ND	ND	NS	ND
	20-Jun-11	5.4	5.5	ND	ND	ND	ND	ND	ND	NS	ND
	5-Dec-11	5.4	5.5	ND	ND	ND	ND	ND	ND	NS	ND
	11-Jun-12	5.4	5.5	ND	ND	ND	ND	ND	ND	ND	ND
	12-Dec-12	5.4	5.5	ND	ND	ND	ND	ND	ND	NS	ND
	1-May-13	5.4	5.5	ND	ND	ND	ND	ND	ND	ND	ND
	5-Aug-13	5.4	5.5	ND	ND	ND	ND	ND	ND	NS	ND
	24-Feb-14	5.4	5.5	ND	ND	ND	ND	ND	ND	ND	ND

TABLE 4:
HISTORICAL CONSTITUENTS IN GROUNDWATER

Analyte	Sample Date	DL	RL	MW-1R	MW-2R	MW-3R	MW-4	MW-5	MW-6	NES-1S	Field Blanks
Tin*	1-Dec-97	NR	100	ND	ND	ND	ND	ND	ND	NI	NS
	19-Nov-98	NR	100	ND	ND	ND	ND	ND	ND	NI	NS
	16-Nov-99	NR	100	ND	ND	ND	ND	ND	ND	NI	NS
	26-Oct-00	NR	100	NS	ND	ND	ND	ND	NS	NI	NS
	18-Apr-01	NR	100	NS	ND	ND	ND	ND	NS	NI	NS
	27-Oct-01	NR	100	NS	NS	NS	NS	NS	NS	NI	NS
	13-Jun-02	NR	100	ND	ND	ND	ND	ND	ND	NI	NS
	19-Nov-02	NR	100	NS	NS	NS	NS	NS	NS	NI	NS
	27-Jun-03	NR	100	ND	149	127	ND	ND	ND	NI	NS
	30-Dec-03	NR	100	ND	ND	ND	ND	ND	ND	NI	ND
	30-Jun-04	NR	100	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-04	NR	100	ND	ND	ND	ND	ND	ND	NI	ND
	29-Jun-05	NR	100	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-05	NR	100	ND	ND	ND	ND	ND	ND	NI	ND
	28-Jun-06	NR	100	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-06	NR	100	ND	41.1	14.4	3.2 J	ND	ND	NI	ND
	12-Jul-07	NR	100	ND	35.2 J	13.9 J	5.2 J	ND	ND	NI	ND
NC 2L = NE ug/L (10/23/07)	19-Dec-07	NR	100	ND	33.6	7.4	ND	ND	ND	ND	ND
	8-Jul-08	NR	100	4.4 J	28.6 J	15.1 J	5.4 J	3.0 J	3.6 J	NS	ND
	17-Dec-08	1.8	100	ND	22.5 J	9.2 J	ND	ND	ND	NS	ND
	9-Jul-09	1.8	100	ND	21.4 J	8.6 J	ND	ND	ND	NS	ND
	16-Dec-09	1.8	100	ND	26.3 J	10.7 J	ND	ND	ND	NS	ND
GWPS = 2100 ug/L (02/05/10)	24-Jun-10	1.8	100	ND	23.4 J	10.7 J	3.2 J	2.2 J	1.9 J	NS	ND
	13-Dec-10	1.8	100	ND	30.3 J	12.1 J	5.8 J	ND	ND	NS	ND
	20-Jun-11	5.0	100	ND	26.8 J	13.8 J	ND	ND	ND	NS	ND
	5-Dec-11	5.0	100	ND	25.8 J	13.9 J	ND	ND	ND	NS	ND
	11-Jun-12	5.0	100	ND	22.2 J	9.0 J	ND	ND	ND	ND	ND
	12-Dec-12	5.0	100	ND	30.0 J	13.2 J	ND	ND	ND	NS	ND
	1-May-13	5.0	100	ND	25.8 J	12.2 J	ND	ND	ND	NS	ND
	5-Aug-13	5.0	100	ND	22.7 J	12.5 J	ND	ND	ND	NS	ND
	24-Feb-14	5.0	100	ND	26.7 J	11.7 J	9.8 J	ND	ND	ND	ND
Vanadium	8-Sep-94	NR	40	ND	ND	ND	ND	ND	130	NI	NS
	1-Dec-94	NR	40	63.0	ND	ND	45.0	ND	ND	NI	NS
	9-Feb-95	NR	40	ND	ND	ND	ND	ND	ND	NI	NS
	2-Mar-95	NR	40	41.0	ND	ND	45.0	ND	ND	NI	NS
	15-Nov-95	NR	40	ND	ND	ND	ND	ND	ND	NI	NS
	28-May-96	NR	40	83.0	ND	ND	ND	ND	ND	NI	NS
	22-Nov-96	NR	40	7.0	17	ND	21.0	ND	ND	NI	NS
	17-Jun-97	NR	40	450	560	ND	19.0	ND	ND	NI	NS
	1-Dec-97	NR	40	62.0	88.0	ND	41.0	ND	10.0	NI	NS
	20-May-98	NR	40	25.0	15.0	ND	10.0	5.0	ND	NI	NS
	19-Nov-98	NR	40	33.0	29.0	5.0	16.0	9.0	5.0	NI	NS
	21-Jul-99	NR	40	ND	ND	ND	ND	ND	ND	NI	NS
	16-Nov-99	NR	40	ND	ND	ND	ND	ND	ND	NI	NS
	10-May-00	NR	40	ND	ND	ND	ND	ND	ND	NI	NS
	26-Oct-00	NR	40	ND	ND	ND	ND	ND	ND	NI	NS
	18-Apr-01	NR	40	ND	ND	ND	ND	ND	ND	NI	NS
	27-Oct-01	NR	40	ND	ND	ND	ND	ND	ND	NI	NS
	13-Jun-02	NR	40	ND	ND	ND	ND	ND	ND	NI	NS
	19-Nov-02	NR	40	ND	ND	ND	ND	ND	ND	NI	NS
	27-Jun-03	NR	40	ND	ND	ND	ND	ND	ND	NI	NS
	30-Dec-03	NR	40	ND	ND	ND	ND	ND	ND	NI	ND
	30-Jun-04	NR	40	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-04	NR	40	ND	ND	ND	ND	ND	ND	NI	ND
	29-Jun-05	NR	40	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-05	NR	40	ND	ND	ND	ND	ND	ND	NI	ND
	28-Jun-06	NR	40	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-06	NR	25	2.7 J	ND	ND	14.5	ND	1.0 J	NI	ND
	12-Jul-07	NR	25	ND	ND	ND	19.4 J	ND	ND	NI	ND
GWPS = 3.5 ug/L (10/23/07)	19-Dec-07	NR	25	2.2 B	2.2 B	ND	15.7 J	3.0 B	1.2 B	4.0 J	0.62 J
	8-Jul-08	NR	25	2.6 J	2.4 J	ND	14.6 J	1.4 J	1.2 J	NS	0.20 J
	17-Dec-08	0.20	25.0	1.9 B	2.3 B	ND	13.9 J	2.5 B	1.2 B	NS	0.76 J
	9-Jul-09	0.20	25.0	3.9 B	9.7 J	2.5 B	18.4 J	2.9 B	2.2 B	8.5 J	1.30 J
	16-Dec-09	0.20	25.0	2.0 B	4.4 J	1.3 B	14.0 J	2.2 B	1.5 B	NS	0.53 J
	24-Jun-10	0.20	25.0	1.8 J	4.4 J	1.5 J	13.3 J	2.2 J	1.3 J	NS	ND
GWPS = 0.3 ug/L (10/1/10)	13-Dec-10	0.20	25.0	3.2 J	3.6 J	0.35 B	16.6 J	1.8 B	1.0 B	NS	0.36 J
	20-Jun-11	5.0	25.0	ND	ND	ND	14.5 J	ND	ND	NS	ND
	5-Dec-11	5.0	25.0	ND	ND	ND	13.5 J	ND	ND	NS	ND
	11-Jun-12	5.0	25.0	ND	18.0 J	ND	12.3 J	ND	ND	ND	ND
	12-Dec-12	5.0	25.0	ND	ND	ND	13.6 J	ND	ND	NS	ND
	1-May-13	5.0	25.0	ND	ND	ND	6.3 J	ND	ND	ND	ND
	5-Aug-13	5.0	25.0	ND	ND	ND	10.2 J	ND	ND	NS	ND
	24-Feb-14	5.0	25.0	ND	ND	ND	12.9 J	ND	ND	ND	ND

TABLE 4:
HISTORICAL CONSTITUENTS IN GROUNDWATER

Analyte	Sample Date	DL	RL	MW-1R	MW-2R	MW-3R	MW-4	MW-5	MW-6	NES-1S	Field Blanks
Zinc	8-Sep-94	NR	50	110	160	ND	ND	320	430	NI	NS
	1-Dec-94	NR	50	132	ND	ND	70	164	ND	NI	NS
	9-Feb-95	NR	50	144	89	ND	91	79	74	NI	NS
	2-Mar-95	NR	50	67	ND	ND	ND	111	ND	NI	NS
	15-Nov-95	NR	50	ND	50	ND	ND	ND	ND	NI	NS
	28-May-96	NR	50	136	ND	ND	ND	122	ND	NI	NS
	22-Nov-96	NR	50	79.0	48.0	28.0	ND	38.0	ND	NI	NS
	17-Jun-97	NR	50	370	410	33.0	39.0	36.0	69.0	NI	NS
	1-Dec-97	NR	50	140	110	11.0	45.0	34.0	30.0	NI	NS
	20-May-98	NR	50	70.0	63.0	23.0	31.0	47.0	34.0	NI	NS
	19-Nov-98	NR	50	61.0	33.0	21.0	17.0	53.0	10.0	NI	NS
	21-Jul-99	NR	50	ND	ND	ND	ND	ND	ND	NI	NS
	16-Nov-99	NR	50	ND	ND	ND	ND	ND	ND	NI	NS
	10-May-00	NR	50	ND	ND	ND	ND	ND	ND	NI	NS
	26-Oct-00	NR	50	ND	ND	ND	ND	ND	ND	NI	NS
	18-Apr-01	NR	50	ND	ND	ND	ND	ND	ND	NI	NS
	27-Oct-01	NR	50	ND	ND	ND	ND	ND	ND	NI	NS
	13-Jun-02	NR	50	ND	ND	ND	ND	382	ND	NI	NS
	19-Nov-02	NR	50	ND	ND	ND	ND	ND	ND	NI	NS
	27-Jun-03	NR	50	ND	ND	ND	ND	ND	ND	NI	NS
	30-Dec-03	NR	50	ND	ND	ND	ND	ND	ND	NI	ND
	30-Jun-04	NR	50	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-04	NR	50	ND	ND	ND	66.0	ND	ND	NI	ND
	29-Jun-05	NR	50	ND	54.0	56.0	ND	ND	ND	NI	ND
	29-Dec-05	NR	50	ND	ND	ND	ND	ND	ND	NI	ND
	28-Jun-06	NR	50	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-06	NR	50	8.0 J	ND	ND	4.1 J	4.3 J	4.1 J	NI	ND
	12-Jul-07	NR	10	9.6 J	ND	ND	ND	ND	ND	NI	ND
NC 2L = 1,050 ug/L (10/23/07)	19-Dec-07	NR	10	4.3 B	14.3 B	6.3 B	ND	ND	ND	2.4 B	102
	8-Jul-08	NR	10	5.9 B	ND	ND	ND	4.1 B	ND	NS	1.2 J
	17-Dec-08	0.40	10.0	2.4 B	6.3 J	ND	ND	4.6 J	0.60 B	NS	0.49 J
	9-Jul-09	0.40	10.0	3.4 B	ND	ND	ND	ND	ND	6.1 B	1.6 J
	16-Dec-09	0.40	10.0	4.6 B	ND	ND	ND	7.4 B	ND	NS	7.7 J
NC 2L = 1,000 ug/L (02/05/10)	24-Jun-10	0.40	10.0	0.58 J	ND	ND	ND	ND	1.3 J	NS	ND
	13-Dec-10	0.40	10.0	4.5 B	ND	ND	ND	ND	ND	NS	6.7 J
	20-Jun-11	10.0	10.0	ND	ND	ND	ND	ND	ND	NS	ND
	5-Dec-11	10.0	10.0	ND	ND	ND	ND	ND	ND	NS	12.4
	11-Jun-12	10.0	10.0	ND	20.9	ND	ND	ND	ND	ND	ND
	12-Dec-12	10.0	10.0	ND	ND	ND	ND	ND	ND	NS	ND
	1-May-13	10.0	10.0	ND	ND	ND	ND	11.8	ND	10.0	ND
	5-Aug-13	10.0	10.0	ND	ND	ND	ND	ND	ND	NS	ND
	24-Feb-14	10.0	10.0	ND	ND	ND	ND	ND	ND	ND	ND
Cyanide*	9-Jul-09	5.0	10	ND	ND	ND	ND	46.9	ND	ND	ND
Resample >	28-Sep-09	5.0	10	NS	NS	NS	NS	ND	NS	NS	ND
NC 2L = 70 ug/L (10/23/07)	16-Dec-09	NR	NR	NS	NS	NS	NS	NS	NS	NS	NS
	24-Jun-10	5.0	10.0	ND	ND	ND	ND	ND	ND	NS	ND
	13-Dec-10	NR	NR	NS	NS	NS	NS	NS	NS	NS	NS
Resample >	20-Jun-11	5.0	10.0	ND	ND	ND	ND	ND	ND	NS	ND
	5-Dec-11	NR	NR	NS	NS	NS	NS	NS	NS	NS	NS
	11-Jun-12	5.0	10.0	ND	6.4 J	ND	ND	8.7 J	ND	NS	ND
	12-Dec-12	NR	NR	NS	NS	NS	NS	NS	NS	NS	NS
	1-May-13	5.0	10.0	ND	ND	ND	ND	ND	ND	NS	ND
	5-Aug-13	NR	NR	NS	NS	NS	NS	NS	NS	NS	NS
	24-Feb-14	5.0	10.0	ND	ND	ND	ND	ND	ND	ND	5.5 J
ORGANICS											
Acetone	27-Oct-01	NR	100	244 B	109 B	ND	130 B	128 B	476 B	NI	479
	13-Jun-02	NR	100	ND	ND	ND	ND	ND	ND	NI	NS
	13-Jun-02	NR	100	ND	ND	ND	ND	ND	ND	NI	NS
	19-Nov-02	NR	100	ND	ND	ND	ND	ND	ND	NI	NS
	27-Jun-03	NR	100	ND	ND	ND	ND	ND	ND	NI	NS
	30-Dec-03	NR	100	ND	ND	ND	ND	ND	ND	NI	ND
	30-Jun-04	NR	100	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-04	NR	100	ND	ND	ND	ND	ND	ND	NI	ND
	29-Jun-05	NR	100	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-05	NR	100	ND	ND	ND	ND	ND	ND	NI	ND
	28-Jun-06	NR	100	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-06	NR	100	ND	ND	ND	ND	ND	ND	NI	ND
	12-Jul-07	NR	100	ND	ND	ND	ND	ND	ND	NI	ND
NC 2L = 700 ug/L (10/23/07)	19-Dec-07	NR	100	ND	ND	ND	ND	ND	ND	ND	4.5 J
	8-Jul-08	NR	100	ND	ND	ND	ND	ND	ND	NS	ND
	17-Dec-08	20.0	100	ND	ND	ND	ND	ND	ND	NS	ND
	9-Jul-09	20.0	100	ND	ND	ND	ND	ND	ND	ND	ND
	16-Dec-09	2.2	100	ND	ND	ND	ND	ND	ND	NS	2.8 J
NC 2L = 6,000 ug/L (02/05/10)	24-Jun-10	2.2	100	ND	18.5 B	6.5 B	ND	2.2 B	ND	NS	7.7 J
	13-Dec-10	2.2	100	ND	ND	ND	ND	ND	ND	NS	ND
	20-Jun-11	2.2	100	ND	ND	ND	ND	ND	2.4 B	NS	3.9 J
	5-Dec-11	2.2	100	ND	2.3 B	ND	ND	ND	ND	NS	8.8 J
	11-Jun-12	2.2	100	ND	3.5 B	ND	ND	ND	ND	ND	4.7 J
	12-Dec-12	10.0	100	ND	ND	ND	ND	ND	ND	NS	ND
	1-May-13	10.0	100	ND	ND	ND	ND	ND	ND	ND	14.6 J
	5-Aug-13	10.0	100	ND	ND	ND	ND	ND	ND	NS	ND
	24-Feb-14	10.0	100	ND	ND	ND	ND	ND	ND	ND	25.7 J

TABLE 4:
HISTORICAL CONSTITUENTS IN GROUNDWATER

Analyte	Sample Date	DL	RL	MW-1R	MW-2R	MW-3R	MW-4	MW-5	MW-6	NES-1S	Field Blanks
Benzene	8-Sep-94	NR	5	ND	ND	ND	ND	ND	ND	NI	NS
	1-Dec-94	NR	5	ND	ND	ND	ND	ND	ND	NI	NS
	9-Feb-95	NR	5	ND	ND	ND	ND	ND	ND	NI	NS
	2-Mar-95	NR	5	ND	ND	ND	ND	ND	ND	NI	NS
	15-Nov-95	NR	5	ND	ND	ND	ND	ND	ND	NI	NS
	28-May-96	NR	5	ND	ND	ND	ND	ND	ND	NI	NS
	22-Nov-96	NR	5	ND	ND	ND	ND	ND	ND	NI	NS
	17-Jun-97	NR	5	ND	ND	ND	ND	ND	ND	NI	NS
	1-Dec-97	NR	5	ND	ND	ND	ND	ND	ND	NI	NS
	20-May-98	NR	5	ND	ND	ND	ND	ND	ND	NI	NS
	19-Nov-98	NR	5	ND	ND	ND	ND	ND	ND	NI	NS
	21-Jul-99	NR	5	ND	ND	ND	ND	ND	ND	NI	NS
	16-Nov-99	NR	5	ND	ND	ND	ND	ND	ND	NI	NS
	10-May-00	NR	5	ND	ND	ND	ND	ND	ND	NI	NS
	26-Oct-00	NR	5	ND	ND	ND	ND	ND	ND	NI	NS
	18-Apr-01	NR	5	ND	ND	ND	ND	ND	ND	NI	NS
	27-Oct-01	NR	5	ND	ND	ND	ND	ND	ND	NI	NS
	13-Jun-02	NR	5	ND	ND	ND	ND	ND	ND	NI	NS
	19-Nov-02	NR	5	ND	ND	ND	ND	ND	ND	NI	NS
	27-Jun-03	NR	5	ND	ND	ND	ND	ND	ND	NI	NS
	30-Dec-03	NR	5	ND	ND	ND	ND	ND	ND	NI	ND
	30-Jun-04	NR	5	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-04	NR	5	ND	ND	ND	ND	ND	ND	NI	ND
	29-Jun-05	NR	5	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-05	NR	5	ND	ND	ND	ND	ND	ND	NI	ND
	28-Jun-06	NR	5	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-06	NR	3	ND	1.5	ND	ND	ND	ND	NI	ND
Resample >	23-Feb-07	NR	3	NS	1.2	NS	NS	NS	NS	NI	ND
	12-Jul-07	NR	1	ND	1.9	ND	ND	ND	ND	NI	ND
NC 2L = 1 ug/L (10/23/07)	19-Dec-07	NR	1	ND	1.8	0.48 J	0.26 J	ND	ND	ND	ND
	8-Jul-08	NR	1	ND	1.4	0.51 J	0.32 J	ND	ND	NS	ND
	17-Dec-08	0.25	1.0	ND	1.7	0.54 J	ND	ND	ND	NS	ND
	9-Jul-09	0.25	1.0	ND	1.7	0.34 J	ND	ND	ND	ND	ND
	16-Dec-09	0.25	1.0	ND	1.7	0.60 J	0.29 J	ND	ND	NS	ND
	24-Jun-10	0.25	1.0	ND	0.77 J	0.49 J	0.33 J	ND	ND	NS	ND
	13-Dec-10	0.25	1.0	ND	1.8	0.59 J	0.37 J	ND	ND	NS	ND
Resample >	8-Feb-11	0.25	1.0	NS	1.4	NS	NS	NS	NS	NS	ND
	20-Jun-11	0.25	1.0	ND	1.7	0.60 J	0.39 J	ND	ND	NS	ND
	5-Dec-11	0.25	1.0	ND	1.4	0.69 J	0.40 J	ND	ND	NS	ND
	11-Jun-12	0.25	1.0	ND	ND	0.51 J	ND	ND	ND	ND	ND
	12-Dec-12	0.25	1.0	ND	1.6	0.73 J	0.32 J	ND	ND	NS	ND
Resample >	10-Jan-13	0.25	1.0	ND	1.4	NS	NS	NS	NS	ND	ND
	1-May-13	0.25	1.0	ND	1.3	0.56 J	0.27 J	ND	ND	ND	ND
	5-Aug-13	0.25	1.0	ND	1.6	0.64 J	0.44 J	ND	ND	NS	ND
	24-Feb-14	0.25	1.0	ND	1.4	ND	ND	ND	ND	ND	ND
Bromomethane	17-Dec-08	0.29	10.0	ND	ND	0.58 J	ND	ND	ND	NS	ND
NC 2L = NE ug/L (10/23/07)	9-Jul-09	0.29	10.0	ND	ND	ND	ND	ND	ND	ND	ND
	16-Dec-09	0.29	10.0	ND	ND	ND	ND	ND	ND	NS	ND
	24-Jun-10	0.29	10.0	ND	ND	ND	ND	ND	ND	NS	ND
GWPS = 10 ug/L (8/1/10)	13-Dec-10	0.29	10.0	ND	ND	ND	ND	ND	ND	NS	ND
	20-Jun-11	0.29	10.0	ND	ND	ND	ND	ND	ND	NS	ND
	5-Dec-11	0.29	10.0	ND	ND	ND	ND	ND	ND	ND	ND
	11-Jun-12	0.29	10.0	ND	ND	ND	ND	ND	ND	ND	ND
	12-Dec-12	0.29	10.0	ND	ND	ND	ND	ND	ND	NS	ND
	1-May-13	0.29	10.0	ND	ND	ND	ND	ND	ND	ND	ND
	5-Aug-13	0.29	10.0	ND	ND	ND	ND	ND	ND	NS	ND
	24-Feb-14	0.29	10.0	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone	17-Dec-08	0.96	100	ND	ND	ND	ND	1.2 J	ND	NS	ND
NC 2L = 4,200 ug/L (10/23/07)	9-Jul-09	0.96	100	ND	ND	ND	ND	ND	ND	ND	ND
	16-Dec-09	0.96	100	ND	ND	ND	ND	ND	ND	NS	ND
NC 2L = 4,000 ug/L (02/05/10)	24-Jun-10	0.96	100	ND	ND	ND	ND	ND	ND	NS	ND
	13-Dec-10	0.96	100	ND	ND	ND	ND	ND	ND	NS	ND
	20-Jun-11	0.96	100	ND	ND	ND	ND	ND	ND	NS	ND
	5-Dec-11	0.96	100	ND	ND	ND	ND	ND	ND	NS	ND
	11-Jun-12	0.96	100	ND	ND	ND	ND	ND	ND	ND	ND
	12-Dec-12	0.96	100	ND	ND	ND	ND	ND	ND	NS	ND
	1-May-13	0.96	100	ND	ND	ND	ND	ND	ND	ND	ND
	8-May-13	0.96	100	ND	ND	ND	ND	ND	ND	NS	ND
	24-Feb-14	0.96	100	ND	ND	ND	ND	ND	ND	ND	ND

TABLE 4:
HISTORICAL CONSTITUENTS IN GROUNDWATER

Analyte	Sample Date	DL	RL	MW-1R	MW-2R	MW-3R	MW-4	MW-5	MW-6	NES-1S	Field Blanks
Carbon Disulfide	17-Jun-97	NR	100	ND	64.0	ND	ND	ND	ND	NI	NS
	1-Dec-97	NR	100	ND	5.0	8.0	ND	ND	ND	NI	NS
	20-May-98	NR	100	ND	7.5	6.2	ND	ND	ND	NI	NS
	19-Nov-98	NR	100	ND	ND	ND	ND	ND	ND	NI	NS
	21-Jul-99	NR	100	ND	ND	ND	ND	ND	ND	NI	NS
	16-Nov-99	NR	100	ND	ND	ND	ND	ND	ND	NI	NS
	10-May-00	NR	100	ND	ND	ND	ND	ND	ND	NI	NS
	26-Oct-00	NR	100	ND	ND	ND	ND	ND	ND	NI	NS
	18-Apr-01	NR	100	ND	ND	ND	ND	ND	ND	NI	NS
	27-Oct-01	NR	100	ND	ND	ND	ND	ND	ND	NI	NS
	13-Jun-02	NR	5	ND	ND	ND	ND	ND	ND	NI	NS
	19-Nov-02	NR	100	ND	ND	ND	ND	ND	ND	NI	NS
	27-Jun-03	NR	100	ND	ND	ND	ND	ND	ND	NI	NS
	30-Dec-03	NR	100	ND	ND	ND	ND	ND	ND	NI	ND
	30-Jun-04	NR	100	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-04	NR	100	ND	ND	ND	ND	ND	ND	NI	ND
	29-Jun-05	NR	100	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-05	NR	100	ND	ND	ND	ND	ND	ND	NI	ND
	28-Jun-06	NR	100	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-06	NR	100	ND	ND	ND	ND	ND	ND	NI	ND
	12-Jul-07	NR	100	ND	ND	ND	ND	ND	ND	NI	ND
NC 2L = 700 ug/L (10/23/07)	19-Dec-07	NR	100	ND	ND	ND	ND	ND	ND	ND	ND
	8-Jul-08	NR	100	ND	ND	ND	ND	ND	ND	NS	ND
	17-Dec-08	1.2	100	ND	ND	ND	ND	ND	ND	NS	ND
	9-Jul-09	1.2	100	ND	ND	ND	ND	ND	ND	ND	ND
	16-Dec-09	1.2	100	ND	ND	ND	ND	ND	ND	NS	ND
	24-Jun-10	1.2	100	ND	ND	ND	ND	ND	ND	NS	ND
	13-Dec-10	1.2	100	ND	ND	ND	ND	ND	ND	NS	ND
	20-Jun-11	1.2	100	ND	ND	ND	ND	ND	ND	NS	ND
	5-Dec-11	1.2	100	ND	ND	ND	ND	ND	ND	NS	ND
	11-Jun-12	1.2	100	ND	ND	ND	ND	ND	ND	ND	ND
	12-Dec-12	1.2	100	ND	ND	ND	ND	ND	ND	NS	ND
	1-May-13	1.2	100	ND	ND	ND	ND	ND	ND	ND	ND
	5-Aug-13	1.2	100	ND	ND	ND	ND	ND	ND	NS	ND
	24-Feb-14	1.2	100	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	8-Sep-94	NR	5	ND	10.0	7.0	ND	ND	ND	NI	NS
	1-Dec-94	NR	5	ND	ND	7.0	ND	ND	ND	NI	NS
	9-Feb-95	NR	5	ND	13.0	8.0	6.0	ND	ND	NI	NS
	2-Mar-95	NR	5	ND	12.0	9.0	ND	ND	ND	NI	NS
	15-Nov-95	NR	5	ND	14.0	8.0	9.0	ND	ND	NI	NS
	28-May-96	NR	5	ND	15.0	9.0	10.0	ND	ND	NI	NS
	22-Nov-96	NR	5	ND	15.0	ND	11.0	ND	ND	NI	NS
	17-Jun-97	NR	5	ND	19.0	11.0	14.0	ND	ND	NI	NS
	1-Dec-97	NR	5	ND	17.0	9.0	14.0	ND	ND	NI	NS
	20-May-98	NR	5	ND	20.0	8.6	12.0	ND	ND	NI	NS
	19-Nov-98	NR	5	ND	17.2	9.2	10.0	ND	ND	NI	NS
	21-Jul-99	NR	5	ND	14.0	10.0	11.0	ND	ND	NI	NS
	16-Nov-99	NR	5	ND	16.0	10.0	8.0	ND	ND	NI	NS
	10-May-00	NR	5	ND	17.0	11.0	10.0	ND	ND	NI	NS
	26-Oct-00	NR	5	ND	16.0	12.0	9.0	ND	ND	NI	NS
	18-Apr-01	NR	5	ND	16.0	13.0	6.0	ND	ND	NI	NS
	27-Oct-01	NR	0.5	ND	17.0	12.0	9.0	ND	ND	NI	NS
	13-Jun-02	NR	0.5	ND	16.0	11.0	8.0	ND	ND	NI	NS
	19-Nov-02	NR	0.5	ND	18.0	15.0	9.0	ND	ND	NI	NS
	27-Jun-03	NR	0.5	ND	17.7	13.3	7.4	ND	ND	NI	ND
	30-Dec-03	NR	5	ND	20.0	15.0	6.1	ND	ND	NI	ND
	30-Jun-04	NR	5	ND	18.0	15.0	9.9	ND	ND	NI	ND
	29-Dec-04	NR	5	ND	19.0	16.0	9.4	ND	ND	NI	ND
	29-Jun-05	NR	5	ND	15.0	13.0	8.0	ND	ND	NI	ND
	29-Dec-05	NR	5	ND	18.0	16.0	5.0	ND	ND	NI	ND
	28-Jun-06	NR	5	ND	16.5	10.8	7.8	ND	ND	NI	ND
	29-Dec-06	NR	3	ND	17.0	17.0	4.2	ND	ND	NI	ND
	12-Jul-07	NR	3	ND	17.0	16.0	ND	ND	ND	NI	ND
NC 2L = 50 ug/L (10/23/07)	19-Dec-07	NR	3	ND	17.3	16.9	4.7	ND	ND	ND	ND
	8-Jul-08	NR	3	ND	17.2	17.4	6.5	ND	ND	NS	ND
	17-Dec-08	0.23	3.0	ND	15.9	15.6	2.6 J	ND	ND	NS	ND
	9-Jul-09	0.23	3.0	ND	16.1	17.2	6.1	ND	ND	ND	ND
	16-Dec-09	0.23	3.0	ND	15.5	17.7	4.8	ND	ND	NS	ND
	24-Jun-10	0.23	3.0	ND	8.3	15.7	6.3	ND	ND	NS	ND
	13-Dec-10	0.23	3.0	ND	17.7	18.2	6.4	ND	ND	NS	0.28 J
	20-Jun-11	0.23	3.0	ND	16.3	17.2	6.7	ND	ND	NS	ND
	5-Dec-11	0.23	3.0	ND	14.2	17.0	5.8	ND	ND	NS	ND
	11-Jun-12	0.23	3.0	ND	12	14.8	4.4	ND	ND	ND	ND
	12-Dec-12	0.23	3.0	ND	15.8	17.9	4.5	ND	ND	NS	ND
	1-May-13	0.23	3.0	ND	14.0	16.6	3.0 J	ND	ND	ND	ND
	5-Aug-13	0.23	3.0	ND	14.4	15.9	4.6	ND	ND	NS	ND
	24-Feb-14	0.23	3.0	ND	16.3	2.5 J	1.4 J	ND	ND	ND	ND

TABLE 4:
HISTORICAL CONSTITUENTS IN GROUNDWATER

Analyte	Sample Date	DL	RL	MW-1R	MW-2R	MW-3R	MW-4	MW-5	MW-6	NES-1S	Field Blanks
Chloroethane	1-Dec-97	NR	10	ND	5.0	2.0	2.0	ND	ND	NI	NS
	20-May-98	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	19-Nov-98	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	21-Jul-99	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	16-Nov-99	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	10-May-00	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	26-Oct-00	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	18-Apr-01	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	27-Oct-01	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	13-Jun-02	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	19-Nov-02	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	27-Jun-03	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	30-Dec-03	NR	10	ND	ND	ND	ND	ND	ND	NI	ND
	30-Jun-04	NR	10	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-04	NR	10	ND	ND	ND	ND	ND	ND	NI	ND
	29-Jun-05	NR	10	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-05	NR	10	ND	ND	ND	ND	ND	ND	NI	ND
	28-Jun-06	NR	10	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-06	NR	10	ND	2.2	1.9	ND	ND	ND	NI	ND
	12-Jul-07	NR	10	ND	ND	ND	ND	ND	ND	NI	ND
NC 2L = 2,800 ug/L (10/23/07)	19-Dec-07	NR	10	ND	1.9	1.9	1.5	ND	ND	ND	ND
	8-Jul-08	NR	10	ND	2.2 J	2.5 J	1.8 J	ND	ND	NS	ND
	17-Dec-08	0.54	10.0	ND	1.6 J	ND	ND	ND	ND	NS	ND
	9-Jul-09	0.54	10.0	ND	ND	ND	3.8 J	ND	ND	ND	ND
	16-Dec-09	0.54	10.0	ND	ND	2.2 J	2.0 J	ND	ND	NS	ND
NC 2L = 3,000 ug/L (02/05/10)	24-Jun-10	0.54	10.0	ND	ND	2.1 J	2.0 J	ND	ND	NS	ND
	13-Dec-10	0.54	10.0	ND	1.8 J	2.0 J	1.7 J	ND	ND	NS	ND
	20-Jun-11	0.54	10.0	ND	1.2 J	2.2 J	2.0 J	ND	ND	NS	ND
	5-Dec-11	0.54	10.0	ND	1.3 J	2.0 J	1.7 J	ND	ND	NS	ND
	11-Jun-12	0.54	10.0	ND	ND	ND	ND	ND	ND	ND	ND
	12-Dec-12	0.54	10.0	ND	ND	ND	ND	ND	ND	NS	ND
	1-May-13	0.54	10.0	ND	ND	1.9 J	2.7 J	ND	ND	ND	ND
	5-Aug-13	0.54	10.0	ND	ND	2.0 J	2.2 J	ND	ND	NS	ND
	24-Feb-14	0.54	10.0	ND	1.1 J	0.82 J	ND	ND	ND	ND	ND
Chloromethane	9-Jul-09	0.11	1.0	ND	ND	ND	ND	ND	ND	ND	ND
NC 2L = 2.6 ug/L (10/23/07)	16-Dec-09	0.11	1.0	ND	ND	ND	ND	ND	ND	NS	ND
	24-Jun-10	0.11	1.0	ND	ND	ND	ND	ND	0.11 J	NS	ND
NC 2L = 3 ug/L (02/05/10)	13-Dec-10	0.11	1.0	ND	ND	ND	ND	ND	ND	NS	ND
	20-Jun-11	0.11	1.0	ND	ND	ND	ND	ND	ND	NS	ND
	5-Dec-11	0.11	1.0	ND	ND	ND	ND	ND	ND	NS	ND
	11-Jun-12	0.11	1.0	ND	ND	ND	ND	ND	ND	ND	ND
	12-Dec-12	0.11	1.0	ND	ND	ND	ND	ND	ND	NS	ND
	1-May-13	0.11	1.0	ND	ND	ND	ND	ND	ND	ND	ND
	5-Aug-13	0.11	1.0	ND	ND	ND	ND	ND	ND	NS	ND
	24-Feb-14	0.11	1.0	ND	ND	ND	ND	ND	ND	ND	0.25 J
1,2-Dichlorobenzene	1-Dec-97	NR	5	ND	3.0	2.0	1.0	ND	ND	NI	NS
	20-May-98	NR	5	ND	ND	ND	ND	ND	ND	NI	NS
	19-Nov-98	NR	5	ND	2.4	2.3	ND	ND	ND	NI	NS
	21-Jul-99	NR	5	ND	ND	ND	ND	ND	ND	NI	NS
	16-Nov-99	NR	5	ND	ND	ND	ND	ND	ND	NI	NS
	10-May-00	NR	5	ND	ND	ND	ND	ND	ND	NI	NS
	26-Oct-00	NR	5	ND	ND	ND	ND	ND	ND	NI	NS
	18-Apr-01	NR	5	ND	ND	ND	ND	ND	ND	NI	NS
	27-Oct-01	NR	5	ND	ND	ND	ND	ND	ND	NI	NS
	13-Jun-02	NR	5	ND	ND	ND	ND	ND	ND	NI	NS
	19-Nov-02	NR	5	ND	ND	ND	ND	ND	ND	NI	NS
	27-Jun-03	NR	5	ND	ND	ND	ND	ND	ND	NI	NS
	30-Dec-03	NR	5	ND	ND	ND	ND	ND	ND	NI	ND
	30-Jun-04	NR	5	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-04	NR	5	ND	ND	ND	ND	ND	ND	NI	ND
	29-Jun-05	NR	5	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-05	NR	5	ND	ND	ND	ND	ND	ND	NI	ND
	28-Jun-06	NR	5	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-06	NR	5	ND	1.5	2.3	ND	ND	ND	NI	ND
	12-Jul-07	NR	5	ND	1.4 J	1.7 J	0.31 J	ND	ND	NI	ND
NC 2L = 24 ug/L (10/23/07)	19-Dec-07	NR	5	ND	1.6	2.0	0.37 J	ND	ND	ND	ND
	8-Jul-08	NR	5	ND	1.6 J	2.0 J	0.39 J	ND	ND	NS	ND
	17-Dec-08	0.30	5.0	ND	1.4 J	1.9 J	ND	ND	ND	NS	ND
	9-Jul-09	0.30	5.0	ND	1.6 J	2.0 J	0.36 J	ND	ND	ND	ND
	16-Dec-09	0.30	5.0	ND	1.6 J	2.0 J	0.33 J	ND	ND	NS	ND
NC 2L = 20 ug/L (02/05/10)	24-Jun-10	0.30	5.0	ND	0.96 J	1.7 J	0.31 J	ND	ND	NS	ND
	13-Dec-10	0.30	5.0	ND	1.9 J	1.9 J	0.43 J	ND	ND	NS	ND
	20-Jun-11	0.30	5.0	ND	1.5 J	1.7 J	0.37 J	ND	ND	NS	ND
	5-Dec-11	0.30	5.0	ND	1.3 J	1.6 J	ND	ND	ND	NS	ND
	11-Jun-12	0.30	5.0	ND	1.0 J	1.5 J	ND	ND	ND	ND	ND
	12-Dec-12	0.30	5.0	ND	1.3 J	1.7 J	ND	ND	ND	NS	ND
	1-May-13	0.30	5.0	ND	1.2 J	1.6 J	ND	ND	ND	ND	ND
	5-Aug-13	0.30	5.0	ND	1.2 J	1.6 J	0.30 J	ND	ND	NS	ND
	24-Feb-14	0.30	5.0	ND	1.4 J	0.64 J	ND	ND	ND	ND	ND

TABLE 4:
HISTORICAL CONSTITUENTS IN GROUNDWATER

Analyte	Sample Date	DL	RL	MW-1R	MW-2R	MW-3R	MW-4	MW-5	MW-6	NES-1S	Field Blanks
1,4-Dichlorobenzene	8-Sep-94	NR	5	ND	ND	5.0	ND	ND	ND	NI	NS
	1-Dec-94	NR	5	ND	ND	5.0	ND	ND	ND	NI	NS
	9-Feb-95	NR	5	ND	8.0	6.0	ND	ND	ND	NI	NS
	2-Mar-95	NR	5	ND	7.0	6.0	ND	ND	ND	NI	NS
	15-Nov-95	NR	5	ND	7.0	6.0	ND	ND	ND	NI	NS
	28-May-96	NR	5	ND	ND	ND	ND	ND	ND	NI	NS
	22-Nov-96	NR	5	ND	ND	ND	ND	ND	ND	NI	NS
	17-Jun-97	NR	5	ND	7.6	6.2	ND	ND	ND	NI	NS
	1-Dec-97	NR	5	ND	6.0	5.0	4.0	ND	ND	NI	NS
	20-May-98	NR	5	ND	7.6	ND	ND	ND	ND	NI	NS
	19-Nov-98	NR	5	ND	3.7	2.8	ND	ND	ND	NI	NS
	21-Jul-99	NR	5	ND	ND	ND	ND	ND	ND	NI	NS
	16-Nov-99	NR	5	ND	ND	ND	ND	ND	ND	NI	NS
	10-May-00	NR	5	ND	ND	ND	ND	ND	ND	NI	NS
	26-Oct-00	NR	5	ND	5.0	6.0	ND	ND	ND	NI	NS
	18-Apr-01	NR	5	ND	ND	5.0	6.0	ND	ND	NI	NS
	27-Oct-01	NR	5	ND	ND	ND	ND	ND	ND	NI	NS
	13-Jun-02	NR	5	ND	ND	ND	ND	ND	ND	NI	NS
	19-Nov-02	NR	5	ND	ND	ND	ND	ND	ND	NI	NS
	27-Jun-03	NR	5	ND	ND	ND	ND	ND	ND	NI	NS
	30-Dec-03	NR	5	ND	ND	ND	ND	ND	ND	NI	ND
	30-Jun-04	NR	5	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-04	NR	5	ND	ND	ND	ND	ND	ND	NI	ND
	29-Jun-05	NR	5	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-05	NR	5	ND	ND	ND	ND	ND	ND	NI	ND
	28-Jun-06	NR	5	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-06	NR	3	ND	3.0	3.3	ND	ND	ND	NI	ND
Resample >	23-Feb-07	NR	3	NS	3.2	3.3	NS	NS	NS	NI	ND
	12-Jul-07	NR	1	ND	3.3	2.9	0.31 J	ND	ND	NI	ND
NC 2L = 1.4 ug/L (10/23/07)	19-Dec-07	NR	1	ND	3.0	2.7	ND	ND	ND	ND	ND
	8-Jul-08	NR	1	ND	3.0	2.4	ND	ND	ND	NS	ND
	17-Dec-08	0.33	1.0	ND	2.9	2.5	ND	ND	ND	NS	ND
	9-Jul-09	0.33	1.0	ND	ND	ND	ND	ND	ND	ND	ND
	16-Dec-09	0.33	1.0	ND	2.8	2.2	ND	ND	ND	NS	ND
NC 2L = 6 ug/L (02/05/10)	24-Jun-10	0.33	1.0	ND	1.6	ND	ND	ND	ND	NS	ND
	13-Dec-10	0.33	1.0	ND	3.1	1.9	ND	ND	ND	NS	ND
	20-Jun-11	0.33	1.0	ND	2.7	1.6	ND	ND	ND	NS	ND
	5-Dec-11	0.33	1.0	ND	2.2	1.4	ND	ND	ND	NS	ND
	11-Jun-12	0.33	1.0	ND	1.8	1.4	ND	ND	ND	ND	ND
	12-Dec-12	0.33	1.0	ND	2.4	1.3	ND	ND	ND	NS	ND
	1-May-13	0.33	1.0	ND	2.1	1.2	ND	ND	ND	ND	ND
	5-Aug-13	0.33	1.0	ND	2.0	1.3	ND	ND	ND	NS	ND
	24-Feb-14	0.33	1.0	ND	2.2	1.8	ND	ND	ND	ND	ND
Trans-1,4-Dichloro-2-Butene	20-May-98	NR	100	ND	ND	5.1	ND	ND	ND	NI	NS
	19-Nov-98	NR	100	ND	ND	ND	ND	ND	ND	NI	NS
	21-Jul-99	NR	100	ND	ND	ND	ND	ND	ND	NI	NS
	16-Nov-99	NR	100	ND	ND	ND	ND	ND	ND	NI	NS
	10-May-00	NR	100	ND	ND	ND	ND	ND	ND	NI	NS
	26-Oct-00	NR	100	ND	ND	ND	ND	ND	ND	NI	NS
	18-Apr-01	NR	100	ND	ND	ND	ND	ND	ND	NI	NS
	27-Oct-01	NR	100	ND	ND	ND	ND	ND	ND	NI	NS
	19-Nov-02	NR	100	ND	ND	ND	ND	ND	ND	NI	NS
	27-Jun-03	NR	100	ND	ND	ND	ND	ND	ND	NI	NS
	30-Dec-03	NR	100	ND	ND	ND	ND	ND	ND	NI	ND
	30-Jun-04	NR	100	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-04	NR	100	ND	ND	ND	ND	ND	ND	NI	ND
	29-Jun-05	NR	100	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-05	NR	100	ND	ND	ND	ND	ND	ND	NI	ND
	28-Jun-06	NR	100	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-06	NR	100	ND	ND	ND	ND	ND	ND	NI	ND
	12-Jul-07	NR	100	ND	ND	ND	ND	ND	ND	NI	ND
NC 2L = NE ug/L (10/23/07)	19-Dec-07	NR	100	ND	ND	ND	ND	ND	ND	ND	ND
	8-Jul-08	NR	100	ND	ND	ND	ND	ND	ND	NS	ND
	17-Dec-08	1.0	100	ND	ND	ND	ND	ND	ND	NS	ND
	9-Jul-09	1.0	100	ND	ND	ND	ND	ND	ND	ND	ND
	16-Dec-09	1.0	100	ND	ND	ND	ND	ND	ND	NS	ND
	24-Jun-10	1.0	100	ND	ND	ND	ND	ND	ND	NS	ND
	13-Dec-10	1.0	100	ND	ND	ND	ND	ND	ND	NS	ND
	20-Jun-11	1.0	100	ND	ND	ND	ND	ND	ND	NS	ND
	5-Dec-11	1.0	100	ND	ND	ND	ND	ND	ND	NS	ND
	11-Jun-12	1.0	100	ND	ND	ND	ND	ND	ND	ND	ND
	12-Dec-12	1.0	100	ND	ND	ND	ND	ND	ND	NS	ND
	1-May-13	1.0	100	ND	ND	ND	ND	ND	ND	ND	ND
	5-Aug-13	1.0	100	ND	ND	ND	ND	ND	ND	NS	ND
	24-Feb-14	1.0	100	ND	ND	ND	ND	ND	ND	ND	ND

TABLE 4:
HISTORICAL CONSTITUENTS IN GROUNDWATER

Analyte	Sample Date	DL	RL	MW-1R	MW-2R	MW-3R	MW-4	MW-5	MW-6	NES-1S	Field Blanks
1,1-Dichloroethane	1-Dec-97	NR	5	ND	ND	1.0	ND	ND	ND	NI	NS
	20-May-98	NR	5	ND	ND	ND	ND	ND	ND	NI	NS
	19-Nov-98	NR	5	ND	ND	ND	ND	ND	ND	NI	NS
	21-Jul-99	NR	5	ND	ND	ND	ND	ND	ND	NI	NS
	16-Nov-99	NR	5	ND	ND	ND	ND	ND	ND	NI	NS
	10-May-00	NR	5	ND	ND	ND	ND	ND	ND	NI	NS
	26-Oct-00	NR	5	ND	ND	ND	ND	ND	ND	NI	NS
	18-Apr-01	NR	5	ND	ND	ND	ND	ND	ND	NI	NS
	27-Oct-01	NR	5	ND	ND	ND	ND	ND	ND	NI	NS
	13-Jun-02	NR	5	ND	ND	ND	ND	ND	ND	NI	NS
	19-Nov-02	NR	5	ND	ND	ND	ND	ND	ND	NI	NS
	27-Jun-03	NR	5	ND	ND	ND	ND	ND	ND	NI	NS
	30-Dec-03	NR	5	ND	ND	ND	ND	ND	ND	NI	ND
	30-Jun-04	NR	5	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-04	NR	5	ND	ND	ND	ND	ND	ND	NI	ND
	29-Jun-05	NR	5	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-05	NR	5	ND	ND	ND	ND	ND	ND	NI	ND
	28-Jun-06	NR	5	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-06	NR	5	ND	ND	ND	ND	ND	ND	NI	ND
	12-Jul-07	NR	5	ND	ND	0.36 J	0.52 J	ND	ND	NI	ND
NC 2L = 70 ug/L (10/23/07)	19-Dec-07	NR	5	ND	ND	ND	0.57 J	ND	ND	ND	ND
	8-Jul-08	NR	5	ND	ND	ND	0.60 J	ND	ND	NS	ND
	17-Dec-08	0.32	5.0	ND	ND	ND	0.51 J	ND	ND	NS	ND
	9-Jul-09	0.32	5.0	ND	ND	ND	0.84 J	ND	ND	ND	ND
	16-Dec-09	0.32	5.0	ND	ND	ND	0.73 J	ND	ND	NS	ND
NC 2L = 6 ug/L (02/05/10)	24-Jun-10	0.32	5.0	ND	ND	ND	0.53 J	ND	ND	NS	ND
	13-Dec-10	0.32	5.0	ND	ND	ND	0.60 J	ND	ND	NS	ND
	20-Jun-11	0.32	5.0	ND	ND	ND	0.63 J	ND	ND	NS	ND
	5-Dec-11	0.32	5.0	ND	ND	ND	0.67 J	ND	ND	NS	ND
	11-Jun-12	0.32	5.0	ND	ND	ND	ND	ND	ND	ND	ND
	12-Dec-12	0.32	5.0	ND	ND	ND	0.61 J	ND	ND	NS	ND
	1-May-13	0.32	5.0	ND	ND	ND	0.62 J	ND	ND	ND	ND
	8-May-13	0.32	5.0	ND	ND	ND	0.53 J	ND	ND	NS	ND
	24-Feb-14	0.32	5.0	ND	ND	ND	0.50 J	ND	ND	ND	ND
1,2-Dichloroethane	17-Dec-08	0.12	1.0	ND	ND	0.15 J	ND	ND	ND	NS	ND
NC 2L = 0.38 ug/L (10/23/07)	9-Jul-09	0.12	1.0	ND	ND	ND	ND	ND	ND	ND	0.19 J
	16-Dec-09	0.12	1.0	ND	ND	0.14 J	ND	ND	ND	NS	ND
NC 2L = 0.4 ug/L (02/05/10)	24-Jun-10	0.12	1.0	ND	ND	ND	ND	ND	ND	NS	ND
	13-Dec-10	0.12	1.0	ND	ND	ND	ND	ND	ND	NS	ND
	20-Jun-11	0.12	1.0	ND	ND	ND	ND	ND	ND	NS	ND
	5-Dec-11	0.12	1.0	ND	ND	ND	ND	0.18 J	ND	NS	ND
	11-Jun-12	0.12	1.0	ND	ND	ND	ND	ND	ND	ND	ND
	12-Dec-12	0.12	1.0	ND	ND	ND	ND	-0.20 J	ND	NS	0.20 (ND) J
	1-May-13	0.12	1.0	ND	ND	ND	ND	ND	ND	ND	ND
	5-Aug-13	0.12	1.0	ND	ND	ND	ND	ND	ND	NS	ND
	24-Feb-14	0.12	1.0	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	17-Dec-08	0.30	1.0	ND	0.31 J	ND	ND	ND	ND	NS	ND
NC 2L = 550 ug/L (10/23/07)	9-Jul-09	0.30	1.0	ND	ND	ND	ND	ND	ND	ND	ND
	16-Dec-09	0.30	1.0	ND	ND	ND	ND	ND	ND	NS	ND
NC 2L = 600 ug/L (02/05/10)	24-Jun-10	0.30	1.0	ND	ND	ND	ND	ND	ND	NS	ND
	13-Dec-10	0.30	1.0	ND	ND	ND	ND	ND	ND	NS	ND
	20-Jun-11	0.30	1.0	ND	ND	ND	ND	ND	ND	NS	ND
	5-Dec-11	0.30	1.0	ND	ND	ND	ND	ND	ND	NS	ND
	11-Jun-12	0.30	1.0	ND	ND	ND	ND	ND	ND	ND	ND
	12-Dec-12	0.30	1.0	ND	ND	ND	ND	ND	ND	NS	ND
	1-May-13	0.30	1.0	ND	ND	ND	ND	ND	ND	ND	ND
	5-Aug-13	0.30	1.0	ND	ND	ND	ND	ND	ND	NS	ND
	24-Feb-14	0.30	1.0	ND	ND	ND	ND	ND	ND	ND	ND
Isobutanol*	24-Jun-10	35.0	100	ND	59.0 J	ND	ND	ND	ND	NS	ND
NC 2L = NE ug/L (02/05/10)	13-Dec-10	NR	NR	NS	NS	NS	NS	NS	NS	NS	NS
	20-Jun-11	35.0	100	ND	39.5 J	ND	ND	ND	ND	NS	ND
	5-Dec-11	NR	NR	NS	NS	NS	NS	NS	NS	NS	NS
	11-Jun-12	35.0	100.0	ND	ND	ND	ND	ND	ND	ND	ND
	12-Dec-12	NR	NR	NS	NS	NS	NS	NS	NS	NS	NS
	1-May-13	35.0	100	ND	ND	ND	ND	ND	ND	NS	ND
	5-Aug-13	NR	NR	NS	NS	NS	NS	NS	NS	NS	NS
	24-Feb-14	35.0	100	ND	ND	ND	ND	ND	ND	NS	ND
Methylene Chloride	9-Jul-09	0.97	2.0	ND	ND	ND	ND	ND	ND	ND	9.6
NC 2L = 4.3 ug/L (10/23/07)	16-Dec-09	0.97	2.0	ND	ND	ND	ND	ND	ND	NS	ND
	24-Jun-10	0.97	1.0	ND	19.0	ND	ND	ND	ND	NS	ND
NC 2L = 5 ug/L (02/05/10) *Resample >*	12-Aug-10	0.97	1.0	NS	ND	NS	NS	NS	NS	NS	ND
	13-Dec-10	0.97	1.0	ND	ND	ND	ND	ND	ND	NS	ND
	20-Jun-11	0.97	1.0	ND	ND	ND	ND	ND	ND	NS	ND
	5-Dec-11	0.97	1.0	ND	ND	ND	ND	ND	ND	NS	ND
	11-Jun-12	0.97	1.0	ND	ND	ND	ND	ND	ND	ND	ND
	12-Dec-12	0.97	1.0	ND	ND	ND	ND	ND	ND	NS	ND
	1-May-13	0.97	1.0	ND	ND	ND	ND	ND	ND	ND	ND
	5-Aug-13	0.97	1.0	ND	ND	ND	ND	ND	ND	NS	ND
	24-Feb-14	0.97	1.0	1.0	ND	ND	ND	ND	ND	ND	ND

TABLE 4:
HISTORICAL CONSTITUENTS IN GROUNDWATER

Analyte	Sample Date	DL	RL	MW-1R	MW-2R	MW-3R	MW-4	MW-5	MW-6	NES-1S	Field Blanks
Naphthalene*	8-Jul-08	NR	10	ND	3.8 J	ND	ND	ND	ND	NS	ND
NC 2L = 21 ug/L (10/23/07)	17-Dec-08	NR	NR	NS	NS	NS	NS	NS	NS	NS	NS
	9-Jul-09	0.24	10.0	ND	2.4 J	ND	ND	ND	ND	NS	ND
	16-Dec-09	NR	NR	NS	NS	NS	NS	NS	NS	NS	NS
NC 2L = 6 ug/L (02/05/10)	24-Jun-10	0.24	10.0	ND	7.4 J	ND	ND	ND	ND	NS	ND
	13-Dec-10	NR	NR	NS	NS	NS	NS	NS	NS	NS	NS
	20-Jun-11	0.24	10.0	ND	4.6 J	ND	ND	ND	ND	NS	0.39 J
	5-Dec-11	NR	NR	NS	NS	NS	NS	NS	NS	NS	NS
	11-Jun-12	0.2	10.0	ND	4.6 J	ND	ND	ND	ND	ND	ND
	12-Dec-12	NR	NR	NS	NS	NS	NS	NS	NS	NS	NS
	1-May-13	0.24	10.0	ND	5.1 J	ND	ND	ND	ND	NS	ND
	5-Aug-13	NR	NR	NS	NS	NS	NS	NS	NS	NS	NS
	24-Feb-14	0.24	10.0	ND	5.8 J	ND	ND	ND	ND	NS	ND
Toluene	20-May-98	NR	5	ND	ND	8.1	ND	ND	ND	NI	NS
	19-Nov-98	NR	5	ND	ND	ND	ND	ND	ND	NI	NS
	21-Jul-99	NR	5	ND	ND	ND	ND	ND	ND	NI	NS
	16-Nov-99	NR	5	ND	ND	ND	ND	ND	ND	NI	NS
	10-May-00	NR	5	ND	ND	ND	ND	ND	ND	NI	NS
	26-Oct-00	NR	5	ND	ND	ND	ND	ND	ND	NI	NS
	18-Apr-01	NR	5	ND	ND	ND	ND	ND	ND	NI	NS
	27-Oct-01	NR	5	ND	ND	ND	ND	ND	ND	NI	NS
	13-Jun-02	NR	5	ND	ND	ND	ND	ND	ND	NI	NS
	19-Nov-02	NR	5	ND	ND	ND	ND	ND	ND	NI	NS
	27-Jun-03	NR	5	ND	ND	ND	ND	ND	ND	NI	-
	30-Dec-03	NR	5	ND	ND	ND	ND	ND	ND	NI	ND
	30-Jun-04	NR	5	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-04	NR	5	ND	ND	ND	ND	ND	ND	NI	ND
	29-Jun-05	NR	5	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-05	NR	5	ND	ND	ND	ND	ND	ND	NI	ND
	28-Jun-06	NR	5	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-06	NR	5	ND	ND	ND	ND	ND	ND	NI	ND
	12-Jul-07	NR	1	ND	0.49 B	ND	ND	ND	ND	NI	0.34 J
NC 2L = 1,000 ug/L (10/23/07)	19-Dec-07	NR	1	ND	0.51 J	ND	ND	ND	ND	ND	ND
	8-Jul-08	NR	1	ND	0.39 J	ND	ND	1.3	ND	NS	ND
	17-Dec-08	0.26	1.0	1.4	1.6	ND	ND	11.7	ND	NS	ND
	9-Jul-09	0.26	1.0	ND	0.46 J	ND	ND	ND	ND	ND	ND
	16-Dec-09	0.26	1.0	ND	0.42 J	ND	ND	ND	ND	NS	ND
NC 2L = 600 ug/L (02/05/10)	24-Jun-10	0.26	1.0	ND	ND	ND	ND	ND	ND	NS	ND
	13-Dec-10	0.26	1.0	ND	0.54 J	ND	ND	ND	ND	NS	ND
	20-Jun-11	0.26	1.0	ND	0.34 J	ND	ND	ND	ND	NS	ND
	5-Dec-11	0.26	1.0	ND	0.28 J	ND	ND	0.30 J	ND	NS	ND
	11-Jun-12	0.26	1.0	ND	0.28 J	ND	ND	ND	ND	ND	ND
	12-Dec-12	0.26	1.0	ND	0.29 J	ND	ND	0.36 J	ND	NS	ND
	1-May-13	0.26	1.0	ND	ND	ND	ND	ND	ND	ND	ND
	5-Aug-13	0.26	1.0	ND	0.29 J	ND	ND	ND	ND	NS	ND
	24-Feb-14	0.26	1.0	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl Chloride	8-Sep-94	NR	10	ND	ND	12.0	ND	ND	ND	NI	NS
	1-Dec-94	NR	10	ND	ND	13.0	ND	ND	ND	NI	NS
	9-Feb-95	NR	10	ND	ND	15.0	ND	ND	ND	NI	NS
	2-Mar-95	NR	10	ND	ND	14.0	ND	ND	ND	NI	NS
	15-Nov-95	NR	10	ND	ND	11.0	ND	ND	ND	NI	NS
	28-May-96	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	22-Nov-96	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	17-Jun-97	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	1-Dec-97	NR	10	ND	ND	7.0	4.0	ND	ND	NI	NS
	20-May-98	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	19-Nov-98	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	21-Jul-99	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	16-Nov-99	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	10-May-00	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	26-Oct-00	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	18-Apr-01	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	27-Oct-01	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	13-Jun-02	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	19-Nov-02	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	27-Jun-03	NR	10	ND	ND	ND	ND	ND	ND	NI	NS
	30-Dec-03	NR	10	ND	ND	ND	ND	ND	ND	NI	ND
	30-Jun-04	NR	10	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-04	NR	10	ND	ND	ND	ND	ND	ND	NI	ND
	29-Jun-05	NR	10	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-05	NR	10	ND	ND	ND	ND	ND	ND	NI	ND
	28-Jun-06	NR	10	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-06	NR	5.5	ND	ND	0.98 J	ND	ND	ND	NI	ND
Resample >	23-Feb-07	NR	5.5	NS	NS	1.0	NS	NS	NS	NI	ND
	12-Jul-07	NR	1	ND	ND	ND	ND	ND	ND	NS	ND
NC 2L = 0.015 ug/L (10/23/07)	19-Dec-07	NR	1	ND	ND	ND	ND	ND	ND	ND	ND
	8-Jul-08	NR	1	ND	ND	0.76 J	ND	ND	ND	NS	ND
	17-Dec-08	0.62	1.0	ND	ND	0.76 J	ND	ND	ND	NS	ND
	9-Jul-09	0.62	1.0	ND	ND	0.99 J	ND	ND	ND	ND	ND
	16-Dec-09	0.62	1.0	ND	ND	0.81 J	ND	ND	ND	NS	ND
NC 2L = 0.03 ug/L (02/05/10)	24-Jun-10	0.62	1.0	ND	ND	0.77 J	ND	ND	ND	NS	ND
	13-Dec-10	0.62	1.0	ND	ND	ND	ND	ND	ND	NS	ND
	20-Jun-11	0.62	1.0	ND	ND	ND	ND	ND	ND	NS	ND
	5-Dec-11	0.62	1.0	ND	ND	ND	ND	ND	ND	NS	ND
	11-Jun-12	0.62	1.0	ND	ND	ND	ND	ND	ND	ND	ND
	12-Dec-12	0.62	1.0	ND	ND	ND	ND	ND	ND	NS	ND
	1-May-13	0.62	1.0	ND	ND	ND	ND	ND	ND	ND	ND
	5-Aug-13	0.62	1.0	ND	ND	ND	ND	ND	ND	NS	ND
	24-Feb-14	0.62	1.0	ND	ND	ND	ND	ND	ND	ND	ND

TABLE 4:
HISTORICAL CONSTITUENTS IN GROUNDWATER

Analyte	Sample Date	DL	RL	MW-1R	MW-2R	MW-3R	MW-4	MW-5	MW-6	NES-1S	Field Blanks
Total Xylenes	29-Dec-06	NR	5	ND	1.4	ND	ND	ND	ND	NI	ND
	12-Jul-07	NR	4	ND	1.2 J	ND	ND	ND	ND	NI	ND
NC 2L = 530 ug/L (10/23/07)	19-Dec-07	NR	4	ND	2.0	ND	ND	ND	ND	ND	ND
	8-Jul-08	NR	4	ND	1.1 J	ND	ND	ND	ND	NS	ND
	17-Dec-08	0.66	2.0	1.4 J	2.7	ND	ND	ND	ND	NS	ND
	9-Jul-09	0.66	2.0	ND	1.5 J	ND	ND	ND	ND	ND	ND
	16-Dec-09	0.66	2.0	ND	2.2	ND	ND	ND	ND	NS	ND
NC 2L = 500 ug/L (02/05/10)	24-Jun-10	0.66	2.0	ND	0.73 J	ND	ND	ND	ND	NS	ND
	13-Dec-10	0.66	2.0	ND	2.0	ND	ND	ND	ND	NS	ND
	20-Jun-11	0.66	2.0	ND	1.4 J	ND	ND	ND	ND	NS	ND
	5-Dec-11	0.66	2.0	ND	1.1 J	ND	ND	ND	ND	NS	ND
	11-Jun-12	0.66	2.0	ND	0.91 J	ND	ND	ND	ND	ND	ND
	12-Dec-12	0.66	5.0	ND	0.97 J	ND	ND	ND	ND	NS	ND
	1-May-13	0.66	5.0	ND	0.68 J	ND	ND	ND	ND	ND	ND
	5-Aug-13	0.66	5.0	ND	ND	ND	ND	ND	ND	NS	ND
	24-Feb-14	0.66	5.0	ND	ND	ND	ND	ND	ND	ND	ND
Bis(2-Ethylhexyl)phthalate	24-Feb-14	0.79	15.0	2.6 J	ND	ND	ND	ND	ND	ND	ND
NC 2L = 3 ug/L (2/5/10)											
N-Nitroso-di-n-butylamine	24-Feb-14	7.5	10.0	ND	ND	ND	8.6 J	ND	ND	ND	ND
Benzo(g,h,i)perylene*	20-Jun-11	0.4	10.0	ND	ND	ND	ND	ND	1.4 J	NS	ND
NC 2L = 200 ug/L (2/5/10)	5-Dec-11	NR	NR	NS	NS	NS	NS	NS	NS	NS	NS
	11-Jun-12	0.38	10.0	ND	ND	ND	ND	ND	ND	NS	ND
	12-Dec-12	NR	NR	NS	NS	NS	NS	NS	NS	NS	NS
	1-May-13	0.38	10.0	ND	ND	ND	ND	ND	ND	NS	ND
	5-Aug-13	NR	NR	NS	NS	NS	NS	NS	NS	NS	NS
	24-Feb-14	0.38	10.0	ND	ND	ND	ND	ND	ND	NS	ND
Dibenz(a,h)anthracene*	20-Jun-11	0.55	10.0	ND	ND	ND	ND	ND	1.5 J	NS	ND
NC 2L = 0.005 ug/L (2/5/10)	5-Dec-11	NR	NR	NS	NS	NS	NS	NS	NS	NS	NS
	11-Jun-12	0.55	10.0	ND	ND	ND	ND	ND	ND	NS	ND
	12-Dec-12	NR	NR	NS	NS	NS	NS	NS	NS	NS	NS
	1-May-13	0.55	10.0	ND	ND	ND	ND	ND	ND	NS	ND
	5-Aug-13	NR	NR	NS	NS	NS	NS	NS	NS	NS	NS
	24-Feb-14	0.55	10.0	ND	ND	ND	ND	ND	ND	NS	ND
Fluorene*	24-Jun-10	3.8	12.2	ND	4.3 J	ND	ND	ND	ND	NS	ND
NC 2L = 300 ug/L (2/5/10) *Resample >*	12-Aug-10	3.1	10.0	NS	ND	NS	NS	NS	NS	NS	ND
	13-Dec-10	NR	NR	NS	NS	NS	NS	NS	NS	NS	NS
	20-Jun-11	0.2	10.0	ND	ND	ND	ND	ND	ND	NS	ND
	5-Dec-11	NR	NR	NS	NS	NS	NS	NS	NS	NS	NS
	11-Jun-12	0.21	10.0	ND	ND	ND	ND	ND	ND	NS	ND
	12-Dec-12	NR	NR	NS	NS	NS	NS	NS	NS	NS	NS
	1-May-13	0.21	10.0	ND	ND	ND	ND	ND	ND	NS	ND
	5-Aug-13	NR	NR	NS	NS	NS	NS	NS	NS	NS	NS
	24-Feb-14	0.21	10.0	ND	ND	ND	ND	ND	ND	NS	ND
Indeno(1,2,3-cd)pyrene*	20-Jun-11	0.29	10.0	ND	ND	ND	ND	ND	1.3 J	NS	ND
NC 2L = 0.05 ug/L (2/5/10)	5-Dec-11	NR	NR	NS	NS	NS	NS	NS	NS	NS	NS
	11-Jun-12	0.29	10.0	ND	ND	ND	ND	ND	ND	NS	ND
	12-Dec-12	NR	NR	NS	NS	NS	NS	NS	NS	NS	NS
	1-May-13	0.29	10.0	ND	ND	ND	ND	ND	ND	NS	ND
	5-Aug-13	NR	NR	NS	NS	NS	NS	NS	NS	NS	NS
	24-Feb-14	0.29	10.0	ND	ND	ND	ND	ND	ND	NS	ND
2-Methylnaphthalene*	24-Jun-10	5.1	12.2	ND	38.9	ND	ND	ND	ND	NS	ND
NC 2L = 30 ug/L (02/05/10) *Resample >*	12-Aug-10	4.2	10	NS	ND	NS	NS	NS	NS	NS	ND
	13-Dec-10	NR	NR	NS	NS	NS	NS	NS	NS	NS	NS
	20-Jun-11	0.3	10.0	ND	ND	ND	ND	ND	ND	NS	ND
	5-Dec-11	NR	NR	NS	NS	NS	NS	NS	NS	NS	NS
	11-Jun-12	0.28	10.0	ND	ND	ND	ND	ND	ND	NS	ND
	12-Dec-12	NR	NR	NS	NS	NS	NS	NS	NS	NS	NS
	1-May-13	0.28	10.0	ND	ND	ND	ND	ND	ND	NS	ND
	5-Aug-13	NR	NR	NS	NS	NS	NS	NS	NS	NS	NS
	24-Feb-14	0.28	10.0	ND	ND	ND	ND	ND	ND	NS	ND
Phorate	18-Apr-01	NR	10	NS	3.2	ND	ND	ND	NS	NI	NS
	27-Oct-01	NR	5	ND	8.1	ND	ND	ND	ND	NI	NS
	27-Oct-01	NR	0.5	NS	8.1	1.3	ND	ND	NS	NI	NS
	13-Jun-02	NR	5	ND	ND	ND	ND	ND	ND	NI	NS
	13-Jun-02	NR	0.5	NS	ND	ND	ND	ND	NS	NI	NS
	19-Nov-02	NR	5	ND	ND	ND	ND	ND	ND	NI	NS
	27-Jun-03	NR	5	ND	ND	ND	ND	ND	ND	NI	ND
	30-Jun-04	NR	10	ND	ND	ND	ND	ND	ND	NI	ND
	29-Jun-05	NR	10	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-05	NR	NR	NS	NS	NS	NS	NS	NS	NI	NS
	28-Jun-06	NR	10	ND	ND	ND	ND	ND	ND	NI	ND
	29-Dec-06	NR	NR	NS	NS	NS	NS	NS	NS	NI	NS
	12-Jul-07	NR	10	ND	ND	ND	ND	ND	ND	NI	ND
NC 2L = 1.4 ug/L (10/23/07)	19-Dec-07	NR	NR	NS	NS	NS	NS	NS	NS	ND	NS
	8-Jul-08	NR	10	ND	ND	ND	ND	ND	ND	NS	ND
	17-Dec-08	NR	NR	NS	NS	NS	NS	NS	NS	NS	NS
	9-Jul-09	6.6	22.2	ND	ND	ND	ND	ND	ND	NS	ND
	16-Dec-09	NR	NR	NS	NS	NS	NS	NS	NS	NS	NS
NC 2L = 1 ug/L (02/05/10)	24-Jun-10	6.5	24.1	ND	ND	ND	ND	ND	ND	NS	ND
	13-Dec-10	NR	NR	NS	NS	NS	NS	NS	NS	NS	NS
	20-Jun-11	5.4	10.0	ND	ND	ND	ND	ND	ND	NS	ND
	5-Dec-11	NR	NR	NS	NS	NS	NS	NS	NS	NS	NS
	11-Jun-12	5.4	10.0	ND	ND	ND	ND	ND	ND	NS	ND
	12-Dec-12	NR	NR	NS	NS	NS	NS	NS	NS	NS	NS
	1-May-13	5.4	10.0	ND	ND	ND	ND	ND	ND	NS	ND
	5-Aug-13	NR	NR	NS	NS	NS	NS	NS	NS	NS	NS
	24-Feb-14	5.4	10.0	ND	ND	ND	ND	ND	ND	NS	ND

TABLE 4:
HISTORICAL CONSTITUENTS IN GROUNDWATER

Analyte		Sample Date	DL	RL	MW-1R	MW-2R	MW-3R	MW-4	MW-5	MW-6	NES-1S	Field Blanks
Beta-BHC*		11-Jun-12	0.050	0.050	ND	ND	0.16	ND	ND	ND	NS	ND
NC 2L = 0.019 ug/L (10/23/07)	*Resample>*	19-Jul-12	0.050	0.050	NS	NS	ND	NS	NS	NS	NS	NS
		12-Dec-12	NR	NR	NS	NS	NS	NS	NS	NS	NS	NS
		1-May-13	0.050	0.050	ND	ND	ND	ND	ND	ND	NS	ND
		5-Aug-13	NR	NR	NS	NS	NS	NS	NS	NS	NS	NS
		24-Feb-14	0.050	0.050	ND	0.052	ND	ND	ND	ND	NS	ND
Delta-BHC*		11-Jun-12	0.050	0.050	ND	ND	0.090	ND	ND	ND	NS	ND
NC 2L = 0.019 ug/L (10/23/07)	*Resample>*	19-Jul-12	0.050	0.050	NS	NS	ND	NS	NS	NS	NS	NS
		12-Dec-12	NR	NR	NS	NS	NS	NS	NS	NS	NS	NS
		1-May-13	0.050	0.050	ND	ND	ND	ND	ND	ND	NS	ND
		5-Aug-13	NR	NR	NS	NS	NS	NS	NS	NS	NS	NS
		24-Feb-14	0.050	0.050	ND	ND	ND	ND	ND	ND	NS	ND
Gamma-BHC		27-Jun-03	NR	1.05	ND	0.085	ND	ND	ND	ND	NI	ND
		30-Dec-03	NR	0.05	ND	ND	ND	ND	ND	ND	NI	ND
		30-Jun-04	NR	0.05	ND	ND	ND	ND	ND	ND	NI	ND
		29-Dec-04	NR	0.05	ND	ND	ND	ND	ND	ND	NI	ND
		29-Jun-05	NR	0.05	ND	ND	ND	ND	ND	ND	NI	ND
		29-Dec-05	NR	0.05	ND	ND	ND	ND	ND	ND	NI	ND
		28-Jun-06	NR	0.05	ND	ND	ND	ND	ND	ND	NI	ND
		29-Dec-06	NR	0.05	ND	ND	ND	ND	ND	ND	NI	ND
		12-Jul-07	NR	0.05	ND	ND	ND	ND	ND	ND	NI	ND
NC 2L = 0.2 ug/L (10/23/07)		19-Dec-07	NR	0.05	ND	ND	ND	ND	ND	ND	ND	ND
		8-Jul-08	NR	0.50	ND	ND	ND	ND	ND	ND	NS	ND
		17-Dec-08	0.050	0.050	ND	ND	ND	ND	ND	ND	NS	ND
		9-Jul-09	0.050	0.050	ND	ND	ND	ND	ND	ND	NS	ND
		16-Dec-09	0.01	0.1	ND	ND	ND	ND	ND	ND	NS	ND
NC 2L = 0.03 ug/L (02/05/10)		24-Jun-10	0.00021	0.010	ND	ND	0.052	ND	ND	ND	NS	ND
	Resample >	12-Aug-10	0.00020	0.010	NS	NS	ND	NS	NS	NS	NS	ND
		13-Dec-10	0.00020	0.050	ND	ND	0.013 J	ND	ND	ND	NS	ND
		20-Jun-11	0.00020	0.050	ND	ND	0.066	ND	ND	ND	NS	ND
	Resample >	28-Jul-11	0.00020	0.010	NS	NS	ND	NS	NS	NS	NS	ND
		5-Dec-11	0.050	0.050	ND	ND	ND	ND	ND	ND	NS	ND
		11-Jun-12	0.050	0.050	ND	ND	ND	ND	ND	ND	NS	ND
		12-Dec-12	0.050	0.050	ND	ND	ND	ND	ND	ND	NS	ND
		1-May-13	0.050	0.050	ND	ND	ND	ND	ND	ND	NS	ND
		5-Aug-13	0.050	0.050	ND	ND	ND	ND	ND	ND	NS	ND
		24-Feb-14	0.050	0.050	ND	ND	ND	ND	ND	ND	NS	ND
Heptachlor		27-Jun-03	NR	1.05	ND	0.03	0.17	ND	ND	ND	NI	ND
		30-Dec-03	NR	0.05	ND	ND	ND	ND	ND	ND	NI	ND
		30-Jun-04	NR	0.05	ND	ND	ND	ND	ND	ND	NI	ND
		29-Dec-04	NR	0.05	ND	ND	ND	ND	ND	ND	NI	ND
		29-Jun-05	NR	0.05	ND	ND	ND	ND	ND	ND	NI	ND
		29-Dec-05	NR	0.05	ND	ND	ND	ND	ND	ND	NI	ND
		28-Jun-06	NR	0.05	ND	ND	ND	ND	ND	ND	NI	ND
		29-Dec-06	NR	0.05	ND	ND	ND	ND	ND	ND	NI	ND
		12-Jul-07	NR	0.05	ND	ND	ND	ND	ND	ND	NI	ND
NC 2L = 0.0078 ug/L (10/23/07)		19-Dec-07	NR	0.05	ND	ND	ND	ND	ND	ND	ND	ND
		8-Jul-08	NR	0.05	ND	ND	ND	ND	ND	ND	NS	ND
		17-Dec-08	0.050	0.050	ND	ND	ND	ND	ND	ND	NS	ND
		9-Jul-09	0.050	0.050	ND	ND	ND	ND	ND	ND	NS	ND
		16-Dec-09	0.02	0.1	ND	ND	ND	ND	ND	ND	NS	ND
NC 2L = 0.008 ug/L (02/05/10)		24-Jun-10	0.0015	0.010	ND	ND	ND	ND	ND	ND	NS	ND
		13-Dec-10	0.0500	0.0015	ND	ND	ND	ND	ND	ND	NS	ND
		20-Jun-11	0.050	0.0015	ND	ND	ND	ND	ND	ND	NS	ND
		5-Dec-11	0.050	0.056	ND	0.062	ND	ND	ND	ND	NS	ND
	Resample >	25-Jan-12	0.050	0.0500	NS	ND	NS	NS	NS	NS	NS	ND
		11-Jun-12	0.050	0.050	ND	ND	ND	ND	ND	ND	NS	ND
		12-Dec-12	0.050	0.050	ND	ND	ND	ND	ND	ND	NS	ND
		1-May-13	0.050	0.050	ND	ND	ND	ND	ND	ND	NS	ND
		5-Aug-13	0.050	0.050	ND	ND	ND	ND	ND	ND	NS	ND
		24-Feb-14	0.050	0.050	ND	ND	ND	ND	ND	ND	NS	ND
2,4-D*		27-Jun-03	NR	3	NS	5.9	ND	ND	ND	NS	NI	NS
		30-Dec-03	NR	2	ND	ND	ND	ND	ND	ND	NI	ND
		30-Jun-04	NR	2	ND	ND	ND	ND	ND	ND	NI	ND
		29-Dec-04	NR	2	ND	ND	ND	ND	ND	ND	NI	ND
		29-Jun-05	NR	2	ND	ND	ND	ND	ND	ND	NI	ND
		29-Dec-05	NR	2	ND	ND	ND	ND	ND	ND	NI	ND
		28-Jun-06	NR	2	ND	ND	ND	ND	ND	ND	NI	ND
		29-Dec-06	NR	2	ND	ND	ND	ND	ND	ND	NI	ND
		12-Jul-07	NR	2	ND	ND	ND	ND	ND	ND	NI	ND
NC 2L = 70 ug/L (10/23/07)		19-Dec-07	NR	2	ND	ND	ND	ND	ND	ND	ND	ND
		8-Apr-08	NR	2	ND	ND	ND	ND	ND	ND	NS	ND
		17-Dec-08	NR	2.0	ND	ND	ND	ND	ND	ND	NS	ND
		9-Jul-09	NR	2.0	ND	ND	ND	ND	ND	ND	NS	ND
		16-Dec-09	0.11	5.0	ND	ND	ND	ND	ND	ND	NS	ND
		24-Jun-10	0.23	2.1	ND	ND	ND	ND	ND	ND	NS	ND
		10-Dec-10	0.22	2.0	ND	ND	ND	ND	ND	ND	NS	ND
		20-Jun-11	0.22	2.0	ND	ND	ND	ND	ND	ND	NS	ND
		5-Dec-11	0.22	2.0	ND	ND	ND	ND	ND	ND	NS	ND
		11-Jun-12	0.22	2.0	ND	ND	ND	ND	ND	ND	NS	ND
		12-Dec-12	0.22	2.0	ND	ND	ND	ND	ND	ND	NS	ND
		1-May-13	0.22	2.0	ND	ND	ND	ND	ND	ND	NS	ND
		5-Aug-13	0.22	2.0	ND	ND	ND	ND	ND	ND	NS	ND
		24-Feb-14	0.22	2.0	ND	ND	ND	ND	ND	ND	NS	ND
4,4'-DDD*		11-Jun-12	0.05	0.05	ND	ND	0.13	ND	ND	ND	NS	ND
NC 2L = 0.1 µg/L (2/5/10)	*Resample>*	19-Jul-12	0.05	0.10	NS	NS	ND	NS	NS	NS	NS	NS
		12-Dec-12	NR	NR	NS	NS	NS	NS	NS	NS	NS	NS
		1-May-13	0.050	0.10	ND	ND	ND	ND	ND	ND	NS	ND
		5-Aug-13	NR	NR	NS	NS	NS	NS	NS	NS	NS	NS
		24-Feb-14	0.050	0.10	ND	ND	ND	ND	ND	ND	NS	ND

TABLE 4:
HISTORICAL CONSTITUENTS IN GROUNDWATER

Analyte	Sample Date	DL	RL	MW-1R	MW-2R	MW-3R	MW-4	MW-5	MW-6	NES-1S	Field Blanks
4,4'-DDT*	11-Jun-12	0.05	0.05	ND	ND	0.10	ND	ND	ND	NS	ND
NC 2L = 0.1 µg/L (2/5/10) *Resample>*	19-Jul-12	0.05	0.10	NS	NS	0.063 J	NS	NS	NS	NS	NS
	12-Dec-12	NR	NR	NS	NS	NS	NS	NS	NS	NS	NS
	1-May-13	0.050	0.10	ND	ND	ND	ND	ND	ND	NS	ND
	5-Aug-13	NR	NR	NS	NS	NS	NS	NS	NS	NS	NS
	24-Feb-14	0.050	0.10	ND	ND	ND	ND	ND	ND	NS	ND
Endrin aldehyde*	11-Jun-12	0.050	0.050	ND	ND	0.14	ND	ND	ND	NS	NS
NC 2L= 2 (2/5/10)	12-Dec-12	0.050	0.10	ND	ND	ND	ND	ND	ND	NS	NS
	1-May-13	0.050	0.10	ND	ND	ND	ND	ND	ND	NS	ND
	5-Aug-13	0.050	0.10	ND	ND	ND	ND	ND	ND	NS	ND
	24-Feb-14	0.050	0.10	ND	ND	ND	ND	ND	ND	NS	ND

Notes:
All concentrations are in micrograms per liter (µg/L).
SWSL = Solid Waste Section Limits (reporting limits established by the NC-DENR Solid Waste Section).
NC 2L = North Carolina Groundwater Standards from 15A NCAC 2L.0202.
GWPS = Groundwater Protection Standards established by the NC-DENR Solid Waste Section.
When the NC 2L has not been established, the GWPS will be used.
DL = Laboratory detection limit.
RL = Laboratory reporting limit (SWSL from October 2007 to present).
J = Estimated value between the DL and the QL.
B = Blank-qualified data (result is unreliable based on similar concentrations in field, trip, or method blanks).
ND = Not detected above the DL.
NI = Well not yet installed.
NS = Not sampled.
NR = Not Reported.
Shaded values for groundwater are above the NC 2L or GWPS.
When results for a constituent are reported by two acceptable methods from the lab, the higher result is entered into the historical table.

TABLE 5:
HISTORICAL CONSTITUENTS IN SURFACE WATER

Analytes	Sample Collection Date	DL	QL	SW-1		SW-2		Field Blanks	
INORGANICS									
Arsenic	06/24/10	2.7	10.00	4.30	J	2.90	J	ND	
NC 2B = 10 ug/L (03/28/08)	12/13/10	2.7	10.0	ND		ND		ND	
	06/20/11	5	10.0	ND		ND		ND	
	12/05/11	5	10.0	ND		ND		ND	
	06/11/12	5	10.0	ND		ND		ND	
	12/12/12	5	10.0	ND		ND		ND	
	05/01/13	5	10.0	ND		ND		ND	
	08/05/13	5	10.0	ND		ND		ND	
	02/24/14	5	10.0	ND		ND		ND	
Barium	11/22/96	NR	500	37.0		37.0		NS	
	06/17/97	NR	500	37.0		62.0		NS	
	12/01/97	NR	500	53.0		45.0		NS	
	05/20/98	NR	500	24.0		69.0		NS	
	11/19/98	NR	500	ND		100.0		NS	
	07/21/99	NR	500	ND		ND		NS	
	11/16/99	NR	500	ND		ND		NS	
	05/10/00	NR	500	ND		ND		NS	
	10/26/00	NR	500	ND		ND		NS	
	04/18/01	NR	500	ND		ND		NS	
	10/27/01	NR	500	ND		ND		NS	
	06/13/02	NR	500	NS		NS		NS	
	11/19/02	NR	500	ND		ND		NS	
	06/27/03	NR	500	ND		ND		NS	
	12/30/03	NR	500	ND		ND		ND	
	06/30/04	NR	500	ND		ND		ND	
	12/29/04	NR	500	ND		ND		ND	
	12/29/04	NR	500	ND		ND		ND	
	06/29/05	NR	500	ND		ND		ND	
	12/29/05	NR	500	ND		ND		ND	
	06/28/06	NR	500	ND		ND		ND	
	12/29/06	NR	100	37.5		40.6		0.20	J
	07/12/07	NR	100	33.3	J	DRY		ND	
	12/19/07	NR	100	52.6	B	149.0		11.7	
NC 2B = 1,000 ug/L (03/28/08)	07/08/08	NR	100	33.8	J	161.0		0.3	J
	12/17/08	0.2	100	30.2	B	33.5	B	10.7	J
	07/09/09	0.2	100	36.8	B	78.4	B	17.6	J
	12/16/09	0.2	100	31.2	B	36.2	B	17.1	J
	06/24/10	0.2	100	34.5	B	71.3	B	27.3	J
	12/13/10	0.2	100	36.1	B	91.0	J	12.1	J
	06/20/11	5	100	40.3	J	93.0	J	ND	
	12/05/11	5	100	32.9	J	59.0	J	ND	
	06/11/12	5	100	40.0	J	95.6	J	ND	
	12/12/12	5	100	45.0	J	97.8	J	ND	
	05/01/13	5	100	32.7	J	43.1	J	ND	
	08/05/13	5	100	49.9	J	79.8	J	ND	
	02/24/14	5	100	29.0	J	30.4	J	ND	

TABLE 5:
HISTORICAL CONSTITUENTS IN SURFACE WATER

Analytes	Sample Collection Date	DL	QL	SW-1		SW-2		Field Blanks	
Beryllium	07/08/08	NR	1.0	0.32	J	ND		ND	
	12/17/08	0.1	1.0	ND		ND		ND	
	07/09/09	0.1	1.0	ND		ND		ND	
	12/16/09	0.1	1.0	0.12	J	ND		ND	
NC 2B = 6.5 ug/L (02/05/10)	06/24/10	0.1	1.0	ND		ND		ND	
	12/13/10	0.1	1.0	ND		ND		ND	
	06/20/11	1	1.0	ND		ND		ND	
	12/05/11	1	1.0	ND		ND		ND	
	06/11/12	1	1.0	ND		ND		ND	
	12/12/12	1	1.0	ND		ND		ND	
	05/01/13	1	1.0	ND		ND		ND	
	08/05/13	1	1.0	ND		ND		ND	
	02/24/14	1	1.0	ND		ND		ND	
Chromium	06/17/97	NR	10.0	ND		3.00		NS	
	12/01/97	NR	10.0	ND		ND		NS	
	05/20/98	NR	10.0	ND		ND		NS	
	11/19/98	NR	10.0	ND		ND		NS	
	07/21/99	NR	10.0	ND		ND		NS	
	11/16/99	NR	10.0	ND		ND		NS	
	05/10/00	NR	10.0	ND		ND		NS	
	10/26/00	NR	10.0	ND		ND		NS	
	04/18/01	NR	10.0	ND		ND		NS	
	10/27/01	NR	10.0	ND		ND		NS	
	06/13/02	NR	10.0	NS		NS		NS	
	11/19/02	NR	10.0	ND		ND		NS	
	06/27/03	NR	10.0	ND		ND		NS	
	12/30/03	NR	10.0	ND		ND		ND	
	06/30/04	NR	10.0	ND		ND		ND	
	12/29/04	NR	10.0	ND		ND		ND	
	06/29/05	NR	10.0	ND		ND		ND	
	12/29/05	NR	10.0	ND		ND		ND	
	06/28/06	NR	10.0	ND		ND		ND	
	12/29/06	NR	10.0	ND		ND		ND	
	07/12/07	NR	10.0	ND		DRY		ND	
	12/19/07	NR	10.0	2.20	B	2.60	B	1.40	J
NC 2B = 50 ug/L (03/28/08)	07/08/08	NR	10.0	2.50	J	2.20	J	ND	
	12/17/08	0.4	10.0	1.40	J	2.60	J	ND	
	07/09/09	0.4	10.0	2.6	J	1.2	J	ND	
	12/16/09	0.4	10.0	4.1	J	3.4	J	ND	
	06/24/10	0.4	10.0	3.3	B	7.3	J	0.71	J
	12/13/10	0.4	10.0	1.4	J	1.5	J	ND	
	06/20/11	5	10.0	ND		ND		ND	
	12/05/11	5	10.0	ND		ND		ND	
	06/11/12	5	10.0	ND		7.2	J	ND	
	12/12/12	5	10.0	ND		8.2	J	ND	
	05/01/13	5	10.0	5.7	J	ND		ND	
	08/05/13	5	10.0	ND		ND		ND	
	02/24/14	5	10.0	ND		ND		ND	

TABLE 5:
HISTORICAL CONSTITUENTS IN SURFACE WATER

Analytes	Sample Collection Date	DL	QL	SW-1		SW-2		Field Blanks	
Cobalt	05/20/98	NR	10	2.0		2.0		NS	
	11/19/98	NR	10	ND		3.0		NS	
	07/21/99	NR	10	ND		ND		NS	
	11/16/99	NR	10	ND		ND		NS	
	05/10/00	NR	10	ND		ND		NS	
	10/26/00	NR	10	ND		ND		NS	
	04/18/01	NR	10	ND		ND		NS	
	10/27/01	NR	10.0	ND		22.0		NS	
	06/13/02	NR	10.0	NS		NS		NS	
	11/19/02	NR	10.0	ND		ND		NS	
	06/27/03	NR	10.0	ND		10.0		NS	
	12/30/03	NR	10.0	ND		ND		ND	
	06/30/04	NR	10.0	ND		ND		ND	
	12/29/04	NR	10.0	ND		ND		ND	
	06/29/05	NR	10.0	ND		ND		ND	
	12/29/05	NR	10.0	ND		ND		ND	
	06/28/06	NR	10.0	ND		ND		ND	
	12/29/06	NR	10.0	ND		ND		ND	
	07/12/07	NR	10.0	ND		DRY		ND	
	12/19/07	NR	10.0	4.2	B	1.20	B	1.8	J
	07/08/08	NR	10.0	4.80	B	10.5	B	6.20	J
	12/17/08	0.6	10.0	1.70	B	1.1	B	2.50	J
	07/09/09	0.6	10.0	ND		ND		ND	
	12/16/09	0.6	10.0	ND		1.0	J	ND	
NC 2B = NE ug/L (03/24/10)	06/24/10	0.6	10.0	ND		ND		ND	
	12/13/10	0.6	10.0	{4.4}	B	{ND}		1.6 {1.0 J}	J
	06/20/11	5	10.0	ND		ND		ND	
	12/05/11	5	10.0	ND		ND		ND	
Resample >	01/25/12	5	10.0	NS		NS		ND	
	06/11/12	5	10.0	ND		5.10	J	ND	
	12/12/12	5	10.0	ND		ND		ND	
	05/01/13	5	10.0	ND		ND		ND	
	08/05/13	5	10.0	ND		ND		ND	
	02/24/14	5	10.0	ND		ND		ND	
Copper	12/29/06	NR	10.0	1.3	B	1.10	B	0.60	J
	07/12/07	NR	10.0	ND		DRY		ND	
	12/19/07	NR	10.0	5.3	B	ND		9.8	
NC 2B = 7 ug/L (03/28/08)	07/08/08	NR	10.0	1.7	J	4.20	J	ND	
	12/17/08	0.3	10.0	1.40	J	1.50	J	ND	
	07/09/09	0.3	10.0	ND		ND		ND	
	12/16/09	0.3	10.0	1.90	J	2.00	J	ND	
	06/24/10	0.3	10.0	ND		3.10	J	ND	
	12/13/10	0.3	10.0	0.31	B	ND		0.49	J
	06/20/11	5	10.0	ND		ND		ND	
	12/05/11	5	10.0	ND		ND		ND	
	06/11/12	5	10.0	ND		5.50	J	ND	
	12/12/12	5	10.0	ND		ND		ND	
	05/01/13	5	10.0	ND		ND		ND	
	08/05/13	5	10.0	ND		ND		ND	
	02/24/14	5	10.0	ND		ND		ND	

TABLE 5:
HISTORICAL CONSTITUENTS IN SURFACE WATER

Analytes	Sample Collection Date	DL	QL	SW-1	SW-2	Field Blanks
Lead	05/20/98	NR	10.0	ND	8.00	NS
	11/19/98	NR	10.0	ND	ND	NS
	07/21/99	NR	10.0	ND	10.0	NS
	11/16/99	NR	10.0	ND	ND	NS
	05/10/00	NR	10.0	ND	ND	NS
	10/26/00	NR	10.0	ND	ND	NS
	04/18/01	NR	10.0	ND	ND	NS
	10/27/01	NR	10.0	ND	ND	NS
	06/13/02	NR	10.0	NS	NS	NS
	11/19/02	NR	10.0	ND	ND	NS
	06/27/03	NR	10.0	ND	ND	NS
	12/30/03	NR	10.0	ND	ND	ND
	06/30/04	NR	10.0	ND	ND	ND
	12/29/04	NR	10.0	ND	ND	ND
	06/29/05	NR	10.0	ND	ND	ND
	12/29/05	NR	10.0	ND	ND	ND
	06/28/06	NR	10.0	ND	ND	ND
	12/29/06	NR	10.0	ND	ND	ND
	07/12/07	NR	10.0	ND	DRY	ND
	12/19/07	NR	10.0	ND	ND	ND
NC 2B = 25 ug/L (03/28/08)	07/08/08	NR	10.0	ND	ND	ND
	12/17/08	4	10.0	ND	ND	ND
	07/09/09	4	10.0	ND	ND	ND
	12/16/09	4	10.0	ND	ND	ND
	06/24/10	4	10.0	ND	ND	ND
	12/13/10	4	10.0	ND	ND	ND
	06/20/11	5	10.0	ND	ND	ND
	12/05/11	5	10.0	ND	ND	ND
	06/11/12	5	10.0	ND	ND	ND
	12/12/12	5	10.0	ND	ND	ND
	05/01/13	5	10.0	ND	ND	ND
	08/05/13	5	10.0	ND	ND	ND
	02/24/14	5	10.0	ND	ND	ND
Nickel	12/29/04	NR	50.0	ND	50.0 (ND)	ND
	06/29/05	NR	50.0	ND	ND	ND
	12/29/05	NR	50.0	ND	ND	ND
	06/28/06	NR	50.0	ND	ND	ND
	12/29/06	NR	50.0	ND	2.9 J	ND
	07/12/07	NR	50.0	3.8 J	DRY	ND
	12/19/07	NR	50.0	6.0	31.5	ND
NC 2B = 25 ug/L (03/28/08)	07/08/08	NR	50.0	3.2 J	29.8 J	ND
	12/17/08	1.7	50.0	2.4 B	4.0 B	2.4 J
	07/09/09	1.7	50.0	4.1 J	12.3 J	ND
	12/16/09	1.7	50.0	3.8 B	4.4 B	3.0 J
	06/24/10	1.7	50.0	ND	2.0 J	ND
	12/13/10	1.7	50.0	ND	14.2 J	2.7 J
	06/20/11	5	50.0	ND	7.8 J	ND
	12/05/11	5	50.0	ND	5.3 J	ND
	06/11/12	5	50.0	ND	11.0 J	ND
	12/12/12	5	50.0	ND	13.8 J	ND
	05/01/13	5	50.0	ND	ND	ND
	08/05/13	5	50.0	ND	5.6 J	ND
	02/24/14	5	50.0	ND	ND	ND

TABLE 5:
HISTORICAL CONSTITUENTS IN SURFACE WATER

Analytes	Sample Collection Date	DL	QL	SW-1		SW-2		Field Blanks	
Silver	07/12/07	NR	10.0	2.20	J	DRY		ND	
	12/19/07	NR	10.0	ND		0.34	J	ND	
NC 2B = 0.06 ug/L (03/28/08)	07/08/08	NR	10.0	0.35	B	1.00	J	0.12	J
	12/17/08	0.1	10.0	ND		ND		ND	
	07/09/09	0.1	10.0	ND		0.10	J	ND	
	12/16/09	0.1	10.0	ND		0.16	J	ND	
	06/24/10	0.1	10.0	ND		0.26	J	ND	
	12/13/10	0.1	10.0	{ND}		{0.28}	B	0.21 {0.19 J}	J
	06/20/11	5	10.0	ND		ND		ND	
	12/05/11	5	10.0	ND		ND		ND	
	06/11/12	5	10.0	ND		ND		ND	
	12/12/12	5	10.0	ND		ND		ND	
	05/01/13	5	10.0	ND		ND		ND	
	08/05/13	5	10.0	ND		ND		ND	
	02/24/14	5	10.0	ND		ND		ND	
Thallium	12/29/04	NR	10.0	ND		10.0 (ND)		ND	
	06/29/05	NR	10.0	ND		ND		ND	
	12/29/05	NR	10.0	ND		ND		ND	
	06/28/06	NR	10.0	ND		ND		ND	
	12/29/06	NR	6.00	ND		ND		ND	
	07/12/07	NR	5.50	ND		DRY		ND	
	12/19/07	NR	5.50	3.60	J	ND		ND	
	07/08/08	NR	5.50	3.40	J	ND		ND	
	12/17/08	3	5.50	ND		ND		ND	
	07/09/09	3	5.50	ND		ND		ND	
	12/16/09	3	5.50	ND		ND		ND	
NC 2B = NE (03/24/10)	06/24/10	3	5.50	ND		ND		ND	
	12/13/10	3	5.50	3.80	J	ND		ND	
	06/20/11	5.4	5.50	ND		ND		ND	
	12/05/11	5.4	5.50	ND		ND		ND	
	06/11/12	5.4	5.50	ND		ND		ND	
	12/12/12	5.4	5.50	ND		ND		ND	
	05/01/13	5.4	5.50	ND		ND		ND	
	08/05/13	5.4	5.50	ND		ND		ND	
	02/24/14	5.4	5.50	ND		ND		ND	
Vanadium	12/29/06	NR	25.0	1.60	J	2.00	J	ND	
	07/12/07	NR	25.0	4.60	J	DRY		ND	
	12/19/07	NR	25.0	3.30	J	1.40	B	0.62	J
NC 2B = NE ug/L (03/28/08)	07/08/08	NR	25.0	5.20	J	2.30	J	0.20	J
	12/17/08	0.2	25.0	1.80	B	2.70	B	0.76	J
	07/09/09	0.2	25.0	5.00	B	3.40	B	1.30	J
	12/16/09	0.2	25.0	3.60	J	3.50	J	0.53	J
	06/24/10	0.2	25.0	5.80	J	2.60	J	ND	
	12/13/10	0.2	25.0	1.60	B	0.67	B	0.36	J
	06/20/11	5	25.0	ND		ND		ND	
	12/05/11	5	25.0	ND		ND		ND	
	06/11/12	5	25.0	ND		11.50	J	ND	
	12/12/12	5	25.0	ND		ND		ND	
	05/01/13	5	25.0	ND		ND		ND	
	08/05/13	5	25.0	ND		ND		ND	
	02/24/14	5	25.0	ND		ND		ND	

TABLE 5:
HISTORICAL CONSTITUENTS IN SURFACE WATER

Analytes	Sample Collection Date	DL	QL	SW-1		SW-2		Field Blanks	
Zinc	11/22/96	NR	50.0	11.0		ND		NS	
	06/17/97	NR	50.0	ND		ND		NS	
	12/01/97	NR	50.0	20.0		ND		NS	
	05/20/98	NR	50.0	20.0		28.0		NS	
	11/19/98	NR	50.0	ND		ND		NS	
	07/21/99	NR	50.0	ND		ND		NS	
	11/16/99	NR	50.0	ND		ND		NS	
	05/10/00	NR	50.0	ND		ND		NS	
	10/26/00	NR	50.0	ND		ND		NS	
	04/18/01	NR	50.0	ND		ND		NS	
	10/27/01	NR	50.0	ND		ND		NS	
	06/13/02	NR	50.0	NS		NS		NS	
	11/19/02	NR	50.0	ND		ND		NS	
	06/27/03	NR	50.0	ND		ND		NS	
	12/30/03	NR	50.0	ND		ND		ND	
	06/30/04	NR	50.0	ND		ND		ND	
	12/29/04	NR	50.0	ND		ND		ND	
	06/29/05	NR	50.0	ND		ND		ND	
	12/29/05	NR	50.0	ND		ND		ND	
	06/28/06	NR	50.0	ND		ND		ND	
	12/29/06	NR	50.0	ND		ND		ND	
	07/12/07	NR	10.0	ND		DRY		ND	
	12/19/07	NR	10.0	24.6	B	ND		102	
NC 2B = 50 ug/L (03/28/08)	07/08/08	NR	10.0	ND		ND		1.20	J
	12/17/08	0.4	10.0	ND		0.89	B	0.49	J
	07/09/09	0.4	10.0	ND		4.90	B	1.60	J
	12/16/09	0.4	10.0	2.60	B	2.60	B	7.70	J
	06/24/10	0.4	10.0	ND		14.9		ND	
	12/13/10	0.4	10.0	ND		9.80	B	6.70	J
	06/20/11	10	10.0	ND		ND		ND	
	12/05/11	10	10.0	ND		ND		12.4	
	06/11/12	10	10.0	ND		ND		ND	
	12/12/12	10	10.0	ND		ND		ND	
	05/01/13	10	10.0	ND		16.80		ND	
	08/05/13	10	10.0	ND		ND		ND	
	02/24/14	10	10.0	ND		ND		ND	

TABLE 5:
HISTORICAL CONSTITUENTS IN SURFACE WATER

Analytes	Sample Collection Date	DL	QL	SW-1		SW-2		Field Blanks	
ORGANICS									
Acetone	10/27/01	NR	100	168.0	B	337.0	B	479.0	
	06/13/02	NR	100	NS		NS		NS	
	06/13/02	NR	100	NS		NS		NS	
	11/19/02	NR	100	ND		ND		NS	
	06/27/03	NR	100	ND		ND		NS	
	12/30/03	NR	100	ND		ND		ND	
	06/30/04	NR	100	ND		ND		ND	
	12/29/04	NR	100	ND		ND		ND	
	06/29/05	NR	100	ND		ND		ND	
	12/29/05	NR	100	ND		ND		ND	
	06/28/06	NR	100	ND		ND		ND	
	12/29/06	NR	100	ND		ND		ND	
	07/12/07	NR	100	ND		DRY		ND	
	12/19/07	NR	100	12.70	B	ND		4.50	J
NC 2B = 2,000 ug/L (03/28/08)	07/08/08	NR	100	ND		ND		ND	
	12/17/08	20	100	ND		ND		ND	
	07/09/09	20	100	ND		ND		ND	
NC 2B = NE (03/24/10)	12/16/09	2.2	100	ND		ND		2.80	J
	06/24/10	2.2	100	2.80	B	ND		7.70	J
	12/13/10	2.2	100	ND		3.00	J	ND	
	06/20/11	2.2	100	ND		3.80	B	3.90	J
	12/05/11	2.2	100	ND		7.20	B	8.80	J
	06/11/12	2.2	100	ND		5.50	B	4.70	J
	12/12/12	10	100	ND		ND		ND	
	05/01/13	10	100	ND		ND		14.6	J
	08/05/13	10	100	ND		ND		ND	
	02/24/14	10	100	ND		ND		25.7	J
Chlorobenzene	06/27/03	NR	5.0	ND		7.20		ND	
	12/30/03	NR	5.0	ND		ND		ND	
	06/30/04	NR	5.0	ND		ND		ND	
	12/29/04	NR	5.0	ND		ND		ND	
	06/29/05	NR	5.0	ND		ND		ND	
	12/29/05	NR	5.0	ND		ND		ND	
	06/28/06	NR	5.0	ND		ND		ND	
	12/29/06	NR	3.0	ND		ND		ND	
	07/12/07	NR	3.0	ND		DRY		ND	
	12/19/07	NR	3.0	ND		ND		ND	
NC 2B = 130 ug/L (03/28/08)	07/08/08	NR	3.0	ND		ND		ND	
	12/17/08	0.23	3.0	ND		ND		ND	
	07/09/09	0.23	3.0	ND		ND		ND	
	12/16/09	0.23	3.0	ND		ND		ND	
	06/24/10	0.23	3.0	ND		ND		ND	
	12/13/10	0.23	3.0	ND		ND		0.28	J
	06/20/11	0.23	3.0	ND		ND		ND	
	12/05/11	0.23	3.0	ND		ND		ND	
	06/11/12	0.23	3.0	ND		ND		ND	
	12/12/12	0.23	3.0	ND		ND		ND	
	05/01/13	0.23	3.0	ND		ND		ND	
	08/05/13	0.23	3.0	ND		ND		ND	
	02/24/14	0.23	3.0	ND		ND		ND	

TABLE 5:
HISTORICAL CONSTITUENTS IN SURFACE WATER

Analytes	Sample Collection Date	DL	QL	SW-1	SW-2	Field Blanks
Chloromethane	07/09/09	0.11	1.0	ND	0.19 J	ND
	12/16/09	0.11	1.0	ND	ND	ND
NC 2B = NE (03/24/10)	06/24/10	0.11	1.0	ND	ND	ND
	12/13/10	0.11	1.0	ND	ND	ND
	06/20/11	0.11	1.0	ND	ND	ND
	12/05/11	0.11	1.0	ND	ND	ND
	06/11/12	0.11	1.0	ND	ND	ND
	12/12/12	0.11	1.0	ND	ND	ND
	05/01/13	0.11	1.0	ND	ND	ND
	08/05/13	0.11	1.0	ND	ND	ND
	02/24/14	0.11	1.0	ND	ND	0.25 J

Notes:
All concentrations are in micrograms per liter (µg/L).
SWSL = Solid Waste Section Limits (reporting limits established by the NC-DENR Solid Waste Section).
NC 2B = North Carolina Surface Water Standards from 15A NCAC 2B.
DL = Laboratory detection limit.
RL = Laboratory reporting limit (SWSL from October 2007 to present).
J = Estimated value between the DL and the RL.
B = Blank-qualified data (result is unreliable based on similar concentrations in field, trip, or method blanks).
ND = Not detected above the DL.
NI = Well not yet installed.
NS = Not sampled.
NR = Not Reported.
Shaded values for surface water are above the NC 2B.

TABLE 6: CORRECTIVE MEASURES SCREENING MATRIX

Remedial Technology:	Feasibility and Effectiveness											Implementability					Cost				SCORE	Comments
	Achieve Target Contaminant Levels	Protective of Human Health & Environment	Long-Term Effectiveness	Addresses (T) toxicity, (M) mobility, or (V) volume		Safety Impacts	Cross-Media Impacts	Residuals Produced -- (S) solid, (L) liquid, (V) vapor		Rating for VOCs	Exposure to Residual Contamination	Ease to Implement	Environmental Conditions	System Reliability and Maintainability	Regulatory/Permitting Acceptability	Community Acceptability	Capital Costs	O&M Costs	Time to Implement	Time to Complete Cleanup		
Ranking system:	Yes=3; Unkwn=2; No=1	Yes=3; Unkwn=2; No=1	Yes=3; Unkwn=2; No=1	1 Pt. Each		Best=3; Avg.=2; Worse=1	Best=3; Avg.=2; Worse=1	-1 Pt. Each		Best=3; Avg.=2; Worse=1	Best=3; Avg.=2; Worse=1	Best=3; Avg.=2; Worse=1	Best=3; Unkwn/ Avg.=2; Worse=1	Best=3; Unkwn/ Avg.=2; Worse=1	Best=3; Unkwn/ Avg.=2; Worse=1	Best=3; Unkwn/ Avg.=2; Worse=1	Best=3; Unkwn/Avg.=2; Worse=1	Best=3; Unkwn/ Avg.=2; Worse=1	Best=3; Unkwn/ Avg.=2; Worse=1	Best=3; Unkwn/ Avg.=2; Worse=1		
Non-Intrusive Controls																						
Monitored Natural Attenuation (MNA)	2	2	2	1	T	3	3	0	---	3	3	3	3	3	3	3	3	3	3	1	**44**	Analytical results demonstrate good conditions for natural attenuation.
Phytoremediation	2	2	2	2	T,M	3	3	0	---	3	3	2	3	3	3	3	2	3	2	1	**42**	Existing vegetation may be sufficient, or may be augmented by planting.
Control of Landfill Gas (Passive Vent Installation)	2	2	2	2	T,M	2	2	-1	V	3	2	2	3	3	3	2	2	3	3	2	**39**	Most likely to be used in addition to other remedial strategies
Constructed Wetlands (for natural near-surface groundwater, no P&T)	3	3	3	2	T,V	3	2	0	---	2	3	2	3	2	2	2	2	3	2	2	**41**	Very shallow groundwater and expansive available treatment area may increase feasibility and reduce costs.
Groundwater Containment																						
Vertical Barrier Walls	1	1	1	1	M	3	3	-1	S	2	3	1	2	2	2	2	1	3	2	2	**31**	Site conditions would require a laterally extensive barrier system, resulting in high costs.
Pump & Treat (P&T) System (see Ex-situ treatment for P&T options)	3	3	3	3	T,M,V	2	1	-1	L	2	2	1	2	2	3	3	1	1	2	2	**35**	Highly visible, very expensive remedial alternative. Not warranted by existing COC levels and site conditions.
Hydraulic Gradient Controls (Injection)	1	1	1	1	M	3	3	0	---	1	2	1	1	1	1	2	1	1	2	1	**24**	May result in undesirable redirection of contaminated groundwater or leachate.
In-Situ - Groundwater Biological Treatment																						
Enhanced Bioremediation (EB) with HRC	3	3	3	2	T,V	2	3	0	---	2	2	1	1	1	2	2	1	2	2	3	**35**	May be effective depending on site conditions. HRC not best choice for benzene at low concentrations. Permit required for injection.
Enhanced Bioremediation (EB) with O_2 CH_4, $C_6H_{15}O_4P$, or N_2O)	3	3	3	2	T,V	2	3	0	---	2	2	1	1	1	2	2	1	2	2	3	**35**	May be effective depending on site conditions. O_2 good choice for benzene. Permit required for injection.
Enhanced Bioremediation (EB) with co-metabolic processes	3	3	3	2	T,V	2	3	0	---	2	2	1	1	1	2	2	1	1	2	2	**33**	Full scale cost unknown; permit required for subsurface injection. May not be effective.
Enhanced Bioremediation (EB) with Nitrate Enhancement	3	3	3	2	T,V	2	3	0	---	1	2	1	1	1	2	2	2	1	2	2	**33**	Full scale success not documented. Permit required for injection. Effective on narrow contaminant range.
In-Situ - Groundwater Abiotic Treatment																						
Permeable Reactive Barrier (PRB)	3	3	2	2	T,V	3	3	-1	S	2	3	1	2	2	2	2	2	2	2	2	**37**	A laterally extensive barrier will increase costs; however, shallow groundwater & plume make it feasible. Biofouling and loss of reactive capacity may require replacement.
Air Sparging (AS)	3	3	3	2	T,V	2	2	-1	L	3	2	1	2	2	3	2	2	2	2	2	**37**	Treatment will be limited to area of sparging. Dual remedial mechanisms (volatilization & EB).
Fenton's Reagent	2	2	2	2	T,V	2	2	-1	L	2	2	1	2	1	2	2	1	1	2	2	**29**	Limited effectiveness on halogenated volatiles and has significant O&M costs.
Hot Water or Steam Flushing/Stripping	2	2	2	1	T	2	1	-2	L,V	2	1	1	1	1	2	2	1	1	2	3	**25**	No full scale success has been achieved; injection prohibited; not cost effective.
Dual Phase Extraction	2	2	1	2	T,M	2	1	-2	L,V	3	1	1	1	2	2	2	2	2	2	2	**28**	Dual phase extraction requires both groundwater and vapor treatment. Vapor is not a substantial concern at this facility. Significant O & M costs.
Soil Vapor Extraction (SVE)	2	2	2	2	T,M	2	2	-1	V	3	2	2	2	2	2	2	2	2	2	2	**34**	May help relive LFG impacts outside of waste. May be used in conjunction with AS.
Ex-Situ Groundwater Treatment (for P&T)																						
Filtration / Sedimentation	2	2	2	3	T,M,V	2	1	-1	S	1	1	2	2	2	2	2	2	1	1	2	**29**	Used as pre-treatment or post-treatment process to remove suspended solids or precipitated metals.
Ion Exchange Filtration	3	3	3	3	T,M,V	2	1	-1	S	1	2	1	1	2	2	2	2	1	1	2	**31**	Treatability study recommended; oxidants in ground water may damage ion exchange resin; generates wastewater during regeneration step.
Bioreactors	3	3	3	3	T,M,V	2	2	-2	S,L	3	1	1	1	2	2	2	1	2	1	2	**32**	Treatability study recommended; residuals from sludge processes require treatment or disposal; air pollution controls may need to be considered.
Constructed Wetlands (for extracted water)	3	2	2	3	T,M,V	3	2	-1	L	2	2	1	2	1	2	2	2	1	2	2	**33**	Very shallow groundwater and expansive available treatment area may increase feasibility and reduce costs.
Air Stripping w/ NPDES Disposal	3	3	3	3	T, M,V	2	1	-2	L,V	3	2	2	2	2	3	2	2	2	2	2	**37**	Best ex-situ option for benzene. Non-volatile compounds not removed. Requires a NPDES permit. Off-gases may require treatment.
Carbon Adsorption (liquid phase)	3	3	3	3	T,M,V	2	2	-1	S	2	2	2	2	2	3	2	2	1	2	2	**37**	Water soluble compounds and small molecules are not adsorbed well. Good option for benzene. Requires a NPDES permit.
Publicly Owned Treatment Work	3	3	3	3	T,M,V	2	2	-2	S,L	2	2	2	1	2	3	2	1	1	2	2	**34**	Pretreatment could be required prior to acceptance of wastewater. Volume-based fees could be exorbitant.
UV Oxidation	2	2	2	2	T,M,V	1	2	-1	L	2	2	2	1	2	2	2	1	1	2	1	**28**	Handling and storage of oxidizers requires special safety precautions; significant O&M costs.

Shaded remedial options retained for further consideration.

TABLE 7: MONITORED NATURAL ATTENUATION PARAMETERS

Parameter	Date	Units	DL	RL	Groundwater Monitoring Wells							Surface Water		
					MW-1R	MW-2R	MW-3R	MW-4	MW-5	MW-6	NES-1	SW-1	SW-2	BLANKS
Temperature	12/30/03	ºC	-	-	15.4	11.1	11.2	12.5	13.6	14.2	-	7.7	8.0	-
	12/19/07	ºC	-	-	12.3	12.5	13.1	14.4	14.9	14.4	13.3	3.8	6.8	-
	05/01/13	ºC	-	-	15.7	13.7	15.1	14.4	14.2	14.2	12.5	14.9	15.7	-
pH	12/30/03	SU	-	-	7.31	6.54	6.81	6.90	7.24	7.29	-	8.22	8.02	-
	12/19/07	SU	-	-	6.89	6.90	7.07	6.87	7.39	6.67	7.64	7.86	7.34	-
	05/01/13	SU	-	-	7.32	6.37	6.61	6.42	6.92	7.13	6.10	6.47	7.89	-
Conductivity	12/19/07	µS/m	-	-	96	1,964	1,591	1,245	-	-	510	-	-	-
	05/01/13	µS/m	-	-	111	1,587	1,357	1,150	195	594	69.6	170.1	256	-
Redox Potential	12/30/03	mV	-	-	257.2	76.2	207.6	212.7	187.3	123.6	-	147.3	122.9	-
(ORP)	12/19/07	mV	-	-	146	45.0	142	134	-	-	138	-	-	-
	05/01/13	mV	-	-	111.7	-26.7	55.2	120.5	-	-	227.1	-	-	-
Dissolved Oxygen	12/30/03	mg/L	-	-	9.49	4.84	26.19	24.19	15.31	20.17	-	23.0	28.7	-
	12/19/07	mg/L	-	-	-	1.88	1.44	3.21	-	-	0.70	-	-	-
	05/01/13	mg/L	-	-	4.40	1.37	1.79	4.65	-	-	2.90			-
Dissolved CO_2	12/19/07	mg/L	-	-	25	365	175	295	-	-	60	-	-	-
	05/01/13	mg/L	-	-	30.0	245	125	225	-	-	45			-
Fe, Ferrous (+2)	12/30/03	mg/L	0.0300	0.100	ND	1.5	ND	ND	0.22	ND	-	ND	ND	ND
	12/19/07	mg/L	-	-	ND	7.2	ND	ND	-	-	0.2	-	-	-
	05/01/13	mg/L	-	-	ND	1.0	ND	ND	-	-	ND			-
Alkalinity (as CaCO3)	12/30/03	mg/L	9.00	10.0	37.0	800	690	640	68.0	350	-	69.0	86.0	ND
	12/19/07	mg/L	-	5.00	39.0	763	726	619	-	-	190	-	-	ND
	05/01/13	mg/L	-	5.00	43.4	757.0	660.0	645.0	-	-	10.4	-	-	-
Chloride	12/30/03	mg/L	0.200	1.00	3.50	280	170	82.0	13.0	44.0	-	10.0	15.0	ND
	12/19/07	mg/L	-	5.00	ND	13.1	297	89.1	-	-	7.90	-	-	ND
	05/01/13	mg/L	-	1.00	3.54	258	180	123	-	-	2.85	-	-	-
Dissolved Hydrogen	05/01/13	nM	0.074	0.600	0.400	0.630	0.610	0.500	-	-	0.470	-	-	-
														-
Nitrate-N	12/30/03	mg/L	0.0200	0.0500	0.120	ND	ND	ND	ND	0.13	-	ND	ND	ND
	12/19/07	mg/L	-	0.100	ND	ND	ND	ND	-	-	13.0	-	-	ND
	05/01/13	mg/L		10.0	0.163	ND	ND	ND	-	-	3.58	-	-	-

TABLE 7: MONITORED NATURAL ATTENUATION PARAMETERS

Parameter	Date	Units	DL	RL	Groundwater Monitoring Wells							Surface Water		
					MW-1R	MW-2R	MW-3R	MW-4	MW-5	MW-6	NES-1	SW-1	SW-2	BLANKS
Sulfate	12/30/03	mg/L	0.0600	2.00	ND	ND	ND	2.60	9.60	9.00	-	11	11	ND
	12/19/07	mg/L	-	5.00	ND	ND	ND	ND	-	-	36.8	-	-	ND
	05/01/13	mg/L	-	250	ND	ND	ND	4.69	-	-	10.7	-	-	-
Total Organic Carbon	12/19/07	mg/L	-	1.0 *	2.9	54.3	23.2	17.2	-	-	7.20	-	-	ND
	05/01/13	mg/L		1.00	2.24	29.5	30.0	19.4	-	-	5.74			-
Dissolved Ethane	12/30/03	mg/L	0.0002	0.0010	ND	ND	ND	ND	ND	ND	-	ND	ND	ND
	12/19/07	mg/L	-	20.0	ND	ND	ND	ND	-	-	ND	-	-	ND
	05/01/13	mg/L			ND	ND	ND	ND	-	-	ND	-	-	-
Dissolved Ethene	12/01/03	mg/L	0.0003	0.0010	ND	ND	ND	ND	ND	ND	-	ND	ND	ND
	12/19/07	mg/L	-	20.0	ND	ND	ND	ND	-	-	ND	-	-	ND
	05/01/13	mg/L		0.0062	ND	ND	0.0017	ND	-	-	ND	-	-	-
Dissolved Methane	12/30/03	mg/L	0.0002	0.0010	ND	0.660	0.130	0.0099	0.0010	ND	-	0.0023	0.0023	ND
	12/19/07	mg/L	-	10.0	ND	0.116	0.186	ND	-	-	ND	-	-	ND
	05/01/13	mg/L		0.0066	ND	0.0379	0.100	0.0337	-	-	ND	-	-	-
Pyruvic Acid	12/19/07	mg/L			2.50	ND	1.50	2.00	-	-	1.20	-	-	ND
	05/01/13	mg/L	2	10	ND	ND	ND	ND	-	-	ND	-	-	-
Lactic Acid	12/19/07	mg/L			ND	5.40	11.9	3.10	-	-	ND	-	-	ND
	05/01/13	mg/L	2.3	25	ND	ND	ND	ND	-	-	ND	-	-	-
Acetic Acid	12/19/07	mg/L			ND	ND	ND	ND	-	-	ND	-	-	ND
	05/01/13	mg/L	1.8	5	ND	ND	ND	ND	-	-	ND	-	-	-
Propionic Acid	12/19/07	mg/L			ND	63.7	38.3	12.8	-	-	ND	-	-	ND
	05/01/13	mg/L	1	5	ND	ND	ND	ND	-	-	ND	-	-	-
Butyric Acid	12/19/07	mg/L			ND	ND	ND	ND	-	-	ND	-	-	ND
	05/01/13	mg/L	0.87	5	ND	ND	ND	ND	-	-	ND	-	-	-

NOTES:
DL = laboratory detection limit.
RL = laboratory reporting limit.
ND = not detected above detection limit.
J = estimated concentration between the DL and the RL.
- = not analyzed, or if used in DL/RL columns, DL/RL not reported.

mg/L = milligrams per liter
mV = millivolt
SU = standard unit
nM = nano-Molar

ºC = degress Celcius
µS/m = microsiemen per meter
ntu = nephelometric turbidity units

TABLE 8: CORRECTIVE ACTION IMPLIMENTATION SCHEDULE

Item/Activity	Timeframe
Implementation of Corrective Action Plan (CAP)	Upon approval of the CAP by the NC-DENR Solid Waste Section (SWS)
Construction/Installation of corrective action system	None required - Remedy is already in place
First semiannual MNA baseline monitoring event	Concurrent with the first regularly-scheduled semiannual compliance monitoring event scheduled more than 30 days after approval of the CAP by the SWS
Subsequent MNA monitoring events	Concurrent with each subsequent semiannual compliance monitoring event
First Annual Phytoremediation Tree Evaluation	During the second quarter of the calendar year following approval of the CAP by the SWS
Subsequent Phytoremediation Tree Evaluations	During the second quarter of each succeeding calendar year
First Corrective Action Evaluation Report (CAER)	To be submitted to SWS within 120 days of the last (4th) semiannual MNA baseline sampling event.
Subsequent CAERs	Every five years after the first CAER
Completion of Corrective Action Program	After all contaminant concentrations are below established GPS for three consecutive years

CHART

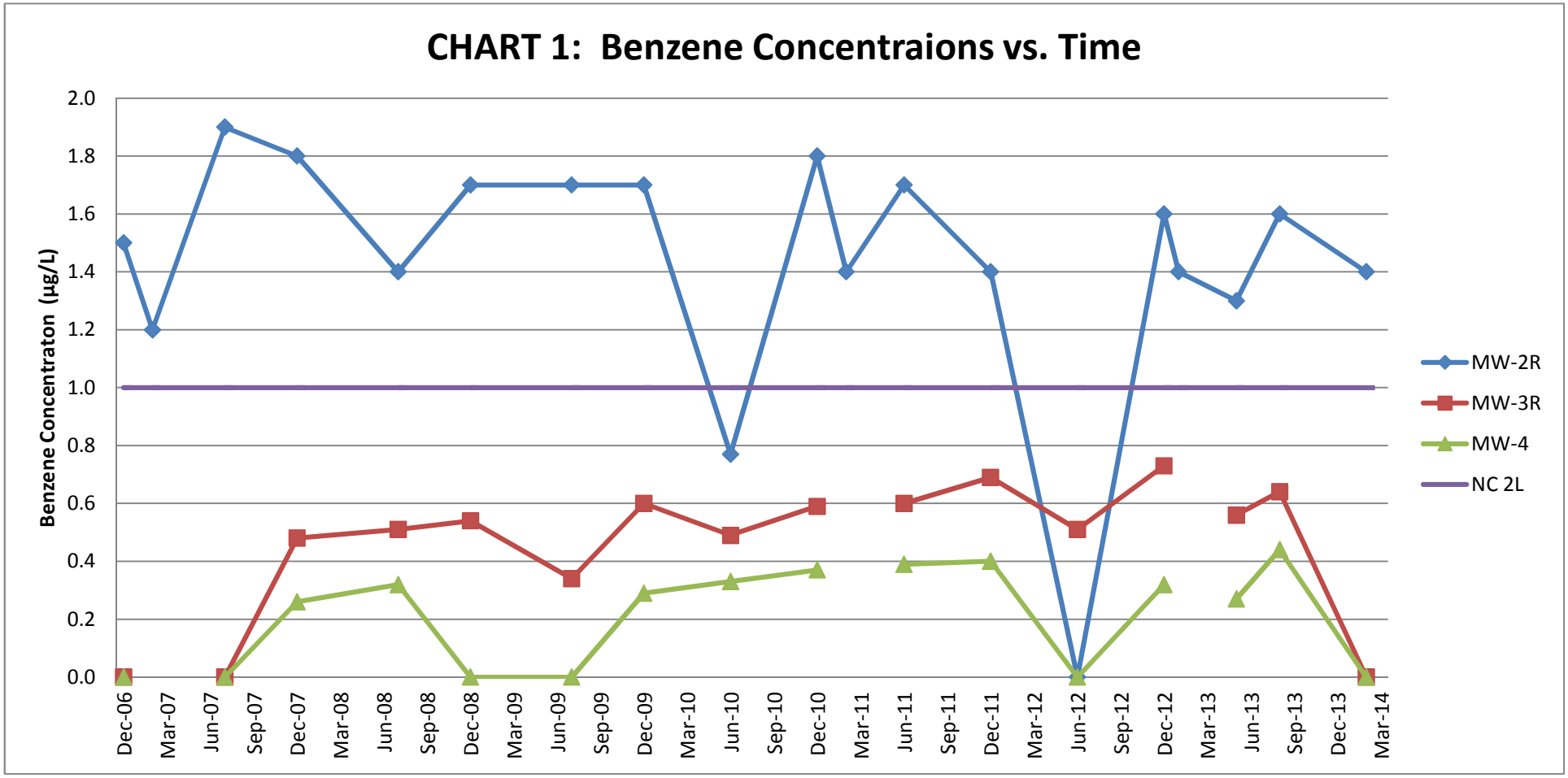
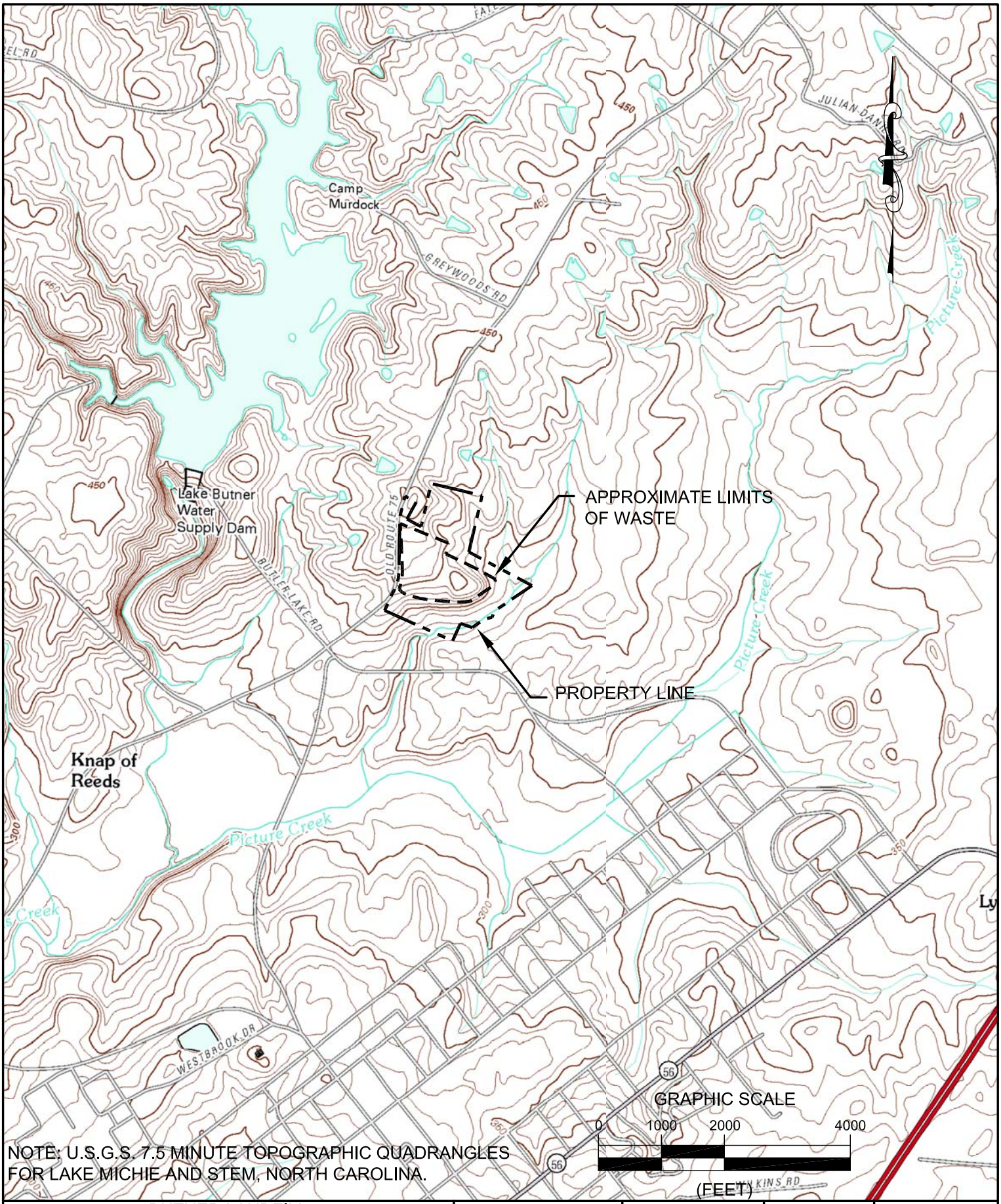


CHART 1: Benzene Concentraions vs. Time
Benzene Concentraton (µg/L)
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
Dec-06
Mar-07
Jun-07
Sep-07
Dec-07
Mar-08
Jun-08
Sep-08
Dec-08
Mar-09
Jun-09
Sep-09
Dec-09
Mar-10
Jun-10
Sep-10
Dec-10
Mar-11
Jun-11
Sep-11
Dec-11
Mar-12
Jun-12
Sep-12
Dec-12
Mar-13
Jun-13
Sep-13
Dec-13
Mar-14
MW-2R
MW-3R
MW-4
NC 2L

FIGURES



NOTE: U.S.G.S. 7.5 MINUTE TOPOGRAPHIC QUADRANGLES FOR LAKE MICHIE AND STEM, NORTH CAROLINA.

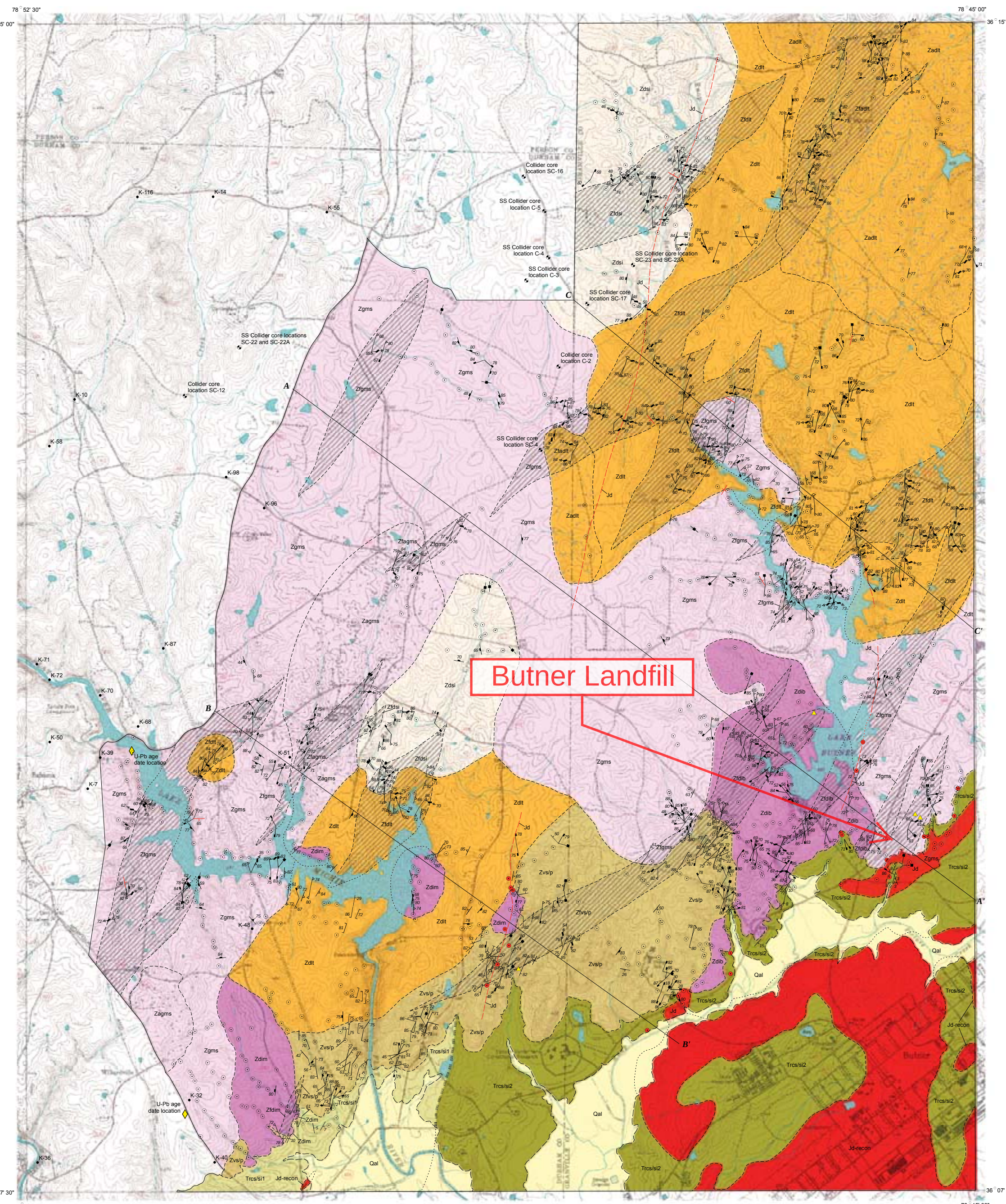
BUTNER LANDFILL GRANVILLE COUNTY, NORTH CAROLINA	JOYCE ENGINEERING 2211 W. MEADOWVIEW ROAD GREENSBORO, NC 27407 PHONE: (336) 323-0092	DESIGNED HRW DRAWN HRW CHECKED ACE APPROVED GVB DATE 04/24/14	SCALE 1" = 2000'	PROJECT NO. 660.1303.12
SITE LOCATION MAP		© 2014 Joyce Engineering, Inc. All rights reserved.	NC CORP LIC: C-0782	FIGURE NO. 1

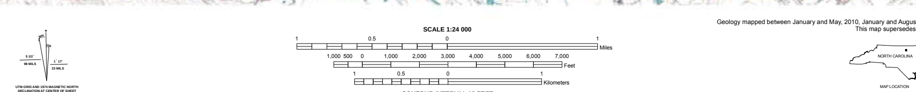
L:\Granville\dwg\Butner\2014 ACM\, FIG-1 Site Location Maps.dwg

DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
DIVISION OF ENERGY, MINERAL, AND LAND RESOURCES
TRACY E. DAVIS, DIRECTOR
KENNETH B. TAYLOR, STATE GEOLOGIST

This geologic map was funded in part by the USGS National Cooperative Geologic Mapping Program

NORTH CAROLINA GEOLOGICAL SURVEY
OPEN FILE REPORT 2012-01





INTRODUCTION

The pre-Mesozoic crystalline rocks of the Lake Michie 7.5-minute Quadrangle are part of the Virgilina sequence of the Carolina terrane, specifically the upper portion (ca. 615 Ma) of the Hyco Formation (Wortman and others, 2001; Hibbard and others 2002; Bradley and Miller, 2011). These rocks are metamorphosed to the chlorite zone of the lower greenschist facies during Late Precambrian and Paleozoic tectonothermal activity. Only Late Triassic sedimentary rocks and Jurassic diabase are not regionally metamorphosed, although contact metamorphic effects occur locally where diabase intrudes sedimentary rocks. While subjected to this low-grade metamorphism and locally displaying fracture, foliation, and lineation, most crystalline rocks preserve relict plutonic, volcanic, or volcanogenic sedimentary textures, which when combined with bulk rock compositions, allow for protolith identification. Therefore, the prefix "meta" is not included in the nomenclature of the pre-Mesozoic rocks described in the quadrangle. In some exposures, especially adjacent to the western boundary of the Deep River Mesozoic rift basin, highly partitioned strain produces either variably fractured, phyllonitic, or protomylonitic and mylonitic rocks of meta-igneous origin. Local outcrops of highly silicified, epidotized, and/or sericitized, or silicified-epidotized cataclasite rock have unclear protolith affinity. All sedimentary rocks of Mesozoic and Cenozoic age have a detrital origin involving mud- to gravel-sized clasts.

The classification and naming of metaigneous rocks in the Lake Michie 7.5-minute Quadrangle uses the nomenclature of the International Union of Geological Sciences (IUGS) subcommission on the systematics of igneous rocks after Le Maitre (2002). Relict igneous textures, modal mineral assemblages, or normalized mineral assemblages when whole-rock geochemical data are available, provide the basis for naming meta-igneous lithodemes. A preliminary lithodemic designation is developed here following Articles 31-42 of the North American Stratigraphic Code. These rock units, which lack in geochronologic data and stratigraphic facing directions, warrant such a designation. Past maps and lithologic descriptions of McConnell and Glover (1982), Blake and others (2009), and Bradley and others (2011) assisted the development of the current U.S. Geological Survey STATEMAP mapping results.

SEDIMENTARY UNITS

Qal – alluvium: Tannish-yellow to gray to reddish-brown, unconsolidated, and poorly sorted and stratified deposits of angular to subrounded clay, silt, sand and gravel- to cobble-sized clasts. Deposits generally occur in major stream drainages and around the shorelines of Lake Michie and Lake Butner.

Trcs/si1 – sandstone with interbedded siltstone and conglomerate of the Chatham Group Lithofacies Association I: Pinkish-gray, light gray, and light tan; fine- to coarse-grained, micaceous, slightly clayey, moderately poor to moderately well sorted, subangular to subrounded arkose and lithic arkose; maroon, very silty, micaceous, moderately well sorted, fine-grained sandstone; maroon, massive, and thickly laminated, micaceous to very micaceous siltstone and mudstone; and poorly sorted, angular to subrounded metavolcanic- and metaplutonic -clasts conglomerate derived from surrounding meta-igneous crystalline rocks that may be clast or matrix supported with reddish-brown to tannish-brown to pinkish-brown, medium- to coarse-grained, poorly to well sorted sandstone, micaceous siltstone or mudstone. Beds are massive or locally thinly bedded, wavy, or cross bedded. Rocks are assigned to the Lithofacies Association I of Hoffman and Gallagher (1989) and have been extended into the Lake Michie Quadrangle to edge-match with the Northeast Durham Geologic map (Phillips et al., 2004 (revised 2010)).

Trcs/si2 – sandstone with interbedded siltstone of the Chatham Group Lithofacies Association II: Cyclical depositional sequences of whitish-yellow to grayish-pink to pale red, coarse- to very coarse-grained, trough cross-bedded lithic arkose that fines upward through yellow to reddish-brown, medium- to fine-grained sandstone, to reddish-brown, burrowed and rooted siltstone. Bioturbation is usually surrounded by greenish-blue to gray reduction halos. Coarse-grained portions contain abundant muscovite, and basal gravel lags consist of clasts of quartz, bluish-gray quartz crystal tuff, and mudstone rip-ups. These rocks are assigned to the Lithofacies Association II of Hoffman and Gallagher (1989) and have been extended into the Lake Michie Quadrangle to edge-match with the Northeast Durham Geologic map (Phillips et al., 2004 (revised 2010)).

FAULT ZONE UNITS

PCsc – silicified and epidotized cataclasite: White, tan, tan-green and pale-green, silicified, epidotized, and highly fractured zones containing mm- to cm-scale, angular silicified and locally original protolith clasts. Silicified and epidotized clasts of metamorphosed diorite, tonalite, granodiorite, and dacite have been observed. Extensional veins filled with syntaxial rhombohedral quartz prisms and epidote common. In many samples, silicification and epidotization is so extensive protolith relationships are completely obscured; in some samples, epidote invades and overprints the crystalline rocks as diffuse, fine-grained mineral domains reminiscent of fluid fronts. Considered to be Mesozoic or Cenozoic in age, but may also be attributed to middle or late Paleozoic deformation.

INTRUSIVE AND META-INTRUSIVE UNITS

Jd – diabase: Black to greenish black, fine to medium phaneritic or aphanitic, dense, consists primarily of plagioclase, augite and may contain olivine. Occurs as dikes and sills and is typically seen as spheriodally weathered stream boulders and cobbles. Weathered surfaces are generally brownish to grayish in color. Red station location indicates outcrop or boulders of diabase.

Jd-recon - diabase reconnaissance: Jurassic diabase from reconnaissance and geophysical data as depicted in Gottfried, et al., (1991).

Zdsi – dacitic shallow intrusions: Gray-green, light green to green, greenish-gray to light gray; plagioclase porphyritic aphanitic dacite, aphanitic dacite and micro-granodiorite. Plagioclase phenocrysts range from less than 1 mm to 5 mm and are commonly saussuritized. Blocky, less than 1 mm to 3mm quartz also occur as phenocrysts. Contains lesser amounts of dark gray, phenocryst poor aphanitic dacite. Leucocratic (CI=5-30) granodiorite ranges from fine to medium crystalline. Major minerals include plagioclase, alkali feldspar, quartz and lesser amounts of biotite. This unit is interpreted as shallowly emplaced dacite/granodiorite and is distinguished from Zdlt by the abundance of dacitic lava/shallow intrusive and the disappearance of tuff. Silicification, sulfide mineralization, and aggregates of white mica and quartz highlight steeply dipping and plunging foliation and lineation domains inferred to be highly fractured and/or phyllonitic and protomylonitic high strain zones (**Zfdsi**).

Zgms – granodiorite tonalite of the Stem and Moriah plutons: Leucocratic (CI=5-15), light tan-gray white, bluish-gray white, or pinkish-white, medium to coarse phaneritic, hypidiomorphic to xenomorpohic granular granodiorite and tonalite. This unit combines the previously mapped Zstg unit in the Stem (Blake and others, 2009) and eastern Lake Michie Quadrangles and the Moriah pluton of McConnell (1974) in the western portion of the Lake Michie Quadrangle. Major minerals include plagioclase, alkali feldspar, and quartz with lesser amounts of biotite and amphibole, interpreted to be hornblende. Plagioclase is highly sericitized and in lesser amount saussuritized, especially in calcic-rich phenocryst cores. Alkali feldspar typically displays granophyric texture in thin section. If present, biotite is commonly recrystallized to chlorite while hornblende may be recrystallized to chlorite, epidote, and actinolite-opaque mineral. Metamorphosed trondhjemite and monzonite pods are present and may represent dikes or differentiated portions of the pluton. Locally becomes granitic in the western portion surrounding Lake Michie. Outcrops locally contain enclaves of microdiorite of the Zdim and Zdib units. Locally, mm- to cm-scale granite dikes crosscut granodiorite. Wortman et al. (2000) report a 613.4 +2.8/-2 Ma U-Pb zircon date from granite and a 613.9 +1.6/-1.5 Ma U-Pb zircon date from diorite sampled from the Moriah pluton in the western portion of the Lake Michie Quadrangle. Aggregates of white mica, quartz, plagioclase, and orthoclase highlight steeply dipping foliation and dip-parallel lineation domains inferred to be highly fractured and/or phyllonitic and protomylonitic high strain zones (**Zfgms**). This unit is correlative to the Zmpf unit of Bradley and others (2011) in the adjacent Rougemont 7.5-minute Quadrangle.

Zagms – altered granodiorite and granite of the Moriah pluton: Leucocratic (CI=10-30), light pinkish gray to gray, fine- to medium-phaneritic, equigranular to porphyritic granodiorite and granite that is highly recrystallized and hydrothermally and chemically altered. Major minerals forming a relict xenomorphic granular phaneritic texture likely included plagioclase, alkali feldspar, and quartz that are now combinations of fine to medium crystalline, foliated and non-foliated domains of white mica and recrystallized feldspar and quartz. Outcrops, and more commonly float cobbles and boulders display apparent silicification, while other samples display chemical weathering that develops predominantly clay mineralization mixed with silica. Some rocks additionally display Fe-oxide-hydroxide staining. Unit interpreted to be a hydrothermally recrystallized and altered portion of Zgms. Domains of highly foliated rocks of this unit are separated as **Zfagms**.

Zdib – diorite of the Butner pluton: Mesocratic to melanocratic (CI=40-70), greenish-gray to grayish-green to green, fine- to medium-phaneritic diorite, microdiorite and quartz diorite. Textures range from equigranular to porphyritic with hypidiomorphic to xenomorpohic granular plagioclase and hornblende phenocrysts ranging up 1-3 mm in tabular length. Major minerals include plagioclase and amphibole, interpreted to be hornblende. Plagioclase crystals are highly saussuritized and in lesser amounts sericitized. Some crystals display evidence of Ca-rich cores with Na-rich rims. Hornblende may be recrystallized to chlorite, epidote, and actinolite-opaque mineral. Locally contains 5-10% quartz classifying it as a quartz diorite. The western portion of the unit is typically finer grained, having crystal size increasing towards the east. Foliated metadacite enclaves are common within the intrusive unit. Silicification, sulfide mineralization, typically pyrite, and aggregates of white mica and quartz highlight steeply dipping and plunging foliation and lineation domains inferred to be highly fractured and/or phyllonitic and protomylonitic high strain zones (**Zfdib**). Locally, highly leached and stained outcrops of pyrite-Fe-oxide-hydroxide mark these deformation zones. Texturally and mineralogically equivalent to Zdim.

Zdim –diorite of the Moriah pluton: Mesocratic to melanocratic (CI=40-70), greenish-gray to grayish-green to green, fine- to medium-phaneritic diorite, microdiorite and quartz diorite. Textures range from equigranular to slightly porphyritic with hypidiomorphic to xenomorpohic granular plagioclase and hornblende phenocrysts ranging up to 1-3 mm in tabular and prismatic length, respectively. Major minerals include plagioclase and amphibole, interpreted to be hornblende. Plagioclase crystals are highly saussuritized and in lesser amounts sericitized. Hornblende may be recrystallized to chlorite, epidote, and actinolite-opaque mineral. Locally contains 5-10% quartz highlighting differentiated outcrops of quartz diorite. Foliated equivalent mapped as **Zfdim**. Texturally and mineralogically equivalent to Zdib.

METAVOLCANIC UNITS

Zvs/p – mixed volcanogenic sedimentary and pyroclastic rocks: Grayish-green to greenish-gray, siltstone/mudstone, sandstone, and tuffaceous sandstone. Contains lesser amounts of fine- to coarse ash tuff and lapilli crystal lithic tuff. Siltstone is medium to thickly laminated (3mm-7mm) and alternate in color between greenish and greenish gray. Locally contains domains of massive magnetite rock and thinly laminated layered magnetite-enriched siltstone. Sandstone is generally massive with subangular to subrounded, moderately to well sorted quartz grains and lithic fragments. Tuffaceous sandstone is typically massive with moderately to poorly sorted, angular to subangular grains of plagioclase and quartz crystals. Pyroclastic tuff is generally massive and contains relict xenomorphic to subidiomorphic plagioclase and quartz phenocrysts in a fine, recrystallized ash groundmass. Minor basaltic to andesitic lavas/shallow intrusions occur locally in the southern portion of the mapped unit. The western and middle portion of the mapped unit is predominantly sedimentary; volcanic material occurs in the eastern portion of the unit in contact with metaplutonic rocks. Rocks are comparable to the Ze/p unit in the adjacent Rougemont Quadrangle immediately to the west (Bradley and others, 2011). Domains of highly foliated rocks of this unit are separated as **Zfvs/p**.

Zdlt – dacitic lavas and tuffs: Greenish-gray to dark gray to tannish gray, siliceous, aphanitic dacite tuff, porphyritic dacite, and flow banded dacite. Dacite is usually massive and ranges from fine ash to coarser plagioclase crystal tuff and lapilli tuff. Locally contains interlayers of immature pebbly to conglomeratic sandstone having lapilli-sized dacite clasts. Also contains outcrops of massive magnetite rock, usually found within close proximity to the contact with Zvs/p. Porphyritic dacite contains plagioclase and hornblende phenocrysts ranging from 3 to 10 mm in prismatic and tabular length, respectively, set in a recrystallized aphanitic groundmass. Locally, dacite may display relict ash flow layering. Unit is correlative to the Zdlt unit of Blake and others (2009) in the Stem Quadrangle and comparable to the Zdlt unit of Bradley and others (2011) in the Rougemont Quadrangle. Silicification, sulfide mineralization, and aggregates of white mica and quartz highlight steeply dipping and plunging foliation and lineation domains inferred to be highly fractured and/or phyllonitic and protomylonitic high strain zones (**Zfdlt**)

Zadlt – altered dacitic lavas and tuffs: White to red to tan, silicecious, hydrothermally altered aphanitic dacite, porphyritic dacite, and dacite lavas of Zdlt. Altered dacite is typically massive, finely crystalline and locally contains relict quartz and plagioclase phenocrysts ranging from 2 to 5 mm in size. Commonly siliceous concentrations give the rock a "chunky" appearance. Localized pyrophyllite mineralization occur as radiating crystals that range from 0.25mm to 1cm in size. Commonly Fe-oxide mineralization gives the rock a red color. Equivalent to the Zadlt unit of Blake and others (2009) in the Stem Quadrangle to the East and the to the Zhat(u) unit of Bradley and others (2011) in the Rougemont Quadrangle to the West. Silicification, sulfide mineralization, and aggregates of white mica and quartz highlight steeply dipping and plunging foliation and lineation domains inferred to be highly fractured and/or phyllonitic and protomylonitic high strain zones (**Zfadlt**).

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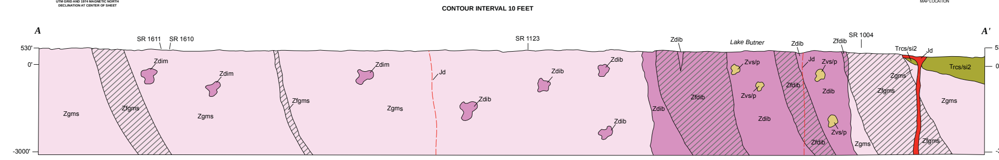
Wortman, G.L., Samson, S.D., and Hibbard, J.P., 2000, Precise U-Pb zircon constraints on the earliest magmatic history of the Carolina terrane, Journal of Geology, v. 108, pp. 321-338.

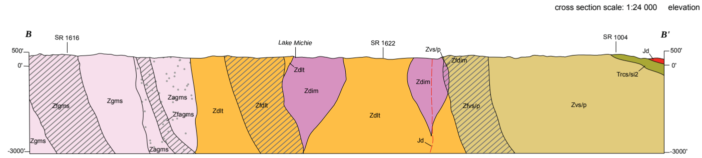
CONTACTS, FOLDS AND OTHER FEATURES

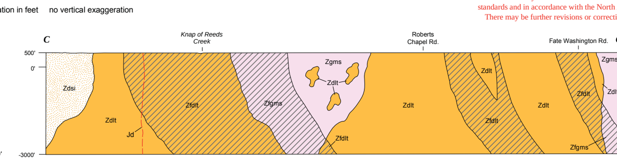
Lithologic contacts - Distribution and concentration of structural symbols indicates degree of reliability.

- contact - location inferred
- contact - location concealed
- Qal contact
- gradational contact
- diabase contact - dashed where inferred, dotted where concealed
- cross section line (A — A')
- strike and dip of primary layering and/or bedding
- strike and dip of primary layering and/or bedding (multiple observations at one locality)
- strike of vertical primary layering and/or bedding
- strike of vertical primary layering and/or bedding (multiple observations at one locality)
- strike and dip of overprinting cleavage
- strike and dip of overprinting cleavage (multiple observations at one locality)
- strike of vertical overprinting cleavage (multiple observations at one locality)
- strike and dip of inclined fracture surface
- strike and dip of inclined fracture surface (multiple observations at one locality)
- strike of vertical fracture surface
- strike of vertical fracture surface (multiple observations at one locality)
- strike and dip of shear fracture
- strike and dip of foliation of enclave
- strike of vertical foliation of enclave
- strike and dip of inclined undifferentiated shear strain foliation
- strike and dip of inclined undifferentiated shear strain foliation (multiple observations at one locality)
- strike of vertical undifferentiated shear strain foliation
- strike of vertical undifferentiated shear strain foliation (multiple observations at one locality)
- Fault plane - normal
- Fault plane - reverse
- Fault plane - reverse (multiple observations at one locality)
- strike and dip of quartz vein
- strike of quartz vein
- bearing and plunge of mineral rod or aggregate lineation
- bearing of mineral rod or aggregate lineation
- bearing and plunge of slickenline
- station location
- diabase station location
- U/Pb age date location (Wortman and others, 2000)
- Superconducting Super (SS) Collider core location (Wilson and Carpenter, 1997)
- K-7 McConnell (1974) point count analysis sample location



cross section scale: 1:24 000 elevation in feet no vertical exaggeration

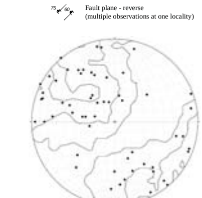




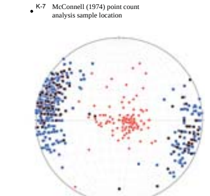
Base topographic map is a digital raster graphic image of the Lake Michie 7.5-minute quadrangle (1977), Lambert Conformal Conic projection.

This geologic map was funded in part by the USGS National Cooperative Geologic Mapping Program, award numbers G10AC00425 and G11AC20296. The views and conclusions contained in this document are those of the authors and should not be interpreted as necessarily representing the official policies, either expressed or implied, of the U.S. Government.

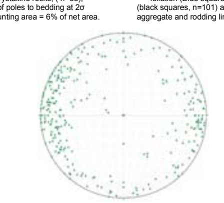
Disclaimer:
This Open-File report is preliminary and has been reviewed internally for conformity with the North Carolina Geological Survey editorial standards and in accordance with the North American Stratigraphic Code. There may be further revisions or corrections to this preliminary map.



Equal area Schmidt net projection of poles to bedding in crystalline rocks, (n=58); Kamb contour of poles to bedding at 2σ contour interval, counting area = 6% of net area.



Equal area Schmidt net projection of poles to shear foliation (Blue squares, n=435) and cleavage (black squares, n=101) and points to lines of mineral aggregate and rodding lineation (red circles, n=126).



Equal area Schmidt net of poles fractures, (n=341).

Scan with smartphone for link to GeoPDF of map. Third party App required.

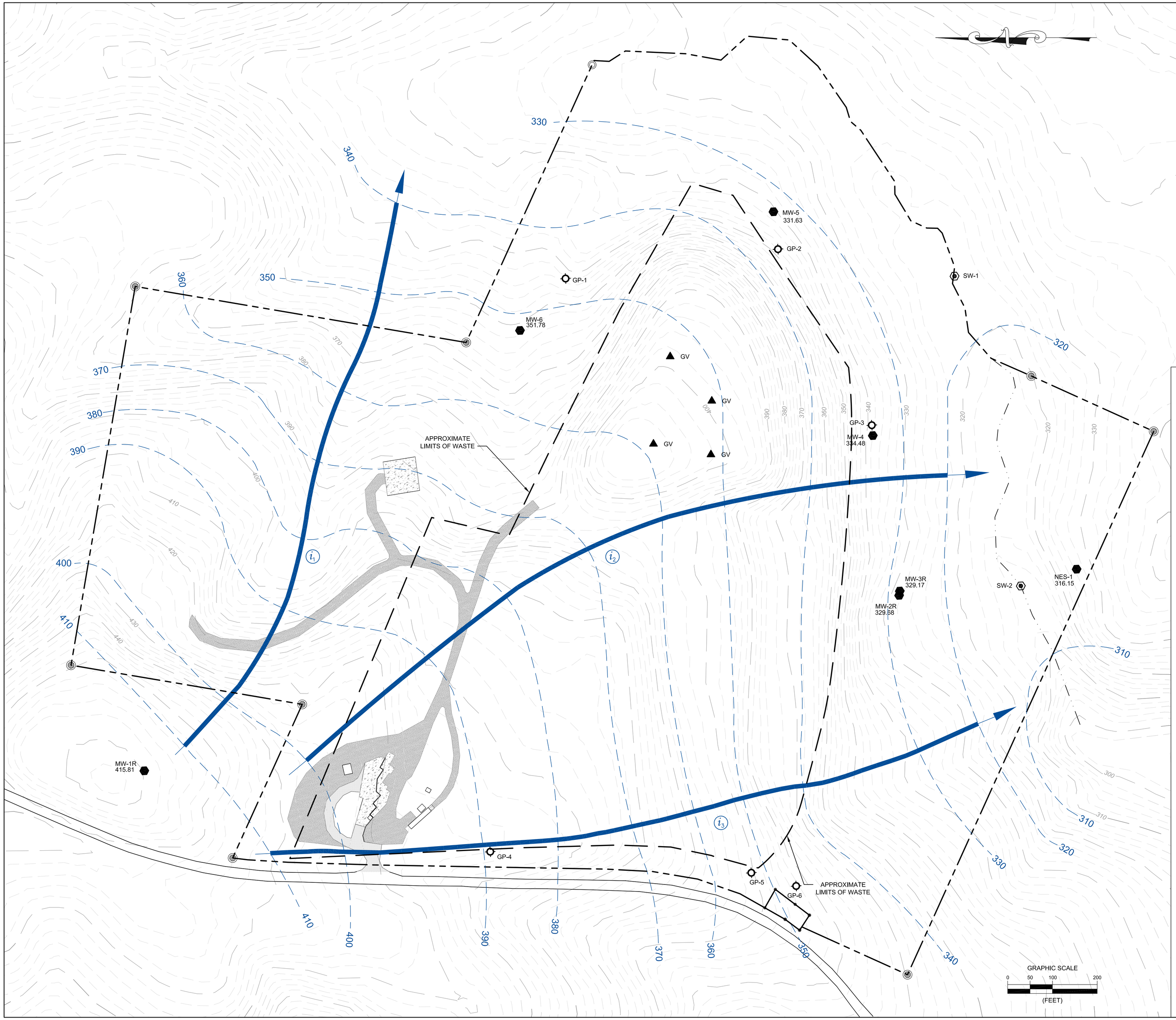
GEOLOGIC MAP OF THE EASTERN AND CENTRAL PORTIONS OF THE LAKE MICHIE 7.5-MINUTE QUADRANGLE, DURHAM, GRANVILLE, AND PERSON COUNTIES, NORTH CAROLINA

By Daniel L. Rhodes, David E. Blake, Robert H. Morrow, Joshua D. April, Amy L. Gross, and Jacob M. Kendall.

Digital representation by Michael A. Medina and Philip J. Bradley

2012

DRAWINGS



LEGEND

130	EXISTING 25' TOPOGRAPHIC CONTOUR
	EXISTING 5' TOPOGRAPHIC CONTOUR
	PROPERTY LINE
	APPROXIMATE LIMITS OF WASTE
380	GROUNDWATER SURFACE CONTOUR (FEET ABOVE MEAN SEA LEVEL)
	GROUNDWATER FLOW DIRECTION WITH GRADIENT CALCULATION SEGMENT
	EXISTING ROAD
	CENTERLINE OF STREAM
MW-1R 415.81	GROUNDWATER MONITORING WELL LOCATION AND IDENTIFICATION
i_1	SEGMENT USED FOR GRADIENT CALCULATIONS
GP-1	GAS PROBE LOCATION AND IDENTIFICATION
GV	GAS VENT
SW-1	SURFACE WATER MONITORING POINT
(NM)	NOT MEASURED

FLOW PATH LENGTH

i_1 = 1,325 LF

i_2 = 1,614 LF

i_3 = 1,621 LF

NOTES

1. TOPOGRAPHIC CONTOUR INTERVAL = 5 FEET
2. GROUNDWATER SURFACE CONTOUR INTERVAL = 5 FEET
3. STATIC WATER LEVELS MEASURED ON 02/24/14.
4. GROUNDWATER CONTOURS BASED ON KNOWN DATA, TOPOGRAPHIC CONTOURS, AND LINEAR INTERPOLATION AND EXTRAPOLATION FROM KNOWN FIELD CONDITIONS.
5. ELEVATION RELATIVE TO MEAN SEA LEVEL.
6. GROUNDWATER ELEVATION IS BASED ON A WELL SURVEY PERFORMED IN APRIL 2008
7. TOPOGRAPHIC CONTOURS SHOWN IN THIS MAP ARE BASED ON 2007 DATA OBTAINED FROM NCDOT WEBSITE.
8. BOUNDARY SURVEY PROVIDED BY BATEMAN CIVIL SURVEY COMPANY DATED MARCH 15, 2013.

DATE	REVISIONS AND RECORD OF ISSUE	NO	BY	CK	APP

DESIGNED	AC
DRAWN	RWH
CHECKED	DSG
APPROVED	GVB
DATE	03/18/14

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NC CORP LIC: C-0782

BUTNER LANDFILL
GRANVILLE COUNTY, NORTH CAROLINA

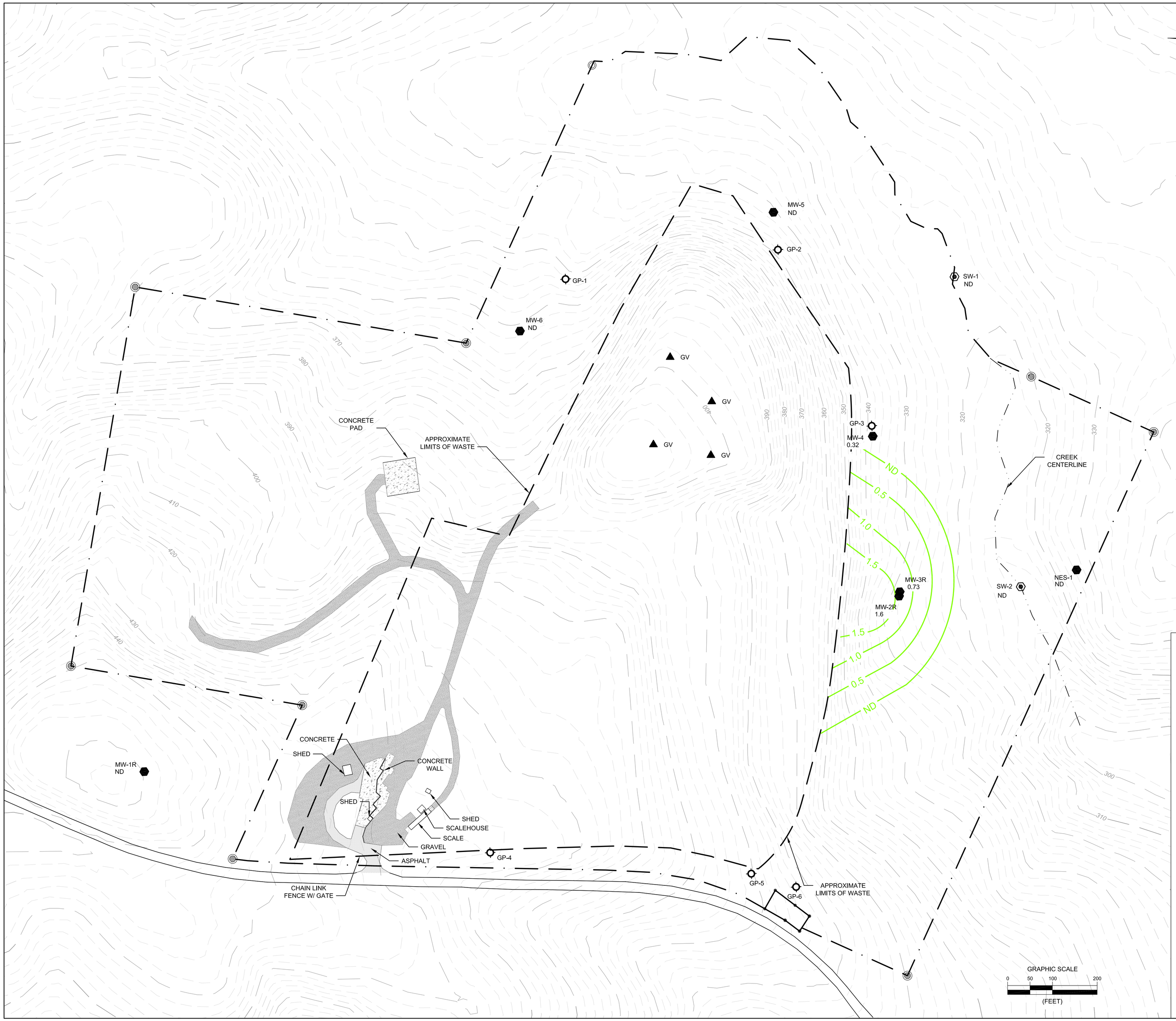
GROUNDWATER
POTENTIOMETRIC SURFACE MAP
FEBRUARY 24, 2014

PROJECT NO.
660.1303.12

SCALE
AS NOTED

DRAWING NO.
1

L:\Granville\dwg\Butner\2014 ACM\1- GW Event 02-14.dwg Layout=Layout1



LEGEND

130	EXISTING 25' TOPOGRAPHIC CONTOUR
	EXISTING 5' TOPOGRAPHIC CONTOUR
1.0	BENZENE CONCENTRATION (µg / L)
	PROPERTY LINE
	APPROXIMATE LIMITS OF WASTE
	EXISTING ROAD
	CENTERLINE OF STREAM
MW-2R 1.6	GROUNDWATER MONITORING WELL LOCATION AND IDENTIFICATION
GP-1	GAS PROBE LOCATION AND IDENTIFICATION
GV	GAS VENT
SW-1	SURFACE WATER MONITORING POINT
ND	NOT DETECTED ABOVE THE LABORATORY DETECTION LIMIT

NOTES

1. TOPOGRAPHIC CONTOUR INTERVAL = 5 FEET
2. TOPOGRAPHIC CONTOURS SHOWN IN THIS MAP ARE BASED ON 2007 DATA OBTAINED FROM NCDOT WEBSITE.
3. BOUNDARY SURVEY PROVIDED BY BATEMAN CIVIL SURVEY COMPANY DATED MARCH 15, 2013.
4. BENZENE C ONTOURS BASED OFF DATA FROM FEBRUARY 24, 2014 SAMPLING EVENT.

NO	BY	CK	APP

DATE	REVISIONS AND RECORD OF ISSUE

DESIGNED GVB
DRAWN RWH
CHECKED GVB
APPROVED GVB
DATE 05/13/14

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BUTNER LANDFILL
GRANVILLE COUNTY, NORTH CAROLINA

BENZENE ISOCONCENTRATION MAP
FEBRUARY 24, 2014

PROJECT NO.
660.1303.12

SCALE
AS NOTED

DRAWING NO.
2

L:\Granville\dwg\Butner\2014 ACM\2- BENZENE ISOCONCENTRATION MAP.dwg Layout=Dwg 2

TREE COVERAGE SURVEY

AREA 1 - APPROX. 6.2 ACRES
LOGGED RECENTLY, WITH STANDING AMERICAN SWEET GUM AND PINE SAPLINGS.

AREA 2 - APPROX. 3.7 ACRES
1. AMERICAN SWEET GUM (70%)
2. BLUE BEECH (10%)
3. LOBLOLLY PINE (3%)
4. WHITE CEDAR (3%)
5. TULIP POPLAR (10%)
6. BLACK MAPLE (4%)

AREA 3 - APPROX. 1.3 ACRES
1. TULIP POPLAR (50%)
2. BLACK MAPLE (15%)
3. LOBLOLLY PINE (15%)
4. AMERICAN SWEET GUM (20%)

TYPICAL OF PREVIOUSLY LOGGED AREA 1

TYPICAL OF AREA 2 AND AREA 3

WETLAND IN AREA 2

LEGEND

130	EXISTING 25' TOPOGRAPHIC CONTOUR
	EXISTING 5' TOPOGRAPHIC CONTOUR
	PROPERTY LINE
	APPROXIMATE LIMITS OF WASTE
	EXISTING ROAD
	CENTERLINE OF STREAM
MW-2R	GROUNDWATER MONITORING WELL LOCATION AND IDENTIFICATION
	SURFACE WATER MONITORING POINT

NOTES

1. TOPOGRAPHIC CONTOUR INTERVAL = 5 FEET
2. TOPOGRAPHIC CONTOURS SHOWN IN THIS MAP ARE BASED ON 2007 DATA OBTAINED FROM NCDOT WEBSITE.
3. BOUNDARY SURVEY PROVIDED BY BATEMAN CIVIL SURVEY COMPANY DATED MARCH 15, 2013.
4. TREE SURVEY CONDUCTED ON APRIL 22, 2014.

DATE	REVISIONS AND RECORD OF ISSUE	NO	BY	CK	APP

DESIGNED RWH
DRAWN RWH
CHECKED VB
APPROVED VB
DATE 04/24/14

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BUTNER LANDFILL
GRANVILLE COUNTY, NORTH CAROLINA

TREE SURVEY

PROJECT NO.
660.1303.12

SCALE
AS NOTED

DRAWING NO.
3

L:\Granville\dwg\Butner\2014 ACM\3- TREE SURVEY.dwg Layout=SITE MAP

APPENDIX A

NC Appendix I and II Constituents
With Groundwater Standards

North Carolina Appendix I, II, and C and D Constituents

NC App. I & II - Total Metals

Number	NC App. #	ANALYTE	CLASS	CAS RN	ANALYTICAL METHOD	GROUNDWATER			NOTES
						NC SWSL	NC 2L	GWP STD.	
1	App. I	**Antimony**	metal	7440-36-0	6010	**6**	**-**	**1**	(RCRA METAL)
2	App. I	**Arsenic**	metal	7440-38-2	6010	**10**	**10**	**-**	(RCRA METAL)
3	App. I	**Barium**	metal	7440-39-3	6010	**100**	**700**	**-**	
4	App. I	**Beryllium**	metal	7440-41-7	6010	**1**	**-**	**4**	(RCRA METAL)
5	App. I	**Cadmium**	metal	7440-43-9	6010	**1**	**2**	**-**	
6	App. I	**Chromium**	metal	7440-47-3	6010	**10**	**10**	**-**	(RCRA METAL)
7	App. I	**Cobalt**	metal	7440-48-4	6010	**10**	**-**	**1**	
8	App. I	**Copper**	metal	7440-50-8	6010	**10**	**1000**	**-**	EPA MCL is a secondary standard.
9	App. I	**Lead**	metal	7439-92-1	6010	**10**	**15**	**-**	EPA MCL is an action level. (RCRA METAL)
10	App. I	**Nickel**	metal	7440-02-0	6010	**50**	**100**	**-**	
11	App. I	**Selenium**	metal	7782-49-2	6010	**10**	**20**	**-**	(RCRA METAL)
12	App. I	**Silver**	metal	7440-22-4	6010	**10**	**20**	**-**	EPA MCL is a secondary standard. (RCRA METAL).
13	App. I	**Thallium**	metal	7440-28-0	6010	**5.5**	**-**	**0.2**	
14	App. I	**Vanadium**	metal	7440-62-2	6010	**25**	**-**	**0.3**	
15	App. I	**Zinc**	metal	7440-66-6	6010	**10**	**1000**	**-**	EPA MCL is a secondary standard. *(AL)* = NC2B Action Level
16	App. II	**Mercury**	metal	7439-97-6	7470	**0.2**	**1**	**-**	(RCRA METAL)
17	App. II	**Tin**	metal	7440-31-5	6010	**100**	**-**	**2000**	

NC App. II - Cyanide/ Sulfide

Number	NC App. #	ANALYTE	CLASS	CAS RN	ANALYTICAL METHOD	GROUNDWATER			NOTES
						NC SWSL	NC 2L	GWP STD.	
1	App. II	**Cyanide**	inorganic	57-12-5	9012A	**10**	**70**	**-**	
2	App. II	**Sulfide**	inorganic	18496-25-8	9030B	**1000**	**-**	**-**	

NC - Additional Constituents for C&D Landfills

Number	NC App. #	ANALYTE	CLASS	CAS RN	ANALYTICAL METHOD	GROUNDWATER			NOTES
						NC SWSL	NC 2L	GWP STD.	
1	C&D	**Alkalinity**	inorganic	SW337	SM 2320B	**-**	**-**	**-**	
2	C&D	**Chloride**	inorganic	SW301	SM 4500-Cl-E	**-**	**250000**	**-**	
3	C&D	**Iron**	metal	7439-89-6	6010	**300**	**300**	**-**	
4	C&D	**Manganese**	metal	7439-96-5	6010	**50**	**50**	**-**	
5	C&D	**Mercury**	metal	7439-97-6	7470	**0.2**	**1**	**-**	(RCRA Metal)
6	C&D	**Sulfate**	inorganic	14808-79-8	300.0	**250000**	**250000**	**-**	
7	C&D	**Total Dissolved Solids (TDS)**	inorganic	SW311	SM 2540C	**-**	**500000**	**-**	
8	C&D	**Tetrahydrofuran**	volatile		8260B	**-**	**-**	**-**	

NC App. I & II - Method 8260

Number	NC App. #	ANALYTE	CLASS	CAS RN	ANALYTICAL METHOD	GROUNDWATER			NOTES
						NC SWSL	NC 2L	GWP STD.	
1	App. I	**Acetone**	volatile	67-64-1	8260B	**100**	**6000**	**-**	
2	App. I	**Acrylonitrile**	volatile	107-13-1	8260B	**200**	**-**	**-**	
3	App. I	**Benzene**	volatile	71-43-2	8260B	**1**	**1**	**-**	
4	App. I	**Bromochloromethane**	volatile	74-97-5	8260B	**3**	**-**	**0.6**	
5	App. I	**Bromodichloromethane**	volatile	75-27-4	8260B	**1**	**0.6**	**-**	*MCL for total trihalomethanes
6	App. I	**Bromoform**	volatile	75-25-2	8260B	**3**	**4**	**-**	*MCL for total trihalomethanes
7	App. I	**Carbon disulfide**	volatile	75-15-0	8260B	**100**	**700**	**-**	
8	App. I	**Carbon tetrachloride**	volatile	56-23-5	8260B	**1**	**0.3**	**-**	
9	App. I	**Chlorobenzene**	volatile	108-90-7	8260B	**3**	**50**	**-**	
10	App. I	**Chloroethane**	volatile	75-00-3	8260B	**10**	**3000**	**-**	
11	App. I	**Chloroform**	volatile	67-66-3	8260B	**5**	**70**	**-**	*MCL for total trihalomethanes
12	App. I	**Dibromochloromethane**	volatile	124-48-1	8260B	**3**	**0.4**	**-**	*MCL for total trihalomethanes
13	App. I	**1,2-Dibromo-3-chloropropane (DBCP)**	volatile	96-12-8	8260B	**13**	**0.04**	**-**	
14	App. I	**1,2-Dibromoethane (EDB)**	volatile	106-93-4	8260B	**1**	**0.02**	**-**	
15	App. I	**o-Dichlorobenzene / 1,2-Dichlorobenzene**	volatile	95-50-1	8260B	**5**	**20**	**-**	
16	App. I	**p-Dichlorobenzene / 1,4-Dichlorobenzene**	volatile	106-46-7	8260B	**1**	**6**	**-**	
17	App. I	**trans-1,4-Dichloro-2-butene**	volatile	110-57-6	8260B	**100**	**-**	**-**	
18	App. I	**1,1-Dichloroethane**	volatile	75-34-3	8260B	**5**	**6**	**-**	
19	App. I	**1,2-Dichloroethane**	volatile	107-06-2	8260B	**1**	**0.4**	**-**	
20	App. I	**1,1-Dichloroethylene**	volatile	75-35-4	8260B	**5**	**7**	**-**	
21	App. I	**cis-1,2-Dichloroethylene**	volatile	156-59-2	8260B	**5**	**70**	**-**	
22	App. I	**trans-1,2-Dichloroethylene**	volatile	156-60-5	8260B	**5**	**100**	**-**	
23	App. I	**1,2-Dichloropropane**	volatile	78-87-5	8260B	**1**	**0.6**	**-**	
24	App. I	**cis-1,3-Dichloropropene**	volatile	10061-01-5	8260B	**1**	**0.4**	**-**	
25	App. I	**trans-1,3-Dichloropropene**	volatile	10061-02-6	8260B	**1**	**0.4**	**-**	
26	App. I	**Ethylbenzene**	volatile	100-41-4	8260B	**1**	**600**	**-**	
27	App. I	**2-Hexanone / Methyl butyl ketone (MBK)**	volatile	591-78-6	8260B	**50**	**-**	**280**	
28	App. I	**Methyl bromide / Bromomethane**	volatile	74-83-9	8260B	**10**	**-**	**10**	
29	App. I	**Methyl chloride / Chloromethane**	volatile	74-87-3	8260B	**1**	**3**	**-**	
30	App. I	**Methylene bromide / Dibromomethane**	volatile	74-95-3	8260B	**10**	**-**	**70**	
31	App. I	**Methylene chloride / Dichloromethane**	volatile	75-09-2	8260B	**1**	**5**	**-**	
32	App. I	**Methyl ethyl ketone / 2-Butanone (MEK)**	volatile	78-93-3	8260B	**100**	**4000**	**-**	
33	App. I	**Methyl iodide / Iodomethane**	volatile	74-88-4	8260B	**10**	**-**	**-**	
34	App. I	**4-Methyl-2-pentanone / Methyl isobutyl ketone**	volatile	108-10-1	8260B	**100**	**-**	**560**	
35	App. I	**Styrene**	volatile	100-42-5	8260B	**1**	**70**	**-**	
36	App. I	**1,1,1,2-Tetrachloroethane**	volatile	630-20-6	8260B	**5**	**-**	**1**	
37	App. I	**1,1,2,2-Tetrachloroethane**	volatile	79-34-5	8260B	**3**	**0.2**	**-**	
38	App. I	**Tetrachloroethylene (PCE)**	volatile	127-18-4	8260B	**1**	**0.7**	**-**	
39	App. I	**Toluene**	volatile	108-88-3	8260B	**1**	**600**	**-**	
40	App. I	**1,1,1-Trichloroethane**	volatile	71-55-6	8260B	**1**	**200**	**-**	
41	App. I	**1,1,2-Trichloroethane**	volatile	79-00-5	8260B	**1**	**-**	**0.6**	
42	App. I	**Trichloroethylene**	volatile	79-01-6	8260B	**1**	**3**	**-**	
43	App. I	**Trichlorofluoromethane (CFC-11)**	volatile	75-69-4	8260B	**1**	**2000**	**-**	
44	App. I	**1,2,3-Trichloropropane**	volatile	96-18-4	8260B	**1**	**0.005**	**-**	
45	App. I	**Vinyl acetate**	volatile	108-05-4	8260B	**50**	**-**	**88**	
46	App. I	**Vinyl chloride**	volatile	75-01-4	8260B	**1**	**0.03**	**-**	
47	App. I	**Xylenes (total)**	volatile	see note	8260B	**5**	**500**	**-**	Includes o-xylene, p-xylene, and unspecified xylenes [dimethyl benzenes (CAS RN 1330-20-7].

NC App. II - Method 8260

Number	NC App. #	ANALYTE	CLASS	CAS RN	ANALYTICAL METHOD	GROUNDWATER			NOTES
						NC SWSL	NC 2L	GWP STD.	
48	App. II	**Acetonitrile (methyl cyanide)**	volatile	75-05-8	8260B	**55**	**-**	**42**	
49	App. II	**Acrolein**	volatile	107-02-8	8260B	**53**	**-**	**4**	
50	App. II	**Allyl chloride (3-chloroprene)**	volatile	107-05-1	8260B	**10**	**-**	**-**	
51	App. II	**Chloroprene**	volatile	126-99-8	8260B	**20**	**-**	**-**	
52	App. II	**m-Dichlorobenzene / 1,3-Dichlorobenzene**	volatile	541-73-1	8260B	**5**	**200**	**-**	
53	App. II	**Dichlorodifluoromethane**	volatile	75-71-8	8260B	**5**	**1000**	**-**	
54	App. II	**1,3-Dichloropropane**	volatile	142-28-9	8260B	**1**	**-**	**-**	
55	App. II	**2,2-Dichloropropane**	volatile	594-20-7	8260B	**15**	**-**	**-**	
56	App. II	**1,1-Dichloropropene**	volatile	563-58-6	8260B	**5**	**-**	**-**	
57	App. II	**Isobutyl alcohol**	volatile	78-83-1	8260B	**100**	**-**	**-**	
58	App. II	**Methacrylonitrile**	volatile	126-98-7	8260B	**100**	**-**	**-**	
59	App. II	**Methyl methacrylate**	volatile	80-62-6	8260B	**30**	**-**	**25**	
60	App. II	**Propionitrile**	volatile	107-12-0	8260B	**150**	**-**	**-**	
61	App. II	**1,2,4-Trichlorobenzene**	volatile	120-82-1	8260B	**10**	**70**	**70**	
62	App. II	**Naphthalene**	volatile	91-20-3	8260B or 8270C	**10**	**6**	**-**	
63	App. II	**Hexachlorobutadiene**	semi-volatile	87-68-3	8270C or 8260B	**10**	**0.4**	**0.44**	
64	App. II	**Ethyl methacrylate**	semi-volatile	97-63-2	8270C or 8260B	**10**	**-**	**-**	

North Carolina Appendix I, II, and C and D Constituents

NC App. II - Method 8270

Number	NC App. #	ANALYTE	CLASS	CAS RN	ANALYTICAL METHOD	GROUNDWATER			NOTES
						NC SWSL	NC 2L	GWP STD.	
1	App. II	**Acenaphthene**	semi-volatile	83-32-9	8270C	**10**	**80**	**-**	
2	App. II	**Acenaphthylene**	semi-volatile	208-96-8	8270C	**10**	**200**	**-**	
3	App. II	**Acetophenone**	semi-volatile	98-86-2	8270C	**10**	**-**	**700**	
4	App. II	**2-Acetylaminofluorene**	semi-volatile	53-96-3	8270C	**20**	**-**	**-**	
5	App. II	**4-Aminobiphenyl**	semi-volatile	92-67-1	8270C	**20**	**-**	**-**	
6	App. II	**Anthracene**	PAH	120-12-7	8270C	**10**	**2000**	**-**	
7	App. II	**Benz[a]anthracene; Benzanthracene**	PAH	56-55-3	8270C	**10**	**0.05**	**-**	
8	App. II	**Benzo[b]fluoranthene**	PAH	205-99-2	8270C	**10**	**0.05**	**-**	
9	App. II	**Benzo[k]fluoranthene**	PAH	207-08-9	8270C	**10**	**0.5**	**-**	
10	App. II	**Benzo[g,h,i]perylene**	PAH	191-24-2	8270C	**10**	**200**	**-**	
11	App. II	**Benzo[a]pyrene**	PAH	50-32-8	8270C	**10**	**0.005**	**-**	
12	App. II	**Benzyl alchohol**	semi-volatile	100-51-6	8270C	**20**	**-**	**700**	
13	App. II	**Bis(2-chloroethoxy)methane**	semi-volatile	111-91-1	8270C	**10**	**-**	**-**	
14	App. II	**Bis(2-chloroethyl)ether**	semi-volatile	111-44-4	8270C	**10**	**-**	**0.031**	
15	App. II	**Bis(2-chloro-1-methylethyl)ether**	semi-volatile	108-60-1	8270C	**10**	**-**	**-**	Bis (2-chloroisopropyl) ether
16	App. II	**Bis(2-ethylhexyl)phthalate**	semi-volatile	117-81-7	8270C	**15**	**3**	**-**	
17	App. II	**4-Bromophenyl phenyl ether**	semi-volatile	101-55-3	8270C	**10**	**-**	**-**	
18	App. II	**Butyl benzyl phthalate**	semi-volatile	85-68-7	8270C	**10**	**1000**	**-**	
19	App. II	**p-Chloroaniline (4-Chloroaniline)**	semi-volatile	106-47-8	8270C	**20**	**-**	**-**	
20	App. II	**Chlorobenzilate**	semi-volatile	510-15-6	8270C	**10**	**-**	**-**	
21	App. II	**p-Chloro-m-cresol (4-chloro-3-methylphenol)**	semi-volatile	59-50-7	8270C	**20**	**-**	**-**	
22	App. II	**2-Chloronaphthalene**	semi-volatile	91-58-7	8270C	**10**	**-**	**-**	
23	App. II	**2-Chlorophenol**	semi-volatile	95-57-8	8270C	**10**	**0.4**	**-**	
24	App. II	**4-Chlorophenyl phenyl ether**	semi-volatile	7005-72-3	8270C	**10**	**-**	**-**	
25	App. II	**Chrysene**	PAH	218-01-9	8270C	**10**	**5**	**-**	
26	App. II	**m-Cresol (3-Methylphenol)**	semi-volatile	108-39-4	8270C	**10**	**400**	**-**	
27	App. II	**o-Cresol**	semi-volatile	95-48-7	8270C	**10**	**-**	**35**	
28	App. II	**p-Cresol (4-Methylphenol)**	semi-volatile	106-44-5	8270C	**10**	**40**	**-**	
29	App. II	**Diallate**	semi-volatile	2303-16-4	8270C	**10**	**-**	**-**	
30	App. II	**Dibenz[a,h]anthracene**	PAH	53-70-3	8270C	**10**	**0.005**	**-**	
31	App. II	**Dibenzofuran**	semi-volatile	132-64-9	8270C	**10**	**-**	**28**	
32	App. II	**Di-n-butyl phthalate**	semi-volatile	84-74-2	8270C	**10**	**700**	**-**	
33	App. II	**3,3'-Dichlorobenzidine**	semi-volatile	91-94-1	8270C	**20**	**-**	**-**	
34	App. II	**2,4-Dichlorophenol**	semi-volatile	120-83-2	8270C	**10**	**-**	**0.98**	
35	App. II	**2,6-Dichlorophenol**	semi-volatile	87-65-0	8270C	**10**	**-**	**-**	
36	App. II	**Diethyl phthalate**	semi-volatile	84-66-2	8270C	**6000**	**6000**	**-**	
37	App. II	**O,O-Diethyl O-2-pyrazinyl phosphorothioate**	OP pesticide	297-97-2	8270C	**20**	**-**	**-**	Thionazine
38	App. II	**Dimethoate**	OP pesticide	60-51-5	8270C	**20**	**-**	**-**	
39	App. II	**p-(Dimethylamino)azobenzene**	semi-volatile	60-11-7	8270C	**10**	**-**	**-**	
40	App. II	**7,12-Dimethylbenz[a]anthracene**	semi-volatile	57-97-6	8270C	**10**	**-**	**-**	
41	App. II	**3,3'-Dimethylbenzidine**	semi-volatile	119-93-7	8270C	**10**	**-**	**-**	
42	App. II	**2,4-Dimethylphenol (M-xylenol)**	semi-volatile	105-67-9	8270C	**10**	**100**	**-**	
43	App. II	**Dimethyl phthalate**	semi-volatile	131-11-3	8270C	**10**	**-**	**-**	
44	App. II	**m-Dinitrobenzene**	semi-volatile	99-65-0	8270C	**20**	**-**	**-**	
45	App. II	**4,6-Dinitro-o-cresol (2-methyl 4,6-dinitrolphenol)**	semi-volatile	534-52-1	8270C	**50**	**-**	**-**	
46	App. II	**2,4-Dinitrophenol**	semi-volatile	51-28-5	8270C	**50**	**-**	**-**	
47	App. II	**2,4-Dinitrotoluene**	semi-volatile	121-14-2	8270C	**10**	**-**	**-**	
48	App. II	**2,6-Dinitrotoluene**	semi-volatile	606-20-2	8270C	**10**	**-**	**-**	
49	App. II	**Di-n-octyl phthalate**	semi-volatile	117-84-0	8270C	**10**	**100**	**-**	
50	App. II	**Diphenylamine**	semi-volatile	122-39-4	8270C	**10**	**-**	**-**	
51	App. II	**Disulfoton**	OP pesticide	298-04-4	8270C	**10**	**0.3**	**-**	
52	App. II	**Ethyl methanesulfonate**	semi-volatile	62-50-0	8270C	**20**	**-**	**-**	
53	App. II	**Famphur**	semi-volatile	52-85-7	8270C	**20**	**-**	**-**	
54	App. II	**Fluoranthene**	PAH	206-44-0	8270C	**10**	**300**	**-**	
55	App. II	**Fluorene**	PAH	86-73-7	8270C	**10**	**300**	**-**	

NC App. II - Method 8270

Number	NC App. #	ANALYTE	CLASS	CAS RN	ANALYTICAL METHOD	GROUNDWATER			NOTES
						NC SWSL	NC 2L	GWP STD.	
56	App. II	**Hexachlorobenzene**	semi-volatile	118-74-1	8270C	**10**	**0.02**	**-**	
57	App. II	**Hexachlorocylopentadiene**	semi-volatile	77-47-4	8270C	**10**	**-**	**50**	
58	App. II	**Hexachloroethane**	semi-volatile	67-72-1	8270C	**10**	**-**	**2.5**	
59	App. II	**Hexachloropropene**	semi-volatile	1888-71-7	8270C	**10**	**-**	**-**	
60	App. II	**Indeno[1,2,3-cd]pyrene**	PAH	193-39-5	8270C	**10**	**0.05**	**-**	
61	App. II	**Isodrin**	semi-volatile	465-73-6	8270C	**20**	**-**	**-**	
62	App. II	**Isophorone**	semi-volatile	78-59-1	8270C	**10**	**40**	**-**	
63	App. II	**Isosafrole**	semi-volatile	120-58-1	8270C	**10**	**-**	**-**	
64	App. II	**Kepone**	pesticide	143-50-0	8270C	**20**	**-**	**-**	
65	App. II	**Methapyrilene**	semi-volatile	91-80-5	8270C	**100**	**-**	**-**	
66	App. II	**3-Methylcholanthrene**	semi-volatile	56-49-5	8270C	**10**	**-**	**-**	
67	App. II	**Methyl methanesulfonate**	semi-volatile	66-27-3	8270C	**10**	**-**	**-**	
68	App. II	**2-Methylnaphthalene**	semi-volatile	91-57-6	8270C	**10**	**30**	**-**	
69	App. II	**Methyl parathion**	semi-volatile	298-00-0	8270C	**10**	**-**	**-**	
70	App. II	**1,4-Naphthoquinone**	semi-volatile	130-15-4	8270C	**10**	**-**	**-**	
71	App. II	**1-Naphthylamine**	semi-volatile	134-32-7	8270C	**10**	**-**	**-**	
72	App. II	**2-Naphthylamine**	semi-volatile	91-59-8	8270C	**10**	**-**	**-**	
73	App. II	**o-Nitroaniline (2-Nitroaniline)**	semi-volatile	88-74-4	8270C	**50**	**-**	**-**	
74	App. II	**m-Nitroaniline (3-Nitroaniline)**	semi-volatile	99-09-2	8270C	**50**	**-**	**-**	
75	App. II	**p-Nitroaniline (4-Nitroaniline)**	semi-volatile	100-01-6	8270C	**20**	**-**	**-**	
76	App. II	**Nitrobenzene**	semi-volatile	98-95-3	8270C	**10**	**-**	**-**	
77	App. II	**5-Nitro-o-toluidine**	semi-volatile	99-55-8	8270C	**10**	**-**	**-**	
78	App. II	**o-Nitrophenol (2-Nitrophenol)**	semi-volatile	88-75-5	8270C	**10**	**-**	**-**	
79	App. II	**p-Nitrophenol (4-Nitrophenol)**	semi-volatile	100-02-7	8270C	**50**	**-**	**-**	
80	App. II	**N-Nitrosodiethylamine**	semi-volatile	55-18-5	8270C	**20**	**-**	**-**	
81	App. II	**N-Nitrosodimethylamine**	semi-volatile	62-75-9	8270C	**10**	**0.0007**	**-**	
82	App. II	**N-Nitrosodi-n-butylamine**	semi-volatile	924-16-3	8270C	**10**	**-**	**-**	
83	App. II	**N-Nitrosodiphenylamine**	semi-volatile	86-30-6	8270C	**10**	**-**	**-**	
84	App. II	**N-Nitrosodipropylamine**	semi-volatile	621-64-7	8270C	**10**	**-**	**-**	
85	App. II	**N-Nitrosomethylethylamine**	semi-volatile	10595-95-6	8270C	**10**	**-**	**-**	
86	App. II	**N-Nitrosopiperidine**	semi-volatile	100-75-4	8270C	**20**	**-**	**-**	
87	App. II	**N-Nitrosopyrrolidine**	semi-volatile	930-55-2	8270C	**10**	**-**	**-**	
88	App. II	**Parathion**	OP pesticide	56-38-2	8270C	**10**	**-**	**-**	
89	App. II	**Pentachlorobenzene**	semi-volatile	608-93-5	8270C	**10**	**-**	**-**	
90	App. II	**Pentachloronitrobenzene**	semi-volatile	82-68-8	8270C	**20**	**-**	**-**	
91	App. II	**Phenacetin**	semi-volatile	62-44-2	8270C	**20**	**-**	**-**	
92	App. II	**Phenanthrene**	PAH	85-01-8	8270C	**10**	**200**	**-**	
93	App. II	**Phenol**	semi-volatile	108-95-2	8270C	**10**	**30**	**-**	
94	App. II	**p-Phenylenediamine**	semi-volatile	106-50-3	8270C	**10**	**-**	**-**	
95	App. II	**Phorate**	OP pesticide	298-02-2	8270C	**10**	**1**	**-**	
96	App. II	**Pronamide**	semi-volatile	23950-58-5	8270C	**10**	**-**	**-**	
97	App. II	**Pyrene**	PAH	129-00-0	8270C	**10**	**200**	**-**	
98	App. II	**Safrole**	semi-volatile	94-59-7	8270C	**10**	**-**	**-**	
99	App. II	**1,2,4,5-Tetrachlorobenzene**	semi-volatile	95-94-3	8270C	**10**	**-**	**2**	
100	App. II	**2,3,4,6-Tetrachlorophenol**	semi-volatile	58-90-2	8270C	**10**	**200**	**-**	
101	App. II	**o-Toluidine**	semi-volatile	95-53-4	8270C	**10**	**-**	**-**	
102	App. II	**2,4,5-Trichlorophenol**	semi-volatile	95-95-4	8270C	**10**	**-**	**63**	
103	App. II	**2,4,6-Trichlorophenol**	semi-volatile	88-06-2	8270C	**10**	**-**	**4**	
104	App. II	**O,O,O-Triethyl phosphorothioate**	semi-volatile	126-68-1	8270C	**10**	**-**	**-**	
105	App. II	**1,3,5-Trinitrobenzene**	semi-volatile	99-35-4	8270C	**10**	**400**	**-**	
106	App. II	**Hexachlorobutadiene**	semi-volatile	87-68-3	8270C or 8260	**10**	**0.4**	**-**	
107	App. II	**Ethyl methacrylate**	semi-volatile	97-63-2	8270C or 8270	**10**	**-**	**-**	
108	App. II	**Naphthalene**	volatile	91-20-3	8260B or 8270	**10**	**6**	**-**	
109	App. II	**Pentachlorophenol**	herbicide	87-86-5	8151 or 8270	**25**	**0.3**	**-**	

North Carolina Appendix I, II, and C and D Constituents

NC App. II - Pesticides Method 8081

Number	NC App. #	ANALYTE	CLASS	CAS RN	ANALYTICAL METHOD	GROUNDWATER			NOTES
						NC SWSL	NC 2L	GWP STD.	
1	App. II	**Aldrin**	pesticide	309-00-2	8081A	**0.05**	**-**	**0.002**	
2	App. II	**alpha-BHC**	pesticide	319-84-6	8081A	**0.05**	**-**	**0.006**	
3	App. II	**beta-BHC**	pesticide	319-85-7	8081A	**0.05**	**-**	**0.019**	
4	App. II	**delta-BHC**	pesticide	319-86-8	8081A	**0.05**	**-**	**0.019**	
5	App. II	**gamma-BHC (Lindane)**	pesticide	58-89-9	8081A	**0.05**	**0.03**	**-**	
6	App. II	**Chlordane**	pesticide	see note	8081A	**0.5**	**0.1**	**-**	This entry includes alpha-chlordane (CAS RN 5103-71-9), beta chlordane (CAS RN 5103-74-2), gamma-chlordane (CAS RN 566-34-7), and constituents of chlordane (CAS RN 57-74-9 and 12672-29-6).
7	App. II	**4,4'-DDD**	pesticide	72-54-8	8081A	**0.1**	**0.1**	**-**	
8	App. II	**4,4'-DDE**	pesticide	72-55-9	8081A	**0.1**	**-**	**-**	
9	App. II	**4-4'-DDT**	pesticide	50-29-3	8081A	**0.1**	**0.1**	**-**	
10	App. II	**Dieldrin**	pesticide	60-57-1	8081A	**0.002**	**0.002**	**-**	
11	App. II	**Endosulfan I**	pesticide	959-96-8	8081A	**0.1**	**40**	**-**	
12	App. II	**Endosulfan II**	pesticide	33213-65-9	8081A	**0.1**	**42**	**-**	
13	App. II	**Endosulfan sulfate**	pesticide	1031-07-8	8081A	**0.1**	**-**	**-**	
14	App. II	**Endrin**	pesticide	72-20-8	8081A	**0.1**	**2**	**-**	
15	App. II	**Endrin aldehyde**	pesticide	7421-93-4	8081A	**0.1**	**2**	**-**	
16	App. II	**Heptachlor**	pesticide	76-44-8	8081A	**0.05**	**0.008**	**-**	
17	App. II	**Heptachlor epoxide**	pesticide	1024-57-3	8081A	**0.075**	**0.004**	**-**	
18	App. II	**Methoxychlor**	pesticide	72-43-5	8081A	**1**	**40**	**-**	
19	App. II	**Toxaphene**	pesticide	see note	8081A	**1.5**	**0.03**	**-**	Includes congener chemicals contained in technical toxaphene (CAS RN 8001-35-2) such as chlorinated camphene.

NC App. II - PCB's Method 8082

Number	NC App. #	ANALYTE	CLASS	CAS RN	ANALYTICAL METHOD	GROUNDWATER			NOTES
						NC SWSL	NC 2L	GWP STD.	
1-6	App. II	**Polychlorinated Biphenyls (PCBs)**	PCB	see note	8082	**2**	**-**	**0.09**	This category contains congener chemicals, including constituents of Aroclor 1016 (CAS RN 12674-11-2), Aroclor 1221 (CAS RN 11104-28-2), Aroclor 1232 (CAS RN 11141-16-5), Aroclor 1242 (CAS RN 53469-21-9), Aroclor 1248 (CAS RN 12672-29-6), Aroclor 1254 (CAS RN 11097-69-1)). Value given for the NC 2L Standard is the GWP for the Solid Waste Section.

NC App. II - Herbicides 8151

Number	NC App. #	ANALYTE	CLASS	CAS RN	ANALYTICAL METHOD	GROUNDWATER			NOTES
						NC SWSL	NC 2L	GWP STD.	
1	App. II	**2,4-Dichlorophenoxyacetic acid (2,4-D)**	herbicide	94-75-7	8151A	**2**	**70**	**-**	
2	App. II	**Dinoseb (DNBP); 2-sec-Butyl-4,6-dinitrophenol**	herbicide	86-85-7	8151A	**1**	**-**	**7**	
3	App. II	**Silvex (2,4,5-TP)**	herbicide	93-72-1	8151A	**2**	**50**	**-**	
4	App. II	**2,4,5-Trichlorophenoxyacetic acid (2,4,5-T)**	herbicide	93-76-5	8151A	**2**	**-**	**-**	
5	App. II	**Pentachlorophenol**	herbicide	87-86-5	8151 or 8270	**25**	**0.3**	**-**	

Notes:

Color denotes NC App. I Constituents

Color denotes remaining NC App. II Constituents

Color denotes C&D Constituents

Color denotes constituents that can be analyzed by more than one method

1. CAS RN: Chemical Abstracts Service Registry Number. Where 'Total' is entered, all species that contain the element are included.
2. Class: General type of compound
3. OP = orthophosphate
4. PAH = polynuclear aromatic hydrocarbon.
5. Volatile EQL of 1 ug/L is based on a 25-mL purge per SW-846, Final Update III, Revision 2, December 1996, page 8260B-35 (most recent revision to method 8260 in SW-846).
6. " - " = not available/not applicable
7. Referenced from North Carolina Dvision of Waste Management website (http://www.wastenotnc.org/sw/swenvmonitoringlist.asp)

APPENDIX B

NC-2B Surface Water Standards

Disclaimer: This table is intended to provide summary information only. It does not substitute for any written regulation, nor is it a regulation itself. **May 1, 2007**

The following standards, criteria, or toxic concentrations are adopted per 15A NCAC 2B. See last page for appropriate use information.

Pollutant	CAS #	Freshwater Aquatic Life	Saltwater Aquatic Life	Water Supply (WS)[1]	Human Health (HH)[2]	Trout Waters (Tr)	High Quality Waters (HQW)	Swamp Waters (Sw)	Synonyms & Other Info	Carcinogen
		ug/l (unless noted)	ug/l (unless noted)	ug/l (unless noted)	ug/l (unless noted)	ug/l (unless noted)	ug/l (unless noted)			
Aldrin	309-00-2	0.002	0.003	0.05 ng/L	0.05 ng/L					y
Arsenic	7440-38-2	50	50	10	10					y
Barium	7440-39-3			1.0 mg/L						n
Bacterial Indicators	*see enterococcus and fecal coliform*									NA
Benzene	71-43-2			1.19	51					y
Beryllium	7440-41-7	6.5								n
Cadmium	7440-43-9	2 (N)	5 (N)			0.4 (N)				n
Carbon Tetrachloride	56-23-5			0.254	1.6				Benzinoform; Carbon Chloride	y
Chlordane	57-74-9	0.004	0.004	0.8 ng/L	0.8 ng/L					y
Chloride	16887-00-6	230 mg/L (AL)		250 mg/L						n
Chlorine (TRC)	7782-50-5	17								n
Chlorinated Benzenes				488						y
Chlorinated Phenols				1.0 (N)						NA
Chlorophyll -a, corrected		40(N)	40(N)			15(N)				NA
Chromium		50	20							NA
Copper	7440-50-8	7 (AL)	3 (AL)							n
Cyanide	57-12-5	5 (N)	1							n
D, 2,4-	94-75-7			100					2,4-Dichlorophenoxy acetic acid	n
DDT, 4,4'-	50-29-3	0.001	0.001	0.2 ng/L	0.2 ng/L				4,4'-Dichlorodiphenyltrichloroethane	y
Demeton	8065-48-3	0.1	0.1							n
Dieldrin	60-57-1	0.002	0.002	0.05 ng/L	0.05 ng/L					y
Dioxin (2,3,7,8-TCDD)	1746-01-6			0.000005 ng/L	0.000005 ng/L				2,3,7,8-Tetrachlorodibenzo-p-dioxin	y
Dissolved Gases		110% sat (N)	110% sat (N)							NA

The following standards, criteria, or toxic concentrations are adopted per 15A NCAC 2B. See last page for appropriate use information.

Pollutant	CAS #	Freshwater Aquatic Life	Saltwater Aquatic Life	Water Supply (WS)[1]	Human Health (HH)[2]	Trout Waters (Tr)	High Quality Waters (HQW)	Swamp Waters (Sw)	Synonyms & Other Info	Carcinogen
		ug/l (unless noted)	ug/l (unless noted)	ug/l (unless noted)	ug/l (unless noted)	ug/l (unless noted)	ug/l (unless noted)			
Dissolved Oxygen		not less than 5.0 mg/L (N)	not less than 5.0 mg/L (N)			not less than 6.0 mg/L (N)	not less than 6.0 mg/L (E)	(N)		NA
Endosulfan	115-29-7	0.05	0.009						Same values apply to Endosulfan Sulfate, alpha-Endosulfan, and beta-Endosulfan	n
Endrin	72-20-8	0.002	0.002							n
Enterococcus					geomean of 35 organisms/100 mL (applicable to class SA, SB, and SC Saltwaters) (N)					NA
Fecal Coliform (MFTCC/100mL)[3]					geomean of 200 organisms/100 mL in Class C Freshwaters (N); and a geomean of 14 organisms/100 mL in class SA Saltwaters (N)					NA
Fluoride		1.8 mg/L								NA
Guthion	86-50-0	0.01	0.01							NA
Hardness, Total				100 mg/L Calcium Carbonate						NA
Heptachlor	76-44-8	0.004	0.004	0.08 ng/L	0.08 ng/L					y
Hexachlorobutadiene	87-68-3			0.44	18				HCBD	y
Iron	7439-89-6	1.0 mg/L (AL)								n
Lead	7439-92-1	25 (N)	25 (N)							n
Lindane	58-89-9	0.01	0.004						gamma-BHC, g-HCH	c
Manganese	7439-96-5			200						n
MBAS[4]				500 (N)					Methylene-blue-active substances (see note)	NA

The following standards, criteria, or toxic concentrations are adopted per 15A NCAC 2B. See last page for appropriate use information.

Pollutant	CAS #	Freshwater Aquatic Life	Saltwater Aquatic Life	Water Supply (WS)[1]	Human Health (HH)[2]	Trout Waters (Tr)	High Quality Waters (HQW)	Swamp Waters (Sw)	Synonyms & Other Info	Carcinogen
		ug/l (unless noted)	ug/l (unless noted)	ug/l (unless noted)	ug/l (unless noted)	ug/l (unless noted)	ug/l (unless noted)			
Mercury	7439-97-6	0.012	0.025							n
Methoxychlor	72-43-5	0.03	0.03							n
Mirex	2385-85-5	0.001	0.001							c
Nickel	7440-02-0	88 (N)	8.3 (N)	25						n
Nitrate (as N)	14797-55-8			10.0 mg/L					Total nitrogen may be regulated in NSW waters. See 2B .0200s for further info	n
Oil and Grease		(N)	(N)							NA
Parathion	56-38-2	0.013	0.178							n
PCB, total		0.001 (N)	0.001 (N)		0.064 ng/L (N)				polychlorinated biphenyls / (Total of all identified PCBs)	y
pH		6.0-9.0 (N)	6.8-8.5 (N)					(N)	Freshwater and Saltwater Aquatic Life Standards are listed as acceptable pH ranges	NA
Phenolic Compounds		(N)	(N)		(N)				(phenolic compounds: no fish flesh tainting)	NA
Polynuclear aromatic hydrocarbons (PAH's)[5]				0.0028 Total PAH's	0.0311 Total PAH's					y
Radioactive Substances		(N)	(N)		(N)					NA
Salinity			(N)							NA
Selenium	7782-49-2	5	71							n
Sewage		(N)	(N)	(N)						NA
Silver	7440-22-4	0.06 (AL)	0.1 (AL)							n
Silvex	93-72-1			10					2,4,5-TP; 2,4,5-Trichlorophenoxypropionoic Acid	n
Solids, settleable		(N)	(N)						also includes floating solids and sludge deposits	NA
Solids, total dissolved				500 mg/L						NA
Solids, total suspended		(N)				HQW=10 mg/L (E)	20 mg/L (E)			NA
Sulfates				250 mg/L						n
Temperature		(N)	(N)		(N)					NA
Tetrachloroethane, 1,1,2,2-	79-34-5			0.17	4				acetosol; acetylene tetrachloride	y
Tetrachloroethylene (PERC)	127-18-4			0.7	3.3				PERC; PCE; perchloroethylene	y

The following standards, criteria, or toxic concentrations are adopted per 15A NCAC 2B. See last page for appropriate use information.

Pollutant	CAS #	Freshwater Aquatic Life	Saltwater Aquatic Life	Water Supply (WS)[1]	Human Health (HH)[2]	Trout Waters (Tr)	High Quality Waters (HQW)	Swamp Waters (Sw)	Synonyms & Other Info	Carcinogen
		ug/l (unless noted)	ug/l (unless noted)	ug/l (unless noted)	ug/l (unless noted)	ug/l (unless noted)	ug/l (unless noted)			
Toluene	108-88-3	11				0.36			methyl benzene; phenyl methane	n
Toxaphene	8001-35-2	0.2 ng/L	0.2 ng/L							y
Trialkyltin		0.07	0.007							n
Tributyltin (TBT)	56573-85-4	0.07	0.007							n
Trichloroethylene	79-01-6			2.5	30				TCE	y
Turbidity		50/25 NTU (N)	25 NTU (N)			10 NTU (N)				NA
Vinyl Chloride	75-01-4			0.025	2.4				chloroethylene	y
Zinc	7440-66-6	50 (AL)	86 (AL)							n

Footnotes, Codes, and Additional Information with Reference to Classifications and Standards

*To determine the appropriate standard, use the most stringent of all applicable columns.For Class C, use the most stringent of freshwater (or, if applicable, saltwater) column and the Human Health column.

* For a WS water, use the most stringent of Freshwater, WS & Human Health. Trout Waters & High Quality Waters likewise must adhere to the most stingent of all applicable standards

* All metal criteria are as total recoverable metals.

(AL) Action Level Standard - See 2B .0211 for additional information

(E) For effluent limits only. See 2B .0224

(HQW) High Quality Waters - see 02B .0101 and .0201

(N) = Narrative standard See 2B .0211 and for WS: .0212, 0214,.0215, .0216 and.0218

(NTU) Nephelometric Turbidity Units

(Sw) Swamp Waters - as defined by 02B .0101

(Tr) Trout Waters - as defined by 02B .0101 and 0301

1 WS standards are applicable to *all* Water Supply Classifications. WS standards are based on the consumption of fish and water. See 2B .0208 for equation.

2 Human Health Standards are based on the consumption of fish only unless dermal contact studies are available. See 2B .0208 for applicable equations.

3 MFTCC/100 mL = Membrane Filter Total Coliform Count per 100 mL of sample

4 MBAS: additional narrative language is located in 02B .0212, .0214, .0215, .0216, .0218

5 PAH=Applies to total PAHs present and includes the following: benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene and indeno(1,2,3-cd)pyrene

Carcinogenicity Color Key:	
Known to cause cancer in humans (y)	**Blue**
Not known to cause cancer in humans (n)	**Green**
Possible human carcinogen (c)	**Yellow**
Carcinogenicity not assessed or Does Not Apply (NA)	**No Color**

Unit Conversions: 1.0 mg/L = 1000.0 ug/L = 1000000.0 ng/L
1.0 ng/L = 0.001 ug/L = 0.000001 mg/L

APPENDIX C

Laboratory Report, Chain-of-Custody,
and Field Data Logs
May 2013 MNA Sampling Event

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May 17, 2013

Mr. Van Burbach
Joyce Engineering-NC
2211 West Meadowview Rd
Boone Bldg, Suite 101
Greensboro, NC 27407

RE: Project: BUTNER MNA-GRANVILLE CO
Pace Project No.: 92156751

Dear Mr. Burbach:
Enclosed are the analytical results for sample(s) received by the laboratory on May 03, 2013. The results relate only to the samples included in this report. Results reported herein conform to the most current TNI standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

Analyses were performed at the Pace Analytical Services location indicated on the sample analyte page for analysis unless otherwise footnoted.

Some analyses have been subcontracted outside of the Pace Network. The subcontracted laboratory report has been attached.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Kevin Godwin

kevin.godwin@pacelabs.com
Project Manager

Enclosures

REPORT OF LABORATORY ANALYSIS

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CERTIFICATIONS

Project: BUTNER MNA-GRANVILLE CO
Pace Project No.: 92156751

Minnesota Certification IDs
1700 Elm Street SE Suite 200, Minneapolis, MN 55414
A2LA Certification #: 2926.01
Alaska Certification #: UST-078
Alaska Certification #MN00064
Arizona Certification #: AZ-0014
Arkansas Certification #: 88-0680
California Certification #: 01155CA
Colorado Certification #Pace
Connecticut Certification #: PH-0256
EPA Region 8 Certification #: Pace
Florida/NELAP Certification #: E87605
Georgia Certification #: 959
Hawaii Certification #Pace
Idaho Certification #: MN00064
Illinois Certification #: 200011
Kansas Certification #: E-10167
Louisiana Certification #: 03086
Louisiana Certification #: LA080009
Maine Certification #: 2007029
Maryland Certification #: 322
Michigan DEQ Certification #: 9909
Minnesota Certification #: 027-053-137
Mississippi Certification #: Pace
Montana Certification #: MT CERT0092
Nebraska Certification #: Pace
Nevada Certification #: MN_00064
New Jersey Certification #: MN-002
New York Certification #: 11647
North Carolina Certification #: 530
North Dakota Certification #: R-036
North Dakota Certification #: R-036A
Ohio VAP Certification #: CL101
Oklahoma Certification #: 9507
Oregon Certification #: MN200001
Oregon Certification #: MN300001
Pennsylvania Certification #: 68-00563
Puerto Rico Certification
Tennessee Certification #: 02818
Texas Certification #: T104704192
Utah Certification #: MN00064
Virginia/DCLS Certification #: 002521
Virginia/VELAP Certification #: 460163
Washington Certification #: C754
West Virginia Certification #: 382
Wisconsin Certification #: 999407970

Asheville Certification IDs
2225 Riverside Dr., Asheville, NC 28804
Florida/NELAP Certification #: E87648
Massachusetts Certification #: M-NC030
North Carolina Drinking Water Certification #: 37712
North Carolina Wastewater Certification #: 40
South Carolina Certification #: 99030001
West Virginia Certification #: 356
Virginia/VELAP Certification #: 460222

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SAMPLE SUMMARY

Project: BUTNER MNA-GRANVILLE CO
Pace Project No.: 92156751

Lab ID	Sample ID	Matrix	Date Collected	Date Received
92156751001	**3902-MW1R**	Water	05/01/13 17:30	05/03/13 10:00
92156751002	**3902-MW2R**	Water	05/01/13 15:40	05/03/13 10:00
92156751003	**3902-MW3R**	Water	05/01/13 15:15	05/03/13 10:00
92156751004	**3902-MW4**	Water	05/01/13 14:24	05/03/13 10:00
92156751005	**3902-NES1**	Water	05/01/13 18:20	05/03/13 10:00

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SAMPLE ANALYTE COUNT

Project: BUTNER MNA-GRANVILLE CO
Pace Project No.: 92156751

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
92156751001	**3902-MW1R**	RSK 175	DR1	3	PASI-M
		SM 2320B	KCS	1	PASI-A
		SM 4500-S2D	SAE	1	PASI-A
		EPA 300.0	SAE	1	PASI-A
		EPA 353.2	SAE	1	PASI-A
		SM 4500-Cl-E	DMN	1	PASI-A
		SM 5310B	SAE	1	PASI-A
92156751002	**3902-MW2R**	RSK 175	DR1	3	PASI-M
		SM 2320B	KCS	1	PASI-A
		SM 4500-S2D	SAE	1	PASI-A
		EPA 300.0	SAE	1	PASI-A
		EPA 353.2	SAE	1	PASI-A
		SM 4500-Cl-E	DMN	1	PASI-A
		SM 5310B	SAE	1	PASI-A
92156751003	**3902-MW3R**	RSK 175	DR1	3	PASI-M
		SM 2320B	KCS	1	PASI-A
		SM 4500-S2D	SAE	1	PASI-A
		EPA 300.0	SAE	1	PASI-A
		EPA 353.2	SAE	1	PASI-A
		SM 4500-Cl-E	DMN	1	PASI-A
		SM 5310B	SAE	1	PASI-A
92156751004	**3902-MW4**	RSK 175	DR1	3	PASI-M
		SM 2320B	KCS	1	PASI-A
		SM 4500-S2D	SAE	1	PASI-A
		EPA 300.0	SAE	1	PASI-A
		EPA 353.2	SAE	1	PASI-A
		SM 4500-Cl-E	DMN	1	PASI-A
		SM 5310B	SAE	1	PASI-A
92156751005	**3902-NES1**	RSK 175	DR1	3	PASI-M
		SM 2320B	KCS	1	PASI-A
		SM 4500-S2D	SAE	1	PASI-A
		EPA 300.0	SAE	1	PASI-A
		EPA 353.2	SAE	1	PASI-A
		SM 4500-Cl-E	DMN	1	PASI-A
		SM 5310B	SAE	1	PASI-A

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HITS ONLY

Project: BUTNER MNA-GRANVILLE CO
Pace Project No.: 92156751

Lab Sample ID / Method	Client Sample ID / Parameters	Result	Units	Report Limit	Analyzed	Qualifiers
92156751001	**3902-MW1R**					
SM 2320B	Alkalinity, Total as CaCO3	43400	ug/L	5000	05/09/13 20:14	
EPA 353.2	Nitrogen, Nitrate	163J	ug/L	10000	05/03/13 14:50	
SM 4500-Cl-E	Chloride	3540	ug/L	1000	05/09/13 18:15	
SM 5310B	Total Organic Carbon	2240	ug/L	1000	05/09/13 21:59	
92156751002	**3902-MW2R**					
RSK 175	Methane	37.9	ug/L	6.6	05/08/13 10:35	
SM 2320B	Alkalinity, Total as CaCO3	757000	ug/L	5000	05/09/13 21:02	M1
SM 4500-Cl-E	Chloride	258000	ug/L	15000	05/09/13 19:07	
SM 5310B	Total Organic Carbon	29500	ug/L	2000	05/10/13 08:54	
92156751003	**3902-MW3R**					
RSK 175	Ethane	1.7J	ug/L	6.2	05/08/13 10:45	
RSK 175	Methane	100	ug/L	6.6	05/08/13 10:45	
SM 2320B	Alkalinity, Total as CaCO3	660000	ug/L	5000	05/09/13 22:25	
SM 4500-Cl-E	Chloride	180000	ug/L	10000	05/09/13 19:09	
SM 5310B	Total Organic Carbon	30000	ug/L	1000	05/09/13 22:20	
92156751004	**3902-MW4**					
RSK 175	Methane	33.7	ug/L	6.6	05/08/13 10:56	
SM 2320B	Alkalinity, Total as CaCO3	645000	ug/L	5000	05/09/13 22:46	
EPA 300.0	Sulfate	4690J	ug/L	250000	05/06/13 22:14	
SM 4500-Cl-E	Chloride	123000	ug/L	10000	05/09/13 19:11	
SM 5310B	Total Organic Carbon	19400	ug/L	1000	05/09/13 22:30	
92156751005	**3902-NES1**					
SM 2320B	Alkalinity, Total as CaCO3	10400	ug/L	5000	05/09/13 23:15	
EPA 300.0	Sulfate	10700J	ug/L	250000	05/06/13 22:27	
EPA 353.2	Nitrogen, Nitrate	3580J	ug/L	10000	05/03/13 14:55	
SM 4500-Cl-E	Chloride	2850	ug/L	1000	05/09/13 18:19	
SM 5310B	Total Organic Carbon	5740	ug/L	1000	05/09/13 22:40	

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ANALYTICAL RESULTS

Project: BUTNER MNA-GRANVILLE CO
Pace Project No.: 92156751

Sample: 3902-MW1R **Lab ID: 92156751001** Collected: 05/01/13 17:30 Received: 05/03/13 10:00 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
RSK 175 AIR Headspace	Analytical Method: RSK 175								
Ethane	ND	ug/L	6.2	0.86	1		05/08/13 10:24	74-84-0	
Ethene	ND	ug/L	6.2	0.79	1		05/08/13 10:24	74-85-1	
Methane	ND	ug/L	6.6	3.3	1		05/08/13 10:24	74-82-8	
2320B Alkalinity	Analytical Method: SM 2320B								
Alkalinity, Total as CaCO3	**43400**	ug/L	5000	1000	1		05/09/13 20:14		
4500S2D Sulfide Water	Analytical Method: SM 4500-S2D								
Sulfide	ND	ug/L	1000	100	1		05/07/13 14:51	18496-25-8	
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0								
Sulfate	ND	ug/L	250000	2000	1		05/06/13 21:06	14808-79-8	
353.2 Nitrogen, NO2/NO3 unpres	Analytical Method: EPA 353.2								
Nitrogen, Nitrate	**163J**	ug/L	10000	20.0	1		05/03/13 14:50		
4500 Chloride	Analytical Method: SM 4500-Cl-E								
Chloride	**3540**	ug/L	1000	1000	1		05/09/13 18:15	16887-00-6	
5310B TOC	Analytical Method: SM 5310B								
Total Organic Carbon	**2240**	ug/L	1000	1000	1		05/09/13 21:59	7440-44-0	

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ANALYTICAL RESULTS

Project: BUTNER MNA-GRANVILLE CO
Pace Project No.: 92156751

Sample: 3902-MW2R **Lab ID: 92156751002** Collected: 05/01/13 15:40 Received: 05/03/13 10:00 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
RSK 175 AIR Headspace	Analytical Method: RSK 175								
Ethane	ND	ug/L	6.2	0.86	1		05/08/13 10:35	74-84-0	
Ethene	ND	ug/L	6.2	0.79	1		05/08/13 10:35	74-85-1	
Methane	**37.9**	ug/L	6.6	3.3	1		05/08/13 10:35	74-82-8	
2320B Alkalinity	Analytical Method: SM 2320B								
Alkalinity, Total as CaCO3	**757000**	ug/L	5000	1000	1		05/09/13 21:02		M1
4500S2D Sulfide Water	Analytical Method: SM 4500-S2D								
Sulfide	ND	ug/L	1000	100	1		05/07/13 14:51	18496-25-8	
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0								
Sulfate	ND	ug/L	250000	2000	1		05/06/13 21:19	14808-79-8	
353.2 Nitrogen, NO2/NO3 unpres	Analytical Method: EPA 353.2								
Nitrogen, Nitrate	ND	ug/L	10000	20.0	1		05/03/13 14:46		
4500 Chloride	Analytical Method: SM 4500-Cl-E								
Chloride	**258000**	ug/L	15000	15000	15		05/09/13 19:07	16887-00-6	
5310B TOC	Analytical Method: SM 5310B								
Total Organic Carbon	**29500**	ug/L	2000	2000	2		05/10/13 08:54	7440-44-0	

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ANALYTICAL RESULTS

Project: BUTNER MNA-GRANVILLE CO
Pace Project No.: 92156751

Sample: 3902-MW3R **Lab ID: 92156751003** Collected: 05/01/13 15:15 Received: 05/03/13 10:00 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
RSK 175 AIR Headspace	Analytical Method: RSK 175								
Ethane	**1.7J**	ug/L	6.2	0.86	1		05/08/13 10:45	74-84-0	
Ethene	ND	ug/L	6.2	0.79	1		05/08/13 10:45	74-85-1	
Methane	**100**	ug/L	6.6	3.3	1		05/08/13 10:45	74-82-8	
2320B Alkalinity	Analytical Method: SM 2320B								
Alkalinity, Total as CaCO3	**660000**	ug/L	5000	1000	1		05/09/13 22:25		
4500S2D Sulfide Water	Analytical Method: SM 4500-S2D								
Sulfide	ND	ug/L	1000	100	1		05/07/13 14:51	18496-25-8	
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0								
Sulfate	ND	ug/L	250000	2000	1		05/06/13 22:00	14808-79-8	
353.2 Nitrogen, NO2/NO3 unpres	Analytical Method: EPA 353.2								
Nitrogen, Nitrate	ND	ug/L	10000	20.0	1		05/03/13 14:41		
4500 Chloride	Analytical Method: SM 4500-Cl-E								
Chloride	**180000**	ug/L	10000	10000	10		05/09/13 19:09	16887-00-6	
5310B TOC	Analytical Method: SM 5310B								
Total Organic Carbon	**30000**	ug/L	1000	1000	1		05/09/13 22:20	7440-44-0	

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ANALYTICAL RESULTS

Project: BUTNER MNA-GRANVILLE CO
Pace Project No.: 92156751

Sample: 3902-MW4 **Lab ID: 92156751004** Collected: 05/01/13 14:24 Received: 05/03/13 10:00 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
RSK 175 AIR Headspace	Analytical Method: RSK 175								
Ethane	ND	ug/L	6.2	0.86	1		05/08/13 10:56	74-84-0	
Ethene	ND	ug/L	6.2	0.79	1		05/08/13 10:56	74-85-1	
Methane	**33.7**	ug/L	6.6	3.3	1		05/08/13 10:56	74-82-8	
2320B Alkalinity	Analytical Method: SM 2320B								
Alkalinity, Total as CaCO3	**645000**	ug/L	5000	1000	1		05/09/13 22:46		
4500S2D Sulfide Water	Analytical Method: SM 4500-S2D								
Sulfide	ND	ug/L	1000	100	1		05/07/13 14:51	18496-25-8	
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0								
Sulfate	**4690J**	ug/L	250000	2000	1		05/06/13 22:14	14808-79-8	
353.2 Nitrogen, NO2/NO3 unpres	Analytical Method: EPA 353.2								
Nitrogen, Nitrate	ND	ug/L	10000	20.0	1		05/03/13 14:39		H1
4500 Chloride	Analytical Method: SM 4500-Cl-E								
Chloride	**123000**	ug/L	10000	10000	10		05/09/13 19:11	16887-00-6	
5310B TOC	Analytical Method: SM 5310B								
Total Organic Carbon	**19400**	ug/L	1000	1000	1		05/09/13 22:30	7440-44-0	

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ANALYTICAL RESULTS

Project: BUTNER MNA-GRANVILLE CO
Pace Project No.: 92156751

Sample: 3902-NES1 **Lab ID: 92156751005** Collected: 05/01/13 18:20 Received: 05/03/13 10:00 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
RSK 175 AIR Headspace	Analytical Method: RSK 175								
Ethane	ND	ug/L	6.2	0.86	1		05/08/13 11:44	74-84-0	
Ethene	ND	ug/L	6.2	0.79	1		05/08/13 11:44	74-85-1	
Methane	ND	ug/L	6.6	3.3	1		05/08/13 11:44	74-82-8	
2320B Alkalinity	Analytical Method: SM 2320B								
Alkalinity, Total as CaCO3	**10400**	ug/L	5000	1000	1		05/09/13 23:15		
4500S2D Sulfide Water	Analytical Method: SM 4500-S2D								
Sulfide	ND	ug/L	1000	100	1		05/07/13 14:51	18496-25-8	
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0								
Sulfate	**10700J**	ug/L	250000	2000	1		05/06/13 22:27	14808-79-8	
353.2 Nitrogen, NO2/NO3 unpres	Analytical Method: EPA 353.2								
Nitrogen, Nitrate	**3580J**	ug/L	10000	20.0	1		05/03/13 14:55		
4500 Chloride	Analytical Method: SM 4500-Cl-E								
Chloride	**2850**	ug/L	1000	1000	1		05/09/13 18:19	16887-00-6	
5310B TOC	Analytical Method: SM 5310B								
Total Organic Carbon	**5740**	ug/L	1000	1000	1		05/09/13 22:40	7440-44-0	

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QUALITY CONTROL DATA

Project: BUTNER MNA-GRANVILLE CO
Pace Project No.: 92156751

QC Batch: AIR/17299 Analysis Method: RSK 175
QC Batch Method: RSK 175 Analysis Description: RSK 175 AIR HEADSPACE
Associated Lab Samples: 92156751001, 92156751002, 92156751003, 92156751004, 92156751005

METHOD BLANK: 1426023 Matrix: Water
Associated Lab Samples: 92156751001, 92156751002, 92156751003, 92156751004, 92156751005

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Ethane	ug/L	ND	6.2	05/08/13 08:25	
Ethene	ug/L	ND	6.2	05/08/13 08:25	
Methane	ug/L	ND	6.6	05/08/13 08:25	

LABORATORY CONTROL SAMPLE & LCSD: 1426024 1426025

Parameter	Units	Spike Conc.	LCS Result	LCSD Result	LCS % Rec	LCSD % Rec	% Rec Limits	RPD	Max RPD	Qualifiers
Ethane	ug/L	114	113	111	99	98	85-115	1	20	
Ethene	ug/L	106	106	104	100	98	85-115	2	20	
Methane	ug/L	60.7	61.6	61.3	102	101	85-115	.4	20	

SAMPLE DUPLICATE: 1426026

Parameter	Units	92156723024 Result	Dup Result	RPD	Max RPD	Qualifiers
Ethane	ug/L	ND	ND		20	
Ethene	ug/L	ND	ND		20	
Methane	ug/L	ND	6.1J		20	

SAMPLE DUPLICATE: 1426027

Parameter	Units	92156810001 Result	Dup Result	RPD	Max RPD	Qualifiers
Ethane	ug/L	ND	ND		20	
Ethene	ug/L	ND	ND		20	
Methane	ug/L	ND	ND		20	

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QUALITY CONTROL DATA

Project: BUTNER MNA-GRANVILLE CO
Pace Project No.: 92156751

QC Batch: WET/25310
QC Batch Method: SM 2320B
Analysis Method: SM 2320B
Analysis Description: 2320B Alkalinity
Associated Lab Samples: 92156751001

METHOD BLANK: 971304
Matrix: Water
Associated Lab Samples: 92156751001

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Alkalinity, Total as CaCO3	ug/L	ND	5000	05/09/13 14:14	

LABORATORY CONTROL SAMPLE: 971305

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Alkalinity, Total as CaCO3	ug/L	50000	45900	92	90-110	

MATRIX SPIKE SAMPLE: 971307

Parameter	Units	92156866002 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Alkalinity, Total as CaCO3	ug/L	72.4 mg/L	50000	115000	85	75-125	

MATRIX SPIKE SAMPLE: 971309

Parameter	Units	92156723004 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Alkalinity, Total as CaCO3	ug/L	146 mg/L	50000	182000	71	75-125	M1

SAMPLE DUPLICATE: 971306

Parameter	Units	92156866002 Result	Dup Result	RPD	Max RPD	Qualifiers
Alkalinity, Total as CaCO3	ug/L	72.4 mg/L	73400	1	20	

SAMPLE DUPLICATE: 971308

Parameter	Units	92156723004 Result	Dup Result	RPD	Max RPD	Qualifiers
Alkalinity, Total as CaCO3	ug/L	146 mg/L	140000	4	20	

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QUALITY CONTROL DATA

Project: BUTNER MNA-GRANVILLE CO
Pace Project No.: 92156751

QC Batch: WET/25313 Analysis Method: SM 2320B
QC Batch Method: SM 2320B Analysis Description: 2320B Alkalinity
Associated Lab Samples: 92156751002, 92156751003, 92156751004, 92156751005

METHOD BLANK: 971485 Matrix: Water
Associated Lab Samples: 92156751002, 92156751003, 92156751004, 92156751005

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Alkalinity, Total as CaCO3	ug/L	ND	5000	05/09/13 20:43	

LABORATORY CONTROL SAMPLE: 971486

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Alkalinity, Total as CaCO3	ug/L	50000	45700	91	90-110	

MATRIX SPIKE SAMPLE: 971488

Parameter	Units	92156751002 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Alkalinity, Total as CaCO3	ug/L	757000	50000	728000	-58	75-125	M1

SAMPLE DUPLICATE: 971487

Parameter	Units	92156751002 Result	Dup Result	RPD	Max RPD	Qualifiers
Alkalinity, Total as CaCO3	ug/L	757000	743000	2	20	

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QUALITY CONTROL DATA

Project: BUTNER MNA-GRANVILLE CO
Pace Project No.: 92156751

QC Batch: WET/25254 Analysis Method: SM 4500-S2D
QC Batch Method: SM 4500-S2D Analysis Description: 4500S2D Sulfide Water
Associated Lab Samples: 92156751001, 92156751002, 92156751003, 92156751004, 92156751005

METHOD BLANK: 969145 Matrix: Water
Associated Lab Samples: 92156751001, 92156751002, 92156751003, 92156751004, 92156751005

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Sulfide	ug/L	ND	1000	05/07/13 14:51	

LABORATORY CONTROL SAMPLE: 969146

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Sulfide	ug/L	500	512J	102	90-110	

MATRIX SPIKE SAMPLE: 969147

Parameter	Units	92156751001 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Sulfide	ug/L	ND	500	491J	98	75-125	

SAMPLE DUPLICATE: 969148

Parameter	Units	92156751001 Result	Dup Result	RPD	Max RPD	Qualifiers
Sulfide	ug/L	ND	ND		20	

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QUALITY CONTROL DATA

Project: BUTNER MNA-GRANVILLE CO
Pace Project No.: 92156751

QC Batch: WETA/15244 Analysis Method: EPA 300.0
QC Batch Method: EPA 300.0 Analysis Description: 300.0 IC Anions
Associated Lab Samples: 92156751001, 92156751002, 92156751003, 92156751004, 92156751005

METHOD BLANK: 968854 Matrix: Water
Associated Lab Samples: 92156751001, 92156751002, 92156751003, 92156751004, 92156751005

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Sulfate	ug/L	ND	250000	05/06/13 16:34	

LABORATORY CONTROL SAMPLE: 968855

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Sulfate	ug/L	20000	18800J	94	90-110	

MATRIX SPIKE SAMPLE: 968856

Parameter	Units	92155810012 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Sulfate	ug/L	ND	20000	19200J	96	90-110	

MATRIX SPIKE SAMPLE: 968858

Parameter	Units	92156283005 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Sulfate	ug/L	2730J	20000	22600J	99	90-110	

SAMPLE DUPLICATE: 968857

Parameter	Units	92155810012 Result	Dup Result	RPD	Max RPD	Qualifiers
Sulfate	ug/L	ND	ND		20	

SAMPLE DUPLICATE: 968859

Parameter	Units	92156283005 Result	Dup Result	RPD	Max RPD	Qualifiers
Sulfate	ug/L	2730J	3050J	11	20	

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QUALITY CONTROL DATA

Project: BUTNER MNA-GRANVILLE CO
Pace Project No.: 92156751

QC Batch: WETA/15229 Analysis Method: EPA 353.2
QC Batch Method: EPA 353.2 Analysis Description: 353.2 Nitrate + Nitrite, Unpres.
Associated Lab Samples: 92156751001, 92156751002, 92156751003, 92156751004, 92156751005

METHOD BLANK: 968181 Matrix: Water
Associated Lab Samples: 92156751001, 92156751002, 92156751003, 92156751004, 92156751005

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Nitrogen, Nitrate	ug/L	ND	10000	05/03/13 14:42	

LABORATORY CONTROL SAMPLE: 968182

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrogen, Nitrate	ug/L	2500	2560J	102	90-110	

MATRIX SPIKE SAMPLE: 968183

Parameter	Units	92156751002 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Nitrogen, Nitrate	ug/L	ND	2500	2730J	109	90-110	

SAMPLE DUPLICATE: 968184

Parameter	Units	92156751002 Result	Dup Result	RPD	Max RPD	Qualifiers
Nitrogen, Nitrate	ug/L	ND	ND		20	

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QUALITY CONTROL DATA

Project: BUTNER MNA-GRANVILLE CO
Pace Project No.: 92156751

QC Batch: WETA/15281 Analysis Method: SM 4500-Cl-E
QC Batch Method: SM 4500-Cl-E Analysis Description: 4500 Chloride
Associated Lab Samples: 92156751001, 92156751002, 92156751003, 92156751004, 92156751005

METHOD BLANK: 971877 Matrix: Water
Associated Lab Samples: 92156751001, 92156751002, 92156751003, 92156751004, 92156751005

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Chloride	ug/L	ND	1000	05/09/13 18:04	

LABORATORY CONTROL SAMPLE: 971878

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Chloride	ug/L	20000	20000	100	90-110	

MATRIX SPIKE SAMPLE: 971879

Parameter	Units	92156723004 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Chloride	ug/L	39.2 mg/L	20000	58500	97	75-125	

SAMPLE DUPLICATE: 971880

Parameter	Units	92156723004 Result	Dup Result	RPD	Max RPD	Qualifiers
Chloride	ug/L	39.2 mg/L	38600	1	20	

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QUALITY CONTROL DATA

Project: BUTNER MNA-GRANVILLE CO
Pace Project No.: 92156751

QC Batch: WETA/15256 Analysis Method: SM 5310B
QC Batch Method: SM 5310B Analysis Description: 5310B TOC
Associated Lab Samples: 92156751001, 92156751002, 92156751003, 92156751004, 92156751005

METHOD BLANK: 969792 Matrix: Water
Associated Lab Samples: 92156751001, 92156751002, 92156751003, 92156751004, 92156751005

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Total Organic Carbon	ug/L	ND	1000	05/09/13 19:41	

LABORATORY CONTROL SAMPLE: 969793

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Total Organic Carbon	ug/L	25000	24200	97	90-110	

MATRIX SPIKE SAMPLE: 969794

Parameter	Units	92155734011 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Total Organic Carbon	ug/L	23.6 mg/L	25000	38800	61	75-125	M1

MATRIX SPIKE SAMPLE: 969796

Parameter	Units	92156751005 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Total Organic Carbon	ug/L	5740	25000	27000	85	75-125	

SAMPLE DUPLICATE: 969795

Parameter	Units	92156065001 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Organic Carbon	ug/L	ND	ND		20	

SAMPLE DUPLICATE: 969797

Parameter	Units	92156551001 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Organic Carbon	ug/L	992 mg/L	987000	1	20	

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QUALIFIERS

Project: BUTNER MNA-GRANVILLE CO
Pace Project No.: 92156751

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to changes in sample preparation, dilution of the sample aliquot, or moisture content.

ND - Not Detected at or above adjusted reporting limit.

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PRL - Pace Reporting Limit.

RL - Reporting Limit.

S - Surrogate

1,2-Diphenylhydrazine (8270 listed analyte) decomposes to Azobenzene.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Acid preservation may not be appropriate for 2-Chloroethylvinyl ether, Styrene, and Vinyl chloride.

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TNI - The NELAC Institute.

LABORATORIES

PASI-A	Pace Analytical Services - Asheville
PASI-M	Pace Analytical Services - Minneapolis

ANALYTE QUALIFIERS

H1	Analysis conducted outside the EPA method holding time.
M1	Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.

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QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: BUTNER MNA-GRANVILLE CO
Pace Project No.: 92156751

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
92156751001	**3902-MW1R**	RSK 175	AIR/17299		
92156751002	**3902-MW2R**	RSK 175	AIR/17299		
92156751003	**3902-MW3R**	RSK 175	AIR/17299		
92156751004	**3902-MW4**	RSK 175	AIR/17299		
92156751005	**3902-NES1**	RSK 175	AIR/17299		
92156751001	**3902-MW1R**	SM 2320B	WET/25310		
92156751002	**3902-MW2R**	SM 2320B	WET/25313		
92156751003	**3902-MW3R**	SM 2320B	WET/25313		
92156751004	**3902-MW4**	SM 2320B	WET/25313		
92156751005	**3902-NES1**	SM 2320B	WET/25313		
92156751001	**3902-MW1R**	SM 4500-S2D	WET/25254		
92156751002	**3902-MW2R**	SM 4500-S2D	WET/25254		
92156751003	**3902-MW3R**	SM 4500-S2D	WET/25254		
92156751004	**3902-MW4**	SM 4500-S2D	WET/25254		
92156751005	**3902-NES1**	SM 4500-S2D	WET/25254		
92156751001	**3902-MW1R**	EPA 300.0	WETA/15244		
92156751002	**3902-MW2R**	EPA 300.0	WETA/15244		
92156751003	**3902-MW3R**	EPA 300.0	WETA/15244		
92156751004	**3902-MW4**	EPA 300.0	WETA/15244		
92156751005	**3902-NES1**	EPA 300.0	WETA/15244		
92156751001	**3902-MW1R**	EPA 353.2	WETA/15229		
92156751002	**3902-MW2R**	EPA 353.2	WETA/15229		
92156751003	**3902-MW3R**	EPA 353.2	WETA/15229		
92156751004	**3902-MW4**	EPA 353.2	WETA/15229		
92156751005	**3902-NES1**	EPA 353.2	WETA/15229		
92156751001	**3902-MW1R**	SM 4500-Cl-E	WETA/15281		
92156751002	**3902-MW2R**	SM 4500-Cl-E	WETA/15281		
92156751003	**3902-MW3R**	SM 4500-Cl-E	WETA/15281		
92156751004	**3902-MW4**	SM 4500-Cl-E	WETA/15281		
92156751005	**3902-NES1**	SM 4500-Cl-E	WETA/15281		
92156751001	**3902-MW1R**	SM 5310B	WETA/15256		
92156751002	**3902-MW2R**	SM 5310B	WETA/15256		
92156751003	**3902-MW3R**	SM 5310B	WETA/15256		
92156751004	**3902-MW4**	SM 5310B	WETA/15256		
92156751005	**3902-NES1**	SM 5310B	WETA/15256		

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Pace Analytical www.pacelabs.com	Document Name: **Sample Condition Upon Receipt (SCUR)**	Document Revised: March 13, 2013 Page 1 of 2
	Document No.: F-ASV-CS-003-rev.09	Issuing Authorities: Pace Asheville Quality Office

Client Name: Joyce

Where Received: ☐ Huntersville ☑ Asheville ☐ Eden ☐ Raleigh

Courier (Circle): Fed Ex UPS USPS Client Commercial Pace Other_____

Custody Seal on Cooler/Box Present: ☐ yes ☑ no Seals intact: ☐ yes ☑ no

Packing Material: ☑ Bubble Wrap ☑ Bubble Bags ☐ None ☐ Other_____

Circle Thermometer Used: IR Gun#2 -80344039 **Type of Ice:** Wet Blue None ☑ Samples on ice, cooling process has begun

IR ~~Gun Back Up~~ 111565135

Temp Correction Factor: Add / Subtract 0.1 C

Corrected Cooler Temp.: 4.0/2.9/2.4/3.1 C **Biological Tissue is Frozen:** Yes No N/A

Temp should be above freezing to 6°C 3.0/3.2/2.0/2.9/1.9 **Comments:**

Date and Initials of person examining contents: 5/3/13

Chain of Custody Present:	☑Yes ☐No ☐N/A	1.
Chain of Custody Filled Out:	☑Yes ☐No ☐N/A	2.
Chain of Custody Relinquished:	☑Yes ☐No ☐N/A	3.
Sampler Name & Signature on COC:	☑Yes ☐No ☐N/A	4.
Samples Arrived within Hold Time:	☑Yes ☐No ☐N/A	5.
Short Hold Time Analysis (<72hr):	☐Yes ☑No ☐N/A	6.
Rush Turn Around Time Requested:	☐Yes ☑No ☐N/A	7.
Sufficient Volume:	☑Yes ☐No ☐N/A	8.
Correct Containers Used:	☑Yes ☐No ☐N/A	9.
-Pace Containers Used:	☑Yes ☐No ☐N/A	
Containers Intact:	☑Yes ☐No ☐N/A	10.
Filtered volume received for Dissolved tests	☑Yes ☐No ☐N/A	11.
Sample Labels match COC:	☑Yes ☐No ☐N/A	12.
-Includes date/time/ID/Analysis Matrix: WT		
All containers needing preservation have been checked.	☑Yes ☐No ☐N/A	13.
All containers needing preservation are found to be in compliance with EPA recommendation.	☑Yes ☐No ☐N/A	
exceptions: VOA, coliform, TOC, O&G, WI-DRO (water)	☑Yes ☐No	**Initial when completed**
Samples checked for dechlorination:	☑Yes ☐No ☐N/A	14.
Headspace in VOA Vials (>6mm):	☑Yes ☐No ☐N/A	15.
Trip Blank Present:	☑Yes ☐No ☐N/A	16.
Trip Blank Custody Seals Present	☑Yes ☐No ☐N/A	
Pace Trip Blank Lot # (if purchased):_____		

Client Notification/ Resolution: Field Data Required? Y / N

Person Contacted: _____ Date/Time: _____

Comments/ Resolution: _____

SCURF Review: JG **Date:** 5/3/13

SRF Review: AMB **Date:** 5/6/13

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e out of hold, incorrect preservative, out of temp, incorrect containers)

WO#: 92156751

92156751

Pace Analytical

CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Page : 1 Of 1

Section A Required Client Information:		Section B Required Project Information:		Section C Invoice Information:	
Company:	Joyce Engineering-NC	Report To:	Van Burbach	Attention:	Jason Falls
Address:	2211 West Meadowview Rd. Greensboro, NC 27407	Copy To:	Dan Girdner	Company Name:	Granville Co., Solid Waste
				Address:	P.O. Box 906, Oxford, NC 27565
Email To:	dgirdner@joyceengineering.com	Purchase Order No.	00660.1201.12.03	Pace Quote Reference:	
Phone:	(336) 323-0092 Fax: (336) 323-0093	Client Project ID:	BUTNER MNA - Granville Co.	Pace Project Manager:	Godwin, Kevin
Requested Due Date/TAT:	10 Day (Default)	Container Order Number:		Pace Profile #:	

Regulatory Agency	
State / Location	
North Carolina	

Requested Analysis Filtered (Y/N)

ITEM#	SAMPLE ID (One Character per box. (A-Z, 0-9 / , -) Sample Ids must be unique)	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED START DATE	COLLECTED START TIME	COLLECTED END DATE	COLLECTED END TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H2SO4	HNO3	HCl	NaOH	Na2S2O3	Methanol	Other	Analyses Test (Y/N): NITRATE	ALKALINITY	CHLORIDE	SULFATE	Methane/ Ethane/ Ethene	T.O.C.	Volatile Fatty Acids	Sulfide	DISSOLVED HYDROGEN				Residual Chlorine (Y/N)	92156751
1	3902-MW-1R	WT	G			5/1/13	1730		13									X	X	X	X	X	X	X	X	X					001
2	3902-MW-2R	WT	G				1540		13									X	X	X	X	X	X	X	X	X					002
3	3902-MW-3R	WT	G				1515		13									X	X	X	X	X	X	X	X	X					003
4	3902-MW-4	WT	G				1424		13									X	X	X	X	X	X	X	X	X					004
~~5~~	~~3902-MW-5~~	~~WT~~	~~G~~															~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~					NOT SAMPLED
~~6~~	~~3902-MW-6~~	~~WT~~	~~G~~															~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~					NOT SAMPLED
7	3902-NES-1	WT	G			5/1/13	1820		13									X	X	X	X	X	X	X	X	X					005
8																															
9																															
10																															
11																															
12																															

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS
	Amanda Freeman/Joyce	5/1/13	2015		5/2/13	10:00	40/29
							2.4/3.1
							3.0/3.2
							2.0/2.9/1.9

SAMPLER NAME AND SIGNATURE		
PRINT Name of SAMPLER:	Amanda Freeman Adam Cox	
SIGNATURE of SAMPLER:	Amanda Freeman Adam Cox	DATE Signed: 5/1/13

TEMP in C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)

DATE: 5/1/2013

JOYCE ENGINEERING

GROUND WATER SAMPLING LOG

Project Name: BUTNER, Granville Co. **Project No./Task No.:** 00660.1201.12.03

Well ID: 3902-MW-1R **Sampler(s):** A. Cox / A. Freeman

Well Location: North of the entrance at the tree line under the tower

Well Diameter: 2 inches

Initial Depth to Water (DTW): 44.82 feet

Depth to Bottom (DTB): 56.00 feet

Water Column Thickness (WCT): 11.18 feet [DTB-DTW]

Calculation for One Well Volume (WV):

For 2" Well: WCT X 0.163 = 1.8 gallons

For 4" Well: WCT X 0.653 = _____ gallons

For THREE Well Volumes: WV X 3 = 5.4 gallons

Actual Amount Purged/Bailed: 4.0 gallons

Purged with: disposable bailer

Sampled with: disposable bailer

Depth to Water before Sampling: _____ feet

Gallons	Time	Temp. °C	pH	Cond. m.s.	Dis. O_2 mg/l	Turb. ntu	ORP mv	Initials
0	1100	15.7	6.57	120.4	1.73	49.7	88.5	AC
1.8	1103	15.8	6.10	90.1	2.56	90.6	105.7	AC
3.6	1106	15.8	6.09	87.5	3.83	63.2	111.2	AC
Dry @ 4 gallons								
Before Sampling	1730	15.7	7.32	110.8	4.40	7.94	111.7	AC

Comments (weather conditions, odor, color, silt, etc.):

Cloudy, light rain 60's

Fe2+ = 0.0

CO2 = 30 mg/l

Signature: Adam Cox **Date:** 5/1/13

QA/QC Sign Off: Amanda [illegible] **Date:** 5/30/13

DATE: 5/1/2013

JOYCE ENGINEERING

GROUND WATER SAMPLING LOG

Project Name: BUTNER, Granville Co. **Project No./Task No.:** 00660.1201.12.03

Well ID: 3902-MW-2R **Sampler(s):** A. Freeman / A. Cox

Well Location: South side of fill, inside tree line and next to MW-3R

Well Diameter: 2 inches

Initial Depth to Water (DTW): 1.95 feet

Depth to Bottom (DTB): 18.85 feet

Water Column Thickness (WCT): 16.90 feet [DTB-DTW]

Calculation for One Well Volume (WV):

For 2" Well: WCT X 0.163 = 2.8 gallons

For 4" Well: WCT X 0.653 = _____ gallons

For THREE Well Volumes: WV X 3 = 8.4 gallons

Actual Amount Purged/Bailed: 5.9 gallons

Purged with: disposable bailer

Sampled with: disposable bailer

Depth to Water before Sampling: _____ feet

Gallons	Time	Temp. °C	pH	Cond. m.s.	Dis. O_2 mg/l	Turb. ntu	ORP mv	Initials
0	1040	13.9	6.38	1599	1.06	49.6	-40.7	AF
2.8	1044	13.7	6.48	1609	2.86	45.0	-37.1	AF
5.6	1048	13.9	6.50	1554	3.57	24.5	-37.8	AF
Dry @ 5.9 gals								
Before Sampling	1540	13.7	6.37	1587	1.37	7.80	-26.7	AC

Comments (weather conditions, odor, color, silt, etc.):

Cloudy, light rain, 60's

Fe2+ = 1.0

CO2 = 245 mg/l

Signature: Adam Cox **Date:** 5/1/13

QA/QC Sign Off: [illegible] **Date:** 5/30/13

DATE: 5/1/2013

JOYCE ENGINEERING

GROUND WATER SAMPLING LOG

Project Name: BUTNER, Granville Co. **Project No./Task No.:** 00660.1201.12.03

Well ID: 3902-MW-3R **Sampler(s):** A. Cox / A. Freeman

Well Location: Next to MW-2R, inside tree line

Well Diameter: 2 inches

Initial Depth to Water (DTW): 1.83 feet

Depth to Bottom (DTB): 35.83 feet

Water Column Thickness (WCT): 34.00 feet [DTB-DTW]

Calculation for One Well Volume (WV):

For 2" Well: WCT X 0.163 = 5.5 gallons

For 4" Well: WCT X 0.653 = _____ gallons

For THREE Well Volumes: WV X 3 = 16.5 gallons

Actual Amount Purged/Bailed: 7.5 gallons

Purged with: disposable bailer

Sampled with: disposable bailer

Depth to Water before Sampling: _____ feet\

Gallons	Time	Temp. °C	pH	Cond. m.s.	Dis. O_2 mg/l	Turb. ntu	ORP mv	Initials
0	1030	15.5	7.03	1058	3.80	15.21	125.5	AF
5.5	1035	15.1	6.68	1237	2.65	11.50	-14.3	AF
Dry @ 7.5 gals								
Before Sampling	1515	15.1	6.61	1357	1.79	9.92	55.2	AC

Comments (weather conditions, odor, color, silt, etc.):

Cloudy, light rain, 60's

Fe2+ = 0

CO2 = 125 mg/l

Signature: Adam Cox **Date:** 5/1/13

QA/QC Sign Off: [illegible] **Date:** 5/30/13

DATE: 5/1/2013

JOYCE ENGINEERING

GROUND WATER SAMPLING LOG

Project Name: BUTNER, Granville Co. **Project No./Task No.:** 00660.1201.12.03

Well ID: 3902-MW-4 **Sampler(s):** A. Cox / A. Freeman

Well Location: south of fill, just inside tree line

Well Diameter: 2 inches

Initial Depth to Water (DTW): 6.31 feet

Depth to Bottom (DTB): 31.43 feet

Water Column Thickness (WCT): 25.21 feet [DTB-DTW]

Calculation for One Well Volume (WV):

For 2" Well: WCT X 0.163 = 4.1 gallons

For 4" Well: WCT X 0.653 = _____ gallons

For THREE Well Volumes: WV X 3 = 12.3 gallons

Actual Amount Purged/Bailed: 5.0 gallons

Purged with: disposable bailer

Sampled with: disposable bailer

Depth to Water before Sampling: 9.60 feet

Gallons	Time	Temp. °C	pH	Cond. m.s.	Dis. O_2 mg/l	Turb. ntu	ORP mv	Initials
0	1000	15.1	6.53	1183	1.48	7.86	53.5	AF
4.1	1006	15.1	6.59	1167	2.67	17.66	41.3	AF
Dry @ 5 gallons								
Before Sampling	1424	14.4	6.42	1150	4.65	16.58	120.5	AC

Comments (weather conditions, odor, color, silt, etc.):

Cloudy, light rain, 60's

Fe2+ = 0

CO2 = 225 mg/l

Signature: Adam Cox **Date:** 5/1/13

QA/QC Sign Off: [illegible] **Date:** 5/30/13

DATE: 5/1/2013

JOYCE ENGINEERING

GROUND WATER SAMPLING LOG

Project Name: BUTNER, Granville Co. **Project No./Task No.:** 00660.1201.12.03

Well ID: 3902-MW-5 **Sampler(s):** A. Cox / A. Freeman

Well Location: South side of old SED. pond, Basin in the woods

Well Diameter: 2 inches

Initial Depth to Water (DTW): 8.73 feet

Depth to Bottom (DTB): 23.52 feet

Water Column Thickness (WCT): 14.79 feet [DTB-DTW]

Calculation for One Well Volume (WV):

For 2" Well: WCT X 0.163 = 2.4 gallons

For 4" Well: WCT X 0.653 = _____ gallons

For THREE Well Volumes: WV X 3 = 7.2 gallons

Actual Amount Purged/Bailed: 7.0 gallons

Purged with: **Disposable Bailer**

Sampled with: **Disposable Bailer**

Depth to Water before Sampling: 11.45 feet

Gallons	Time	Temp. °C	pH	Cond. m.s.	Turb. ntu	Initials
0	0900	13.6	5.52	103.0	16.74	AF
2.4	0903	13.4	5.67	142.4	142	AF
4.8	0906	13.8	5.82	171.8	214	AF
Dry @ 7 gallons						
Before Sampling	1354	14.2	6.92	195	16.50	AC

Comments (weather conditions, odor, color, silt, etc.):

Cloudy, light rain, 60's

Signature: Adam Cox **Date:** 5/1/13

QA/QC Sign Off: [illegible] **Date:** 5/31/13

DATE: 5/1/2013

JOYCE ENGINEERING

GROUND WATER SAMPLING LOG

Project Name: BUTNER, Granville Co. **Project No./Task No.:** 00660.1201.12.03

Well ID: 3902-MW-6 **Sampler(s):** A. Cox / A. Freeman

Well Location: other side of large mulch pile

Well Diameter: 2 inches

Initial Depth to Water (DTW): 8.90 feet

Depth to Bottom (DTB): 32.63 feet

Water Column Thickness (WCT): 23.73 feet [DTB-DTW]

Calculation for One Well Volume (WV):

For 2" Well: WCT X 0.163 = 3.9 gallons

For 4" Well: WCT X 0.653 = _____ gallons

For THREE Well Volumes: WV X 3 = 11.7 gallons

Actual Amount Purged/Bailed: _____ gallons

Purged with: **Disposable Bailer**

Sampled with: **Disposable Bailer**

Depth to Water before Sampling: _____ feet

Gallons	Time	Temp. °C	pH	Cond. m.s.	Turb. ntu	Initials
0	0930	14.0	6.67	600	7.98	AC
3.9	0936	14.7	7.08	597	15.05	AC
Dry @ 7.5 gals						
Before Sampling	1330	14.2	7.13	594	9.57	AF

Comments (weather conditions, odor, color, silt, etc.):

Cloudy, light rain, 60's

Signature: Adam Cox **Date:** 5/1/13

QA/QC Sign Off: [illegible] **Date:** 5/30/13

DATE: 5/1/2013

JOYCE ENGINEERING

GROUND WATER SAMPLING LOG

Project Name: BUTNER, Granville Co. **Project No./Task No.:** 00660.1201.12.03

Well ID: 3902-NES-1 **Sampler(s):** A. Cox / A. Freeman

Well Location: South of landfill, access through Wildlife Area hunt camp

Well Diameter: 2 inches

Initial Depth to Water (DTW): 11.29 feet

Depth to Bottom (DTB): 36.10 feet

Water Column Thickness (WCT): 24.81 feet [DTB-DTW]

Calculation for One Well Volume (WV):

For 2" Well: WCT X 0.163 = 4.0 gallons

For 4" Well: WCT X 0.653 = _____ gallons

For THREE Well Volumes: WV X 3 = 12.0 gallons

Actual Amount Purged/Bailed: 12.0 gallons

Purged with: disposable bailer

Sampled with: disposable bailer

Depth to Water before Sampling: _____ feet

Gallons	Time	Temp. °C	pH	Cond. m.s.	Dis. O_2 mg/l	Turb. ntu	ORP mv	Initials
0	1130	12.5	5.41	64.4	1.97	11.87	232.3	AF
4.0	1135	13.0	5.14	85.8	1.92	138	232.0	AF
8.0	1140	13.2	5.02	76.9	2.81	219	262.7	AF
12.0	1145	13.5	5.06	74.4	2.43	247	268.9	AF
Before Sampling	1820	12.5	6.10	69.6	2.90	21.4	227.1	AC

Comments (weather conditions, odor, color, silt, etc.):

Cloudy, light rain, 60's

Fe2+ = 0, CO2 = 45 mg/l

Field Blank @ 1850

Signature: Adam Cox **Date:** 5/1/13

QA/QC Sign Off: [signature] **Date:** 5/30/13

DATE: 5/1/2013

JOYCE ENGINEERING

SURFACE WATER MONITORING LOG

Project Name: BUTNER, Granville Co. **Project/Task No.:** 00660.1201.12.03

Surface Point ID: 3902-SW-1 **Sampler(s):** A. Cox / A. Freeman

Location: Near Sed. pond, Basin

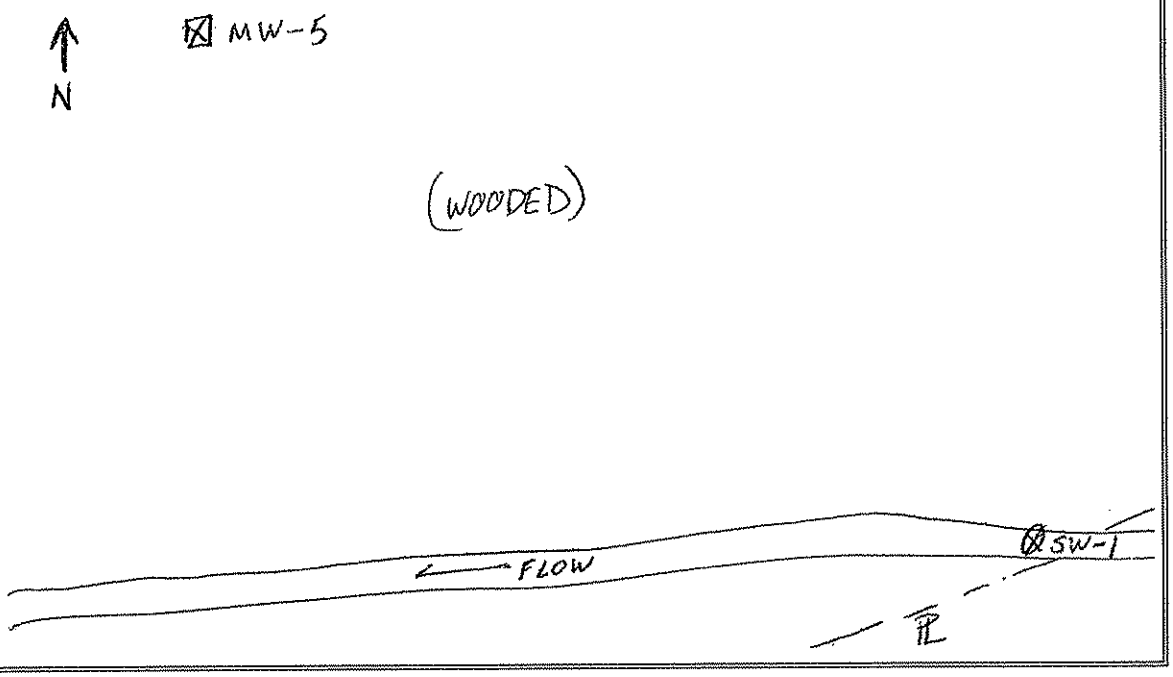
Field Parameters:

Time of Sampling:	0920	
pH:	6.47	
Temperature:	14.9	(°C)
Conductivity:	170.1	(µS)
Turbidity:	12.90	(ntu)

Comments/Sample Description (weather conditions, odor, color, silt, etc.):

Cloudy, light rain, 60's

Sketch of Sample Location (include flow direction, drainage pathways, etc.):



Signature: Adam Cox **Date:** 5/1/13

QA/QC Sign Off: [illegible] **Date:** 5/30/13

DATE: 5/1/2013

JOYCE ENGINEERING

SURFACE WATER MONITORING LOG

Project Name: BUTNER, Granville Co. **Project/Task No.:** 00660.1201.12.03

Surface Point ID: 3902-SW-2 **Sampler(s):** A. Cox / A. Freeman

Location: Down from MW-2R & MW-3R

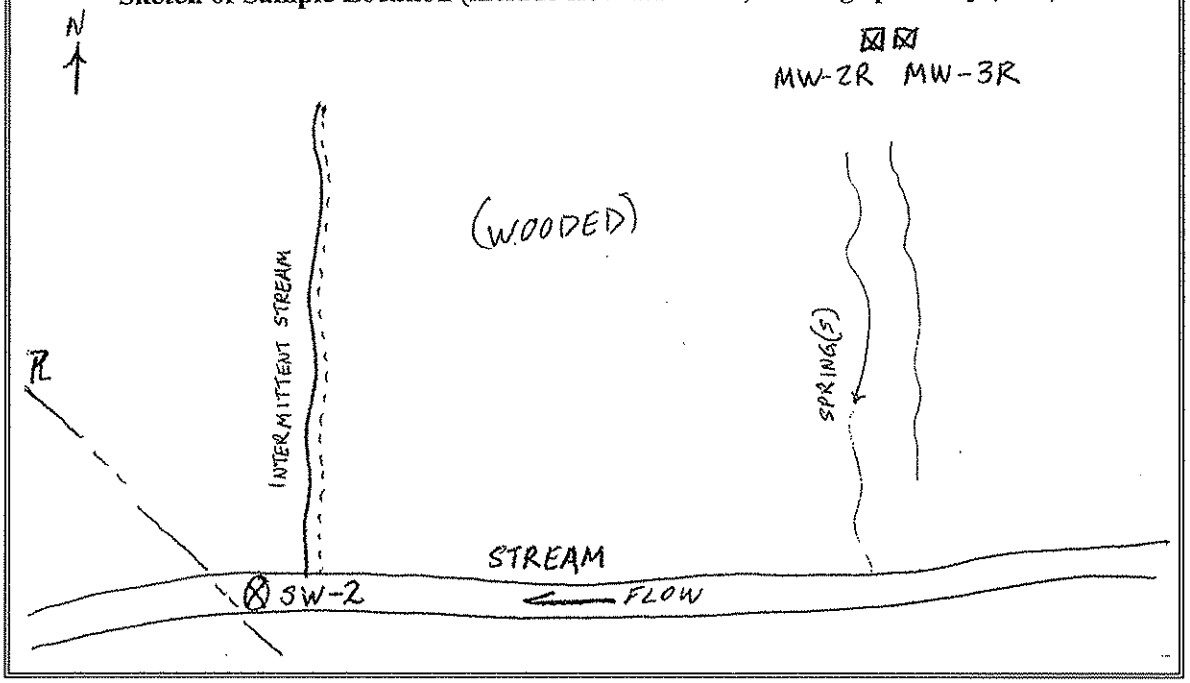
Field Parameters:

Time of Sampling:	1300	
pH:	7.89	
Temperature:	15.7	(°C)
Conductivity:	256	(µS)
Turbidity:	24.6	(ntu)

Comments/Sample Description (weather conditions, odor, color, silt, etc.):

Cloudy, light rain, 60's

Sketch of Sample Location (include flow direction, drainage pathways, etc.):



Signature: Adam Cox **Date:** 5/1/13

QA/QC Sign Off: [illegible] **Date:** 5/30/13

APPENDIX D

BIOSCREEN Modeling
Input and Output

BIOSCREEN Natural Attenuation Decision Support System

Air Force Center for Environmental Excellence

Version 1.4

Butner Landfill
Granville County
Run Name

Data Input Instructions:

115 → *1. Enter value directly....or*
↑ *or*
0.02 → *2. Calculate by filling in grey cells below. (To restore formulas, hit button below).*

Variable* → *Data used directly in model.*
20 → *Value calculated by model. (Don't enter any data).*

1. HYDROGEOLOGY

Seepage Velocity*	*Vs*	6.6	*(ft/yr)*
or		↑ *or*	
Hydraulic Conductivity	*K*	2.2E-05	*(cm/sec)*
Hydraulic Gradient	*i*	0.0526	*(ft/ft)*
Porosity	*n*	0.18	*(-)*

2. DISPERSION

Longitudinal Dispersivity*	*alpha x*	21.0	*(ft)*
Transverse Dispersivity*	*alpha y*	2.1	*(ft)*
Vertical Dispersivity*	*alpha z*	0.0	*(ft)*
or		↑ *or*	
Estimated Plume Length	*Lp*	700	*(ft)*

3. ADSORPTION

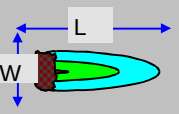
Retardation Factor*	*R*	1.0	*(-)*
or		↑ *or*	
Soil Bulk Density	*rho*	1.7	*(kg/l)*
Partition Coefficient	*Koc*	2.13	*(L/kg)*
FractionOrganicCarbon	*foc*	5.7E-5	*(-)*

4. BIODEGRADATION

1st Order Decay Coeff*	*lambda*	4.6E+0	*(per yr)*
or		↑ *or*	
Solute Half-Life	*t-half*	0.15	*(year)*
or Instantaneous Reaction Model			
Delta Oxygen*	*DO*	-3.03	*(mg/L)*
Delta Nitrate*	*NO3*	-1.63	*(mg/L)*
Observed Ferrous Iron*	*Fe2+*	1	*(mg/L)*
Delta Sulfate*	*SO4*	0	*(mg/L)*
Observed Methane*	*CH4*	0.038	*(mg/L)*

5. GENERAL

Modeled Area Length*	1200	*(ft)*
Modeled Area Width*	2000	*(ft)*
Simulation Time*	7	*(yr)*



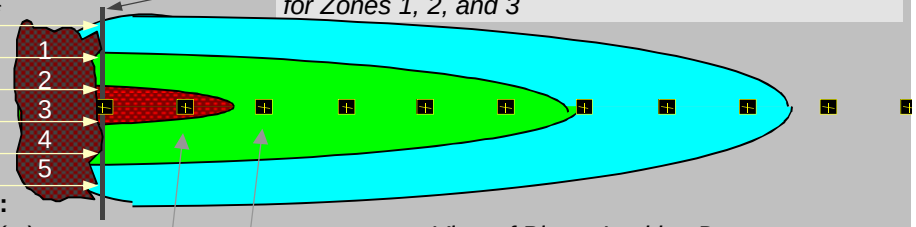
6. SOURCE DATA

Source Thickness in Sat.Zone* 10 *(ft)*

Vertical Plane Source: Look at Plume Cross-Section and Input Concentrations & Widths for Zones 1, 2, and 3

Source Zones:

Width* (ft)	Conc. (mg/L)*
1000	0
500	0.001
0	0.002
500	0.001
1000	0



View of Plume Looking Down

Source Halflife (see Help):

<1	>1000	*(yr)*
Inst. React.	1st Order	

Soluble Mass 1 *(Kg)*
In Source NAPL, Soil

Observed Centerline Concentrations at Monitoring Wells
If No Data Leave Blank or Enter "0"

7. FIELD DATA FOR COMPARISON

Concentration (mg/L)	.001	.0	.0								
Dist. from Source (ft)	*270*	*800*	*1060*								

8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN | **RUN ARRAY** | ***Help*** | Recalculate

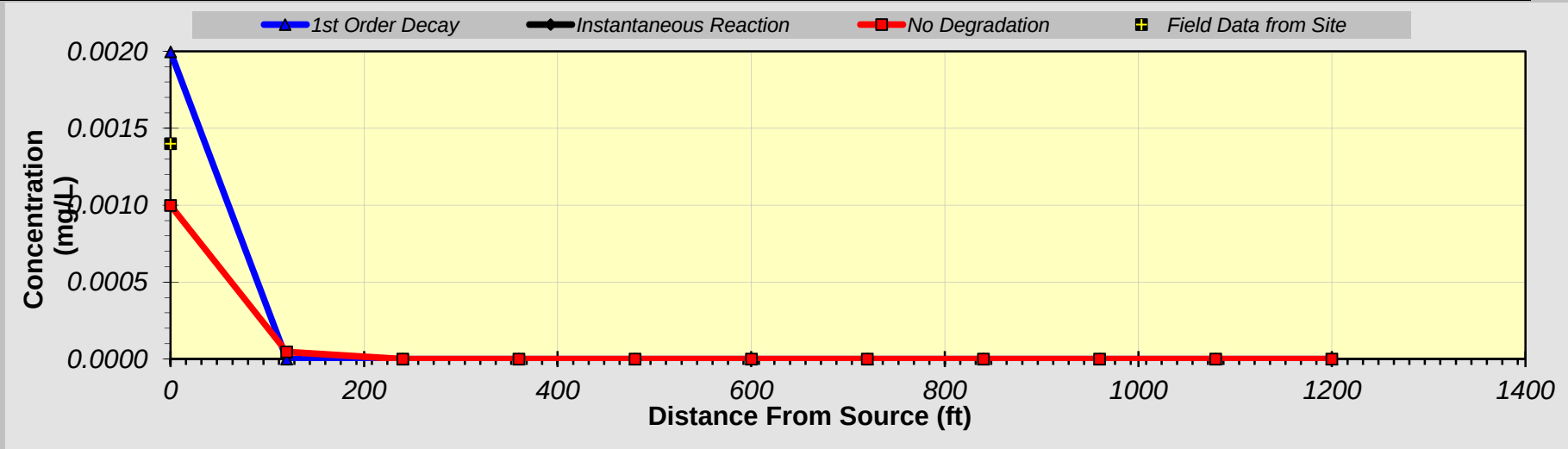
View Output | **View Output** | Paste Example Dataset

Restore Formulas for Vs,

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

Distance from Source (ft)

TYPE OF MODEL	0	120	240	360	480	600	720	840	960	1080	1200
No Degradation	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1st Order Decay	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	0.004	1.147	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203
Field Data from Site	0.001										



Replay

Next Timestep

Prev Timestep

Time:

7 Years

Return to

Recalculate This

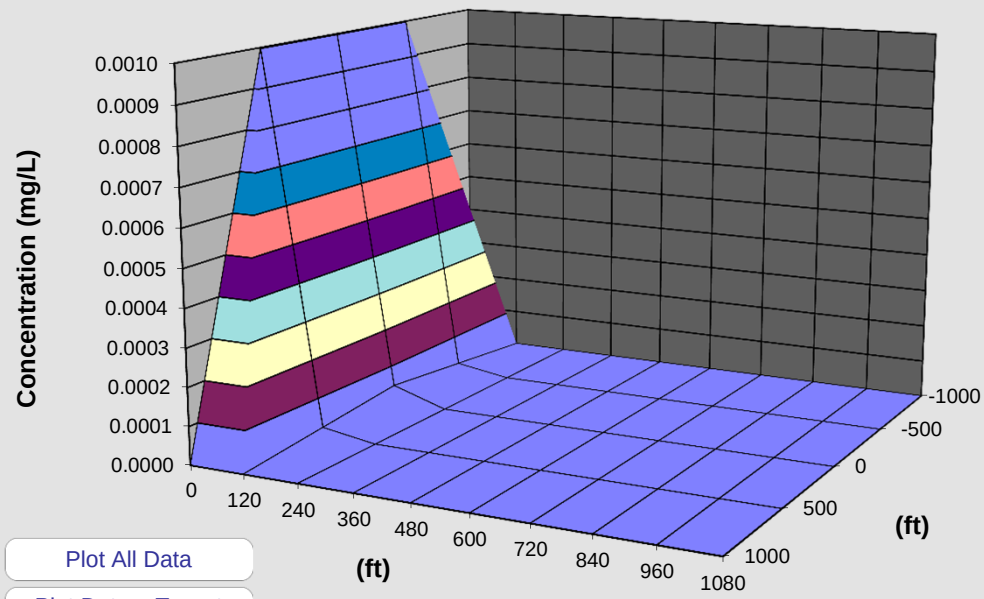
DISSOLVED HYDROCARBON CONCENTRATIONS IN PLUME (mg/L at Z=0)

Transverse Distance (ft) ↓ / Distance from Source (ft) →	0	120	240	360	480	600	720	840	960	1080	1200
1000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
500	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-500	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-1000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
MASS FLUX (mg/day)	9.2E-1	4.3E-2	4.8E-6	4.4E-13	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0

Time: **7 Years** Target Level: **0.001** mg/L Displayed Model: **No Degradation**

Model to Display:

- *No Degradation*
- *1st Order Decay*
- *Instantaneous*



Plot All Data

Plot Data > Target

Plume and Source Masses (Order-of-Magnitude Accuracy)

Plume Mass if No Biodegradation	Can't Calc.	*(Kg)*
- Actual Plume Mass	Can't Calc.	*(Kg)*
= Plume Mass Removed by Biodeg	-	*(Kg)*

Change in Electron Acceptor/Byproduct Masses:

Oxygen	*Nitrate*	*Iron II*	*Sulfate*	*Methane*	
na	na	na	na	na	*(Kg)*

Contam. Mass in Source (t=0 Years)	1.0	*(Kg)*
Contam. Mass in Source Now (t=7Years)	1.0	*(Kg)*
Current Volume of Groundwater in Plume	Can't Calc.	*(ac-ft)*
Flowrate of Water Through Source Zone	Can't Calc.	*(ac-ft/yr)*

Mass HELP

Recalculat

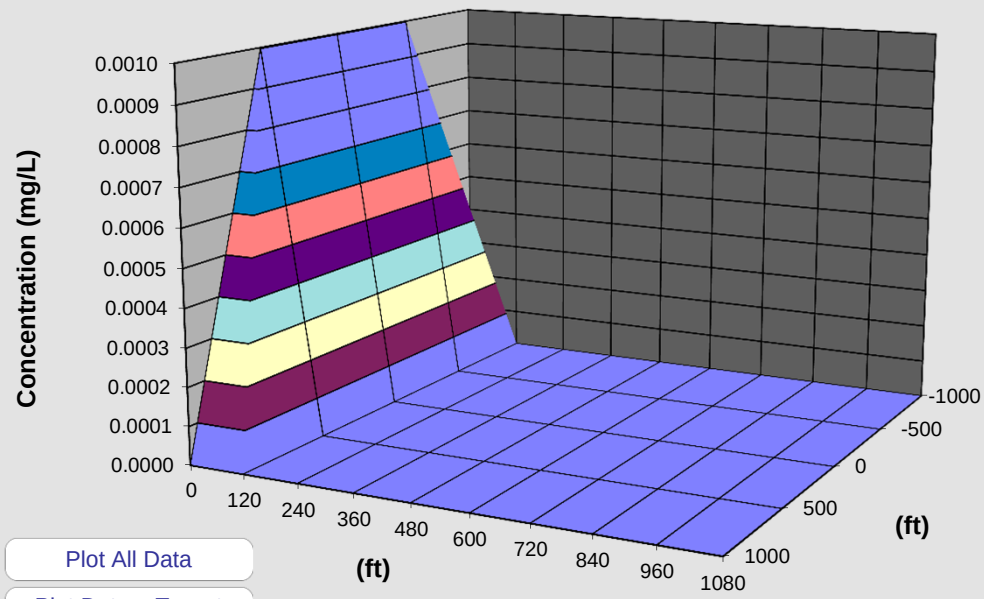
DISSOLVED HYDROCARBON CONCENTRATIONS IN PLUME (mg/L at Z=0)

Transverse Distance (ft) ↓ / Distance from Source (ft) →	0	120	240	360	480	600	720	840	960	1080	1200
1000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
500	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-500	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-1000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
MASS FLUX (mg/day)	9.2E-1	4.0E-9	1.7E-17	3.4E-26	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0

Model to Display:

- *No Degradation*
- *1st Order Decay*
- *Instantaneous*

Time: **7 Years** Target Level: **0.001** mg/L Displayed Model: **1st Order Decay**



Plot All Data

Plot Data > Target

Plume and Source Masses (Order-of-Magnitude Accuracy)

Plume Mass if No Biodegradation	Can't Calc.	*(Kg)*
- Actual Plume Mass	Can't Calc.	*(Kg)*
= Plume Mass Removed by Biodeg	-	*(Kg)*

Change in Electron Acceptor/Byproduct Masses:

Oxygen	*Nitrate*	*Iron II*	*Sulfate*	*Methane*	
na	na	na	na	na	*(Kg)*

Contam. Mass in Source (t=0 Years)	1.0	*(Kg)*
Contam. Mass in Source Now (t=7Years)	1.0	*(Kg)*
Current Volume of Groundwater in Plume	Can't Calc.	*(ac-ft)*
Flowrate of Water Through Source Zone	Can't Calc.	*(ac-ft/yr)*

Mass HELP

Recalculat

APPENDIX E

Tree Inspection Form

Phytoremediation Tree and Flora Inspection Log

SITE: Butner Landfill, Granville County, NC **DATE:** _____

Personnel: _____

Weather Conditions: _____

Description of Area: _____

Has the ground surface been disturbed by rutting, erosion, tire tracks, settlement, etc.?

Are there any indications of vandalism or trespassing:

Is there any ponded water in the area?

Has there been any change in the number of live/dead trees in the area since the last inspection?

Do any trees exhibit signs of disease, damage, or distress (discolored leaves, damaged bark, broken limbs, etc.)?

Are there any signs of unusual animal/insect damage to the trees?

Has there been any change in the type, amount, or health of undergrowth or ground cover flora?

Has there been any change in the observed wetlands (size, maturity, health) in the area?

Please describe the prevalent tree species and give approximate percentages in the area:

SPECIES or COMMON NAME	%	AVERAGE MATURITY	AVERAGE HEALTH

COMMENTS:

Signature of Inspector: _____

APPENDIX F

Financial Assurance

Estimate of Post-Closure Care Costs:
Butner Landfill, Permit # 39-02

ITEM	UNIT	ANNUAL QUANTITY	UNIT COST	ANNUAL COST
INSPECTIONS/ RECORD KEEPING	per trip	4	$250	**$1,000**
MONITORING				
Explosive gases (quarterly)	per trip	4	$500	$2,000
Groundwater (semi-annually)	per trip	2	$7,500	$15,000
Surface Water (semi-annually)	per trip	2	$500	$1,000
Subtotal				**$18,000**
LEACHATE COLLECTION AND TREATMENT	allowance	0	$0	N/A
ROUTINE MAINTENANCE				
Mowing	acre	25.75	$145	$3,734
Fertilizing (once every 3 years)	acre/3	8.6	$290	$2,489
Reseeding (once every 3 years)	acre/3	8.6	$1,750	$15,021
Vector and Rodent Control	acre	25.75	$30	$773
Subtotal				**$22,016**
WELL MAINTENANCE				
Groundwater Wells	lump sum	1	$250	$250
Gas Detection Probes	lump sum	1	$250	$250
Subtotal				**$500**
CAP REPAIR	lump sum	1	$5,000	**$5,000**
CORRECTIVE ACTION PLAN ACTIVITIES (MNA & Phyto)				
Semiannual MNA Sampling and Reporting	per trip	2	$3,250	$6,500
Annual Tree Inspection	per trip	1	$1,500	$1,500
CAER (every 5 years)	per trip	0.2	$12,500	$2,500
Subtotal				**$10,500**
TOTAL OF ABOVE ITEMS				**$57,016**
ENGINEERING	-	-	0%	N/A
CONTINGENCY	-	-	5%	$2,851
TOTAL ANNUAL POST-CLOSURE COST (IN 2014 DOLLARS)				**$59,867**
TOTAL 15 YEAR POST-CLOSURE COST (IN 2014 DOLLARS)				**$898,006**
TOTAL 30 YEAR POST-CLOSURE COST (IN 2014 DOLLARS)				**$1,796,012**

Notes:

1. Costs include labor by a third party.
2. Water quality monitoring and gas monitoring are based on current JOYCE budgets plus current Laboratory costs.
3. Costs for maintenance of groundwater wells and gas probes assume that, on average, one well and one probe will need repair each year.