R.J. Reynolds Tobacco Company

May 2, 2012

Ms. Jaclynne Drummond
Division of Waste Management
North Carolina Department of Environment and Natural Resources
217 West Jones Street (Green Square)
Raleigh, NC 27603

Via Overnight Mail

Subject: *Summary Report – Ground Water Modeling for Site Assessment*
R.J. Reynolds Ash Landfill – Permit #34-05
Edwards Road
Rural Hall, Forsyth County, North Carolina

Dear Ms. Drummond:

R.J. Reynolds Tobacco Company (RJRT) is submitting the enclosed *Summary Report - Ground Water Modeling for Site Assessment* by ERM NC, Inc. (ERM) which presents the results of groundwater modeling activities for the subject property. The modeling activities were conducted by ERM in accordance with correspondence by ERM to NCDENR on behalf of RJRT dated July 6, 2011 and NCDENR's correspondence to RJRT dated July 28, 2011. We believe that the enclosed report completes the required assessment activities at the site including the delineation of appropriate constituents in the groundwater.

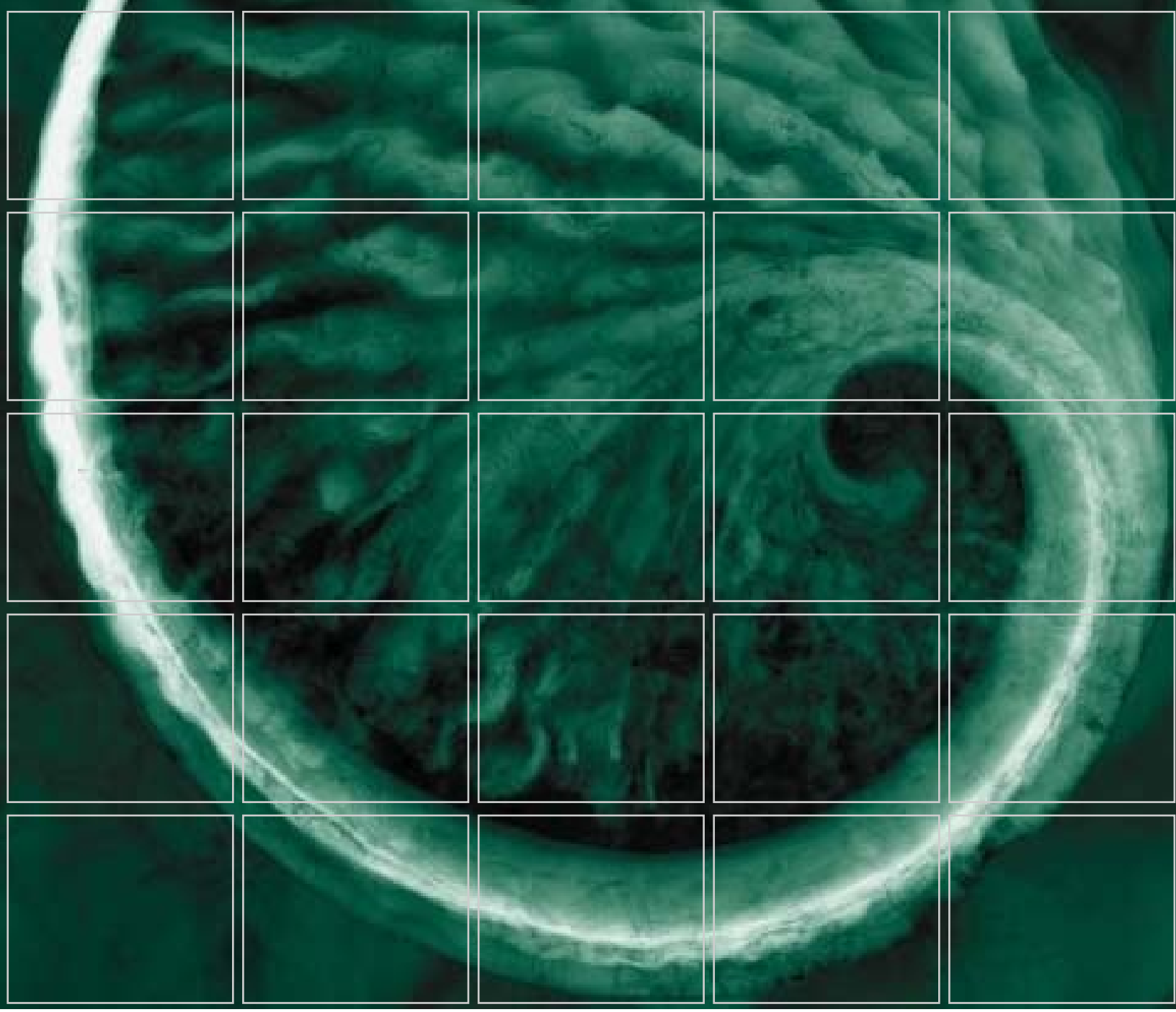
Please contact me at 336-741-1491 or Mr. Alan Martin of ERM at 704-541-8345 if you have any questions or comments.

Sincerely,

Yong Yi
Sr. Area Manager – Environmental, Health & Safety

Attachment: *Summary Report – Ground Water Modeling for Site Assessment*

cc: Mr. John Patrone – NCDENR DWM Winston-Salem Regional Office
Mr. Jason Watkins - NCDENR DWM Winston-Salem Regional Office
Alan Martin, P.G. – ERM NC, Inc.
Nancy E. Scott – Assistant Attorney General – NCDOJ (without attachments)



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Summary Report –
Ground Water Modeling for Site Assessment

Edwards Road Ash Landfill - Permit No. 34-05
Rural Hall, Forsyth County,
North Carolina

April 2012

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R.J. Reynolds Tobacco Company

Summary Report –
Ground Water Modeling for Site Assessment
Edwards Road Ash Landfill - Permit No. 34-05
Rural Hall, Forsyth County,
North Carolina

April 30, 2012

Project No. 0149451

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1.0 INTRODUCTION

This report summarizes the ground water modeling conducted for the Edwards Road Landfill, Permit Number 34-05, previously operated by R.J. Reynolds Tobacco Company (RJRT) and located northeast of Rural Hall, Forsyth County, North Carolina. The location of the landfill is shown on Figure 1.

The modeling activities were conducted by ERM NC, Inc. (ERM) in accordance with correspondence from the North Carolina Department of Environment and Natural Resources, Division of Waste Management (NCDENR DWM) to RJRT dated June 10, 2011 and correspondence by ERM to NCDENR on behalf of RJRT dated July 6, 2011. The modeling was performed as part of a comprehensive assessment of ground water quality impacts that have resulted from the migration of contaminants from the closed landfill. The site assessment is being conducted under a compliance order issued by NCDENR.

As part of the site assessment, ERM performed ground water quality monitoring by sampling a network of monitor wells and private water wells located at and adjacent to the landfill site. ERM sought access for installation of an additional monitoring well on three adjacent properties to complete the delineation of ground water impacts in the area to the east/northeast of the landfill. All of the property owners declined to allow access for the additional well installation. In lieu of installing and sampling an off-site ground water monitoring well in this location, NCDENR allowed RJRT to develop ground water flow and contaminant fate-and-transport models to complete the required site assessment.

The objective of this modeling was to simulate the three-dimensional transport of dissolved constituents in ground water from the landfill in the vicinity of the Site. The modeling was developed to evaluate the extent of affected ground water under existing conditions. The modeling output also includes:

- the plume distribution in ground water relative to off-site wells; and,
- concentrations along streams.

This effort included both a ground water flow model and a fate-and-transport model. The ground water flow model utilized MODAEM for regional ground water flow modeling and MODFLOW for the 3-D ground water flow model in the site area. The fate-and-transport model used MT3D, which is a multi-species fate and transport model. MT3D is the transport counterpart of MODFLOW. This modeling approach was approved by NCDENR in correspondence to RJRT dated July 28, 2011.

2.0 BACKGROUND

The Edwards Road Landfill was permitted by NCDENR DWM for disposal of coal ash and construction and demolition debris generated at off-site RJRT manufacturing facilities. The Edwards Road Landfill encompasses approximately 16.7 acres of disposal area within a 145-acre tract of land. This landfill was operated by RJRT from 1986 to 2002 under DWM Permit # 34-05 issued to RJRT. The landfill ceased receiving waste in December 2002 and placement of final cover soils over the disposal limits was completed in 2004. Monitoring of the ground water and surface water during operations and post-closure has detected certain inorganic compounds in excess of the 15A NCAC 2L ground water and 2B surface water standards.

HISTORICAL GROUND WATER AND SURFACE WATER QUALITY

Ground water and surface water quality monitoring has been conducted in the vicinity of the Edwards Road Landfill since 1989 in accordance with the conditions of Permit # 34-05. Ground water quality in the vicinity of the Edwards Road Landfill has historically been evaluated via five monitoring wells identified as W-1, W-2, W-3, W-3B and W-6. Three additional monitoring wells identified as W-7, W-8 and W-9 were installed in December 2010. Four additional monitoring wells were installed as part of a hydrogeologic evaluation in 1993 for a proposed expansion of the Edwards Road Landfill. Figure 1 depicts the locations of the monitoring wells. Table 1 presents well construction details and Table 2 presents historical ground water table elevation data.

Surface water quality has historically been monitored east of the Edwards Road Landfill at two locations along Leak Branch, identified as SS-01 and SS-02. Surface water samples have been collected at nine additional locations on and near the Edwards Road Landfill property in August 2009 and April 2011 as part of the site assessment. These are identified as SS-20, SS-25, SS-30, SS-40, SS-50, SS-60, SS-70, SS-80 and SS-90. Surface water sample locations are presented on Figure 2.

Ground water and surface water samples from the Edwards Road Landfill site have been analyzed for inorganic compounds including 13 metals, nitrates, sulfates, total dissolved solids, total organic carbon as well as pH, specific conductivity and temperature. These analytical parameters were established as part of the landfill operation permit.

Historically, sulfates, total dissolved solids, iron and manganese are the primary constituents detected in ground water samples collected from monitoring wells at the Edwards Road Landfill at concentrations above the applicable North Carolina Ground water Standards (see Appendix A - Table A1). In addition, intermittent exceedances of barium, cadmium, chromium, selenium and lead have been observed in the ground water. No other constituents have been detected in concentrations above the applicable North Carolina Ground water Standards. Ground water samples collected upgradient of the landfill have contained background levels of primarily iron, manganese and, occasionally, cadmium, chromium, lead and selenium at concentrations above applicable ground water quality standards.

Based on the historical surface water analyses at the site, sulfates, manganese and aluminum are the primary constituents detected in surface water samples collected from the streams adjacent to the Edwards Road Landfill at concentrations above the applicable North Carolina Surface Water Standards (see Appendix A - Table A2). In addition, intermittent exceedances of cadmium, copper, iron and zinc have been observed in the surface water. Surface water samples collected upstream of the landfill have contained background levels of aluminum, cadmium, copper, iron, zinc and other metals at concentrations above applicable surface water quality standards.

Elevated concentrations of iron, manganese and aluminum are naturally occurring in background ground water and surface water quality samples upgradient of the landfill. Sulfate is a primary constituent related to the landfill and is used as an indicator of impact to ground water or surface water quality. Detections of other constituents above the applicable ground water or surface water standard, including cadmium and selenium, are intermittent or are limited in geographic area.

The site assessment activities associated with the Edwards Road Landfill have been focused on the following constituents:

INORGANICS		FIELD PARAMETERS
Sulfates	Barium	pH
Total Dissolved Solids	Cadmium	Specific Conductivity
Iron	Chromium	Temperature
Manganese	Lead	Oxidation-Reduction Potential
Selenium		

Note: The primary constituents associated with the ash landfill are shown in bold font.

EXISTING LANDFILL COVER CONDITIONS

The source of the affected ground water and surface water at the site is landfill leachate which is generated by infiltration of rainfall through the current landfill cap. Evaluations have been previously conducted of the existing condition of the final soil cover closure at the Edwards Road Landfill which included detailed site reconnaissance, collection of undisturbed samples within the upper landfill footprint, hand auger borings along the eastern side slope, subsequent laboratory testing and leachate generation modeling ("HELP Model"). The purpose of the evaluations was to determine closure integrity and performance as well as predict the average and peak daily values for leachate generated. Findings of the initial evaluation included:

- The thickness of the soil cover overlying the landfill ranges from 10 to 25 inches with an average thickness of 16 inches. Permeability values for the soil cover range from a high of 1.9×10^{-4} centimeters per second (cm/sec) to a low of 1.6×10^{-5} cm/sec for an average permeability of 6.5×10^{-5} cm/sec across the landfill surface. The surface of the closed landfill maintains a good to excellent stand of vegetation consisting of grasses and no apparent erosion problems.

- Results of the "HELP Model" simulations indicated an average leachate generation rate of approximately 7,500 gallons per day and a peak generation rate of approximately 46,000 gallons per day based on existing conditions and a landfill footprint of approximately 17 acres.
- Reduction of leachate generation will reduce the volume of leachate discharged to the underlying aquifer.

Installation of a synthetic liner component has been selected by RJRT as a means to reduce the leachate volume generated. A design for proposed closure modifications including the synthetic liner system and improvements in site drainage characteristics was submitted to NCDENR DWM for approval in June 2011 (ERM). The proposed closure modifications were approved by NCDENR on August 16, 2011. Construction of the closure modifications was initiated in March 2012.

3.0 POTENTIAL RECEPTORS

3.1 WATER SUPPLY

Water in the vicinity of the Edwards Road Landfill is provided via supply wells installed into bedrock. The nearest municipal water supply piping operated by Forsyth County is located near the center of the Town of Rural Hall approximately 3,800 feet southwest of the Edwards Road Landfill.

3.2 WATER SUPPLY WELLS

FORMER ONSITE WATER SUPPLY WELL PW-1

One inactive water supply well is located on the Edwards Road Landfill property immediately west of the limits of the landfill. This well, identified as PW-1, provided non-potable water to the property for equipment wash down. This well was installed in 1987 to a total depth of 405 feet with galvanized casing set approximately five feet into bedrock to a depth of 21.5 feet below ground surface. This well was removed from service on August 11, 2009 and the well is now utilized for ground water quality monitoring purposes only. The location of the PW-1 well is depicted on Figures 1 and 2.

Concentrations of sulfates, iron and manganese were detected above the applicable 2L ground water quality standards in the sample from this well collected in August 2009. Historical and recent water quality analytical results of samples from the PW-1 supply well are summarized in Table A1 in Appendix A.

OFF-SITE WATER SUPPLY WELLS

Ground water in the vicinity of the Edwards Road Landfill is utilized for potable uses and livestock watering. Six off-site water supply wells were identified within 1,500 feet of the limits of the Edwards Road Landfill and six additional water supply wells were identified between 1,500 and 2,100 feet from the limits of the landfill. The nearest off-site water supply well is located approximately 1,090 feet east of the landfill limits. All identified wells are screened in bedrock between 185 and 705 feet below ground surface and all but one are active. A summary of nearby water supply wells, owner information and available well construction details is presented in Table 3. The locations of the identified water supply wells are depicted on Figures 1 and 2.

Samples have been collected from the 11 active supply wells to evaluate ground water quality at these locations. Analysis of eight of the 11 water supply well samples indicated no concentrations of constituents above applicable 2L ground water standards. Analytical results for the water supply well samples are presented on Table 4.

Analyses of ground water collected from two water supply wells, the Don Stewart well and the Sprinkle well, indicated elevated concentrations of lead. The source of elevated lead

detected in the initial sample from the Sprinkle well and three of the seven samples from the Don Stewart residential water supply well has not been determined. Evidence indicates that the elevated concentrations of lead reported in the Sprinkle and Stewart residential well samples are localized conditions. The absence of lead detected in the three additional samples from other water supply wells along Crestbrook Road and the absence or low concentrations of lead in the other six well samples surrounding the Stewart residential well indicate that the lead affected ground water is not a widespread condition. Additionally, no significant concentrations of sulfates, which is the primary constituent associated with the Edwards Road Landfill, were detected in any of the well samples. Based on these results, the elevated lead concentrations reported in samples from the Sprinkle and Stewart water supply wells are unrelated to the Edwards Road Landfill.

Subsequent sampling of Don Stewart's livestock well (ID# 4B) in June 2011 indicated concentrations of manganese and iron exceeding the applicable 2L ground water standards. Quarterly sampling and analysis of this well water since June 2011 have indicated consistent levels of manganese and iron above the 2L ground water standards.

3.3 SURFACE WATER

Topographic map coverage of the vicinity is illustrated on Figure 1. The nearest water body to the Edwards Road Landfill is Leak Branch which defines the eastern boundary of the property. An unnamed tributary to Leak Branch is located to the north and northwest of the Edwards Road Landfill.

4.0 HYDROGEOLOGICAL CONCEPTUAL SITE MODEL

Based on previous site investigation activities, the following hydrogeological conceptual site model has been developed. The site is underlain by sulfidic biotite gneiss (metagraywacke) with minor amphibolite and kyanite schist of the Ashe Formation group. The biotite gneiss has a strongly developed planar cleavage with a general northeast orientation and a moderate to shallow dip to the southeast, averaging 35°. The southeast dip reflects the regional thrust faulting in the region and low angle faulting is expected to be common within the study area. The other rock type found in the study area is vein quartz, also known as "bull" quartz. Massive "bull" quartz veins occur sporadically within the study area.

The drainage pattern surrounding the landfill is controlled by the generally northeast-trending strike of the biotite gneiss foliation and cleavage which is also parallel to thrust faulting that has been mapped in the region. The N45W-oriented structural features are likely vertical based on topographic lineaments in the area.

The saprolite aquifer is largely absent in the study area. However, the presence of perched ground water along the transition zone at the bedrock-saprolite interface is evident based on ground water levels in shallow monitoring wells (i.e. W-2 & W-3) and surface water quality data collected from locations northwest and east of the landfill. The bedrock aquifer is both quasi-confined and unconfined. Ground water flow within the bedrock aquifer appears to be controlled by low angle geologic structures or stratigraphically controlled transmissive and/or confining zones. In the upper bedrock aquifer zone, secondary fracture sets may provide lateral ground water flow paths and interconnection between low angle geologic structures.

The key features of the site hydrogeological conceptual model include the following:

- The orientation of the creeks and streams in the study area is primarily controlled by the orientation of the stratigraphy (northeast). Bedrock is present along almost the entirety of these streams.
- The depth to ground water ranges from 0 feet bgs at the creeks to more than 110 feet along topographic ridges. The saprolite aquifer is largely absent within the study area due to the shallow level of bedrock across the site (0 – 30 feet bgs). However, some of the water that infiltrates the ash landfill appears to be migrating laterally along the top of the bedrock surface. Surficial expressions of this "perched water" migration are discharges on the side slope between Leak Branch and the access road near the base of the landfill.
- Based on the fundamental concepts of ground water flow in a watershed, the regional ground water flow regime within the lower portion of the bedrock aquifer flows to the northeast toward the nearest regional drainage feature, Town Fork Creek. This ground water may discharge into Town Fork Creek or continue to flow toward the northeast.

- Ground water in the bedrock aquifer locally flows from areas of higher elevation to areas of low elevation. Ground water in the uppermost portion of the bedrock aquifer discharges into the creeks adjacent to the landfill.
- Rainfall infiltration through the landfill cap migrates vertically downward through the ash under the influence of gravity. Constituents within the ash may be dissolved by the infiltration water and become mobile.
- Infiltration water also enters into the bedrock along stratigraphically or structurally controlled permeable zones, particularly the foliation or cleavage planes. The predominant strike and dip of these zones beneath the landfill is northeast and approximately 35° southeast respectively. Vertically oriented northwest striking structures may also act as conduits to the bedrock aquifer.
- Once the infiltration water enters the bedrock aquifer, it migrates laterally and vertically along the stratigraphically and structurally controlled permeable zones and secondary fracture sets. With increasing depth, there is a general decrease in the frequency and interconnectivity of the fractures resulting in reduced permeability and an upward vertical hydraulic gradient in the lower bedrock aquifer, as indicated by artesian flow in bedrock monitor well W-3B at the site.
- The creeks surrounding the landfill act as a "perimeter drain" and much of the ground water derived from infiltration through the landfill migrates along the permeable zones in the bedrock and discharges into these creeks.
- The contaminant levels within the creeks adjacent to the landfill decrease with distance from the landfill due to dilution with unaffected water entering the creeks from other drainage basins.
- Some of the ground water derived from infiltration through the landfill migrates vertically within the bedrock aquifer and does not discharge into the creeks unless a conduit through a confining unit, such as monitor well W-3B, or a naturally occurring permeable feature, allows upward migration of the affected ground water. Ground water within the deeper portion of the bedrock aquifer would be expected to eventually enter the deep regional flow regime and flow northeastward toward the Town Creek drainage.
- The lateral extent of the sulfate-affected ground water has been determined sidegradient to the northwest and southeast and downgradient to the northeast of the landfill.
- Based on the absence of elevated levels of sulfates and manganese in the ground water samples collected from the side-gradient monitoring wells and off-site water supply wells in the area, affected ground water is not present in the vicinity of the nearest off-site water wells located approximately 1,100 feet east of the landfill.
- The vertical extent of sulfate-affected ground water within the bedrock aquifer is projected to be approximately 250-300 feet below ground surface (elevation 550-500 feet amsl) based on concentrations observed in monitoring well W-3B.
- Aquifer testing has not been conducted at the site to determine hydraulic conductivity values for the bedrock aquifer. Based on the ground water modeling of the watershed presented below, a bulk hydraulic conductivity in the range from 0.08 to 0.008 feet per day (2.8×10^{-4} to 2.8×10^{-5} centimeters per second) was derived for the bedrock aquifer. Based on the model-derived hydraulic conductivity values and the observed hydraulic gradients at the site, the

general contaminant migration rates are estimated to be in the approximate range of 6 to 70 feet/year in the bedrock aquifer zone under existing conditions.

Regional and local ground water flow directions are depicted on Figure 3 and site hydrogeologic conceptual model is presented on Figure 4.

5.0 GROUND WATER FLOW MODEL DEVELOPMENT

The geologic formations beneath the Site consist of fractured bedrock overlain by saprolite (residual soil and weathered bedrock) that are hydraulically connected. The Site is underlain by fractured bedrock (gneiss and schist) that is characterized by a strongly developed stratigraphic layering (foliation or cleavage planes) with a general northeast orientation and a moderate to shallow dip to the southeast, averaging 35°. The orientation of the creeks and streams in the study area are primarily controlled by the northeast orientation of the bedrock stratigraphy. Bedrock is present along almost the entirety of these streams. The first occurrence of ground water beneath the upper portion of the site is within the fractured bedrock. Ground water flow occurs primarily through secondary porosity features such as fractures, joints, and bedding plane separations. The ground water flow at the Site is also strongly influenced by the northeast-trending bedrock fabric because fractures tend to develop along the stratigraphic layers and provide permeable zones for ground water flow and contaminant migration. Fractured bedrock formations with secondary-porosity-dominated flow are commonly anisotropic, such that hydraulic conductivity is an orientation-dependent parameter. Under anisotropic flows conditions, ground water may not flow directly downgradient as in unconsolidated formations but rather flows in a vector oriented between the main anisotropy orientation and the direction of decreasing hydraulic head. The bedrock anisotropy was reflected in the model's construction.

The conceptual ground water flow model for the Site is a three-dimensional (3-D) flow system with multiple model layers, reflecting zones of saprolite and bedrock formations weathered with various degrees of anisotropy characteristics and varied hydraulic conductivity. Infiltration from precipitation is the predominant source of ground water. Infiltrated water flows through the aquifers and discharges to surface streams and tributaries in and around the watershed under natural conditions.

5.1 MODEL SELECTION

ERM's modeling consisted of first developing the regional ground water flow model, followed by development of the local ground water flow and fate-and-transport models. ERM developed the regional ground water flow model using the two-dimensional MODAEM to set baseline conditions and model boundaries for subsequent use in a three-dimensional (3-D) local-scale ground water flow and fate and transport model using MODFLOW and MT3D. MODAEM was developed by Dr. V. Kelson (Kelson, 2001) of Wittman Hydro Planning Associates (WHPA) in Bloomington, Indiana. MODAEM is an analytic element model and so does not require subdivision of the interior of the model area into cells and elements, as must be done with finite-difference and finite-element models. Instead, the model is characterized by "analytic elements" representing line sources and sinks, such as streams and drains or specified head and flow boundaries. Wells are represented as points, and recharge and aquifer properties are defined on polygons. MODAEM then develops a set of equations from these elements to be solved for any location in the horizontal plane. After a MODAEM conceptual model has been defined, the model can be executed without establishing a model grid. Although a background grid is

provided to help display the model results using contour lines, this grid is strictly for visual display and is unrelated to model accuracy. MODAEM also supports particle tracking/ streamlines. MODAEM can depict steady, confined, and unconfined two-dimensional ground water flow, although streamlines are calculated in three dimensions.

The 3-D site ground water flow model employed MODFLOW. MODFLOW is a 3-D finite-difference ground water flow model, developed by the USGS (McDonald, 1988). MODFLOW is the most widely used modeling package accepted by regulatory agencies throughout the United States.

The fate-and-transport model is a MT3D model. MT3D is a multi-species fate and transport model developed by Zheng (1990) for simulating reactive multi-species fate and transport in 3-D aquifers. MT3D is the transport counterpart of the MODFLOW model. All MODFLOW model input and setup assumptions are preserved in the MT3D modeling.

MODAEM, MODFLOW, and MT3D models are well suited for the modeling objectives of this project. MODAEM, MODFLOW, and MT3D have been extensively used by ground water professionals worldwide. These models are set up using the latest version of the Ground Water Modeling System (GMS) developed by Aquaveo (Aquaveo, 2011). GMS is a powerful ground water modeling platform that has been widely used for several decades. This modeling approach was approved by NCDENR in correspondence to RJRT dated July 28, 2011.

6.0 DEVELOPMENT OF GROUND WATER FLOW MODELS

6.1 REGIONAL WATERSHED AND GROUND WATER FLOW MODEL DEVELOPMENT

ERM developed the regional two-dimensional ground water flow model for the purpose of identifying the necessary modeling region and to develop the model's boundary conditions for the subsequent and localized 3-D ground water and fate and transport models for the area of interest.

Development of the regional ground water flow model was aided by watershed modeling that employed the USGS Digital Elevation Model (DEM), which uses the Watershed Modeling System (WMS). WMS was developed by Aquaveo (Aquaveo, 2011). The topographic contours developed using USGS's DEM and the stream network developed using WMS are presented on Figure 2.

ERM ran several iterations of the regional ground water MODAEM model, starting with a large area covering over 20 square miles. The following data were used in the development of the regional ground water flow model:

- USGS DEM (online),
- stream flow data from USGS (online),
- geologic map (ERM, 2011), and
- ground water levels (based upon site data).

Much of the model's boundary consists of natural rivers and streams. The model receives a uniform equivalent recharge that is the net effect of infiltration from precipitation, evaporation, evapotranspiration, and exchanges in water storage. The equivalent recharges are derived from the USGS' stream flow data. Recharge rates remain relatively uniform throughout the study region, similar to what has been observed in most parts of the world. The regional ground water flow model input parameters are given in Table 5. Modeled regional ground water contours under mean water level conditions are presented on Figure 3.

6.2 3-D SITE GROUND WATER FLOW MODEL DEVELOPMENT

The Site's ground water flow model was developed to represent the underlying flow characteristics of the aquifer, and to serve as a basis for the subsequent fate and transport models. The 3-D Site's ground water flow model was developed based on the boundary conditions provided by the regional model. The inset on Figure 5 presents the model grid with variable spacing with finer spaced grids near the Site. The model has three model layers dividing the aquifer into three vertical zones. The bases of these three zones are artificially set at 700, 600, and 500 feet, above mean sea level (amsl). The top layer receives infiltration from precipitation. Ground water flows into streams and tributaries around the perimeter of the watershed.

Besides providing reliable boundary conditions, the regional ground water flow model establishes a relationship between infiltration and overall aquifer transmissivity, field data for which can have orders of magnitude of uncertainty (Shapiro, 2004). This relationship is based on water balancing and allows the model to develop proper aquifer transmissivities using the more reliable infiltration rate developed in the model calibration process. This enables more reliable model simulations of actual conditions. Local infiltration rates can be reliably developed using USGS's long-term stream flow data at nearby stations. The model input and model-derived parameters and sources of the data are presented in Table 5. The anisotropy orientation was set at N60^{o}E to mimic the likely regional grain orientation of structural weakness, based upon existing ERM geologic maps and cross-sections (ERM, 2011).

This model is intended to simulate worst-case (lowest) ground water elevation conditions in late summer and early fall arising from the natural low point in the water table cycle as well as higher-than-normal ground water withdrawals for nearby residence, livestock, and agricultural water needs. These conditions cause reduced stream discharges relative to normal flows that provide dilution, thereby simulating periods when surface water quality impacts from affected ground water discharges to the streams would be greatest.

The observed background ground water flow conditions in April 2011 were used to calibrate the model. The April 2011 data were used because there was a more extensive data record for this sampling event compared to other sampling events. The water balance features of the model automatically compensate for different water table conditions desired to be modeled. Therefore, use of the April 2011 data set versus a fall season data set does not have a significant effect on modeled outcomes. It should be noted that the reference elevations (top of casing) for some of the wells had not been surveyed at the time of this modeling. Their reference elevations were estimated using USGS DEM information. The ground water level data developed using these estimated reference elevations should therefore be viewed as preliminary and should be modified once the survey data become available.

Following the ground water modeling guideline developed by ASTM (1994), the predetermined model calibration criteria are that:

- the average of the residuals (difference between the modeled and observed water levels) is less than 2 percent of the natural water level difference; and
- the standard deviation of the residuals is less than 10 percent of the natural water level difference.

The model calibration results are presented in Table 6. This table indicates that the average of the residuals is -2 feet, which is 1.2 percent of the natural water table difference of 146 feet. This is less than the 2 percent criterion set above. The standard deviation of the residuals is 11 feet, which is 7.5 percent of the natural water level variation. This is less than the 10 percent criterion set above. From this table, it may be seen that the constructed model has surpassed the predetermined calibration criteria and is considered appropriate for further simulations.

7.0 DEVELOPMENT OF FATE-AND-TRANSPORT MODELS

The MT3D model simulates the relevant fate-and-transport mechanisms, including advection, dilution, dispersion, and degradation. Advection and dilution effects on constituents of concern plume migration are controlled by the ground water flow model and are automatically included in the MODFLOW modeling. The MT3D model's input and calibration parameters are also presented in Table 5.

Constituents of concern (COCs) for this modeling were sulfates, dissolved iron, and dissolved manganese. COC source loadings were applied to the model along with the infiltration rate. The COC sources in the model were assumed to start in 1986 at the opening of the landfill at the Site. The fate-and-transport model simulated the transient plume migration process from 1986 onward. Based on the model output, general contaminant migration rates are estimated to be in the approximate range of 6 to 70 feet per year in the bedrock aquifer zone under existing conditions. This model was set up to include the entire drainage network upstream of the Site, thus allowing the model to generate not only ground water concentrations, but also COC concentrations in the receiving stream at selected locations that matched previous stream sampling locations.

The models were calibrated using the highest observed COC concentrations in recent years. This is considered to be a conservative approach because both observed ground water and stream concentrations have varied by up to two orders of magnitude both periodically and seasonally. Results of the calibration are presented in Table 7.

The transport model utilized available analytical data collected at the Site to further refine several input parameters in the ground water flow model, including the anisotropy ratio for the aquifer hydraulic conductivity, effective porosity, and aquifer transmissivity distribution among the model layers. These parameters have limited effects on the calibration of the ground water flow model, however.

Specifically, the effective aquifer porosity does not change the ground water flow model but does, however, affect plume travel time in the transport model. The porosity values are adjusted through trial and error until the modeled concentration trends are consistent with the observed ones at key locations along the plume path.

8.0 GROUND WATER MODEL SIMULATIONS

The developed and calibrated ground water flow and fate-and-transport models were applied to simulate ground water flow and plume fate-and-transport at the Site, as discussed below.

8.1 GROUND WATER FLOW CONDITIONS

Figures 5 and 6 respectively present the modeled ground water elevation contours under current conditions in the shallow and deep zones of the fractured bedrock aquifer and especially in the vicinity of local pumping wells, as indicated by the capture zones of these wells. While the ground water contours were presented in plan view for each zone in Figures 5 and 6, the depicted ground water flow lines and well capture zones are modeled in 3-D and are not zone-dependent.

The modeling indicates that ground water at the Site discharges into small streams and tributaries directly downgradient of the perimeter of the landfill. These streams and tributaries near the perimeter of the landfill are the ultimate receptors for site-related COCs in ground water.

The modeling indicates that the private water wells in the surrounding areas are not receiving ground water from the Edwards Road Landfill site. The simulated capture zones of the private water wells located east of Leak Branch do not extend to the Edwards Road landfill. The simulated capture zones were based on a pumping rate of 2 gallons per minute (gpm) for most of the private wells. Higher pumping rates (4 to 13 gpm) were used at four of the private wells (3B, 4B, 6 & 7) based on model calibration results to simulate observed ground water levels. The range of simulated pumping rates is conservatively high to reflect the worse-case conditions in late summer and early fall, compared to a 0.27 gpm pumping rate derived from the USEPA's daily water consumption of 400 gallons per average U.S. household.

Livestock Well 4B (Don Stewart), located approximately 1,100 feet southeast of the Edwards Road Landfill, is currently being routinely monitored for ground water quality. The modeled capture zone of Well 4B extends southwestward and not toward the landfill. The model indicates that ground water quality in this private well is not likely to be affected by contaminants originating from the Edwards Road Landfill site.

8.2 EXISTING SULFATE PLUME DISTRIBUTIONS

Figure 7 presents the modeled existing sulfate plume distribution as of 2011. This is a snapshot of transient sulfate plume migration, assuming sulfate was first released at the site in 1986. An inset in this figure illustrates the 3-D sulfate plume in ground water. None of the private wells are situated within the area affected by the site-related sulfate plume. The outer extent of the sulfate plume depicted in Figure 7 is set at the North Carolina 2L Ground Water Standard of 250 mg/L for sulfate.

Modeling indicates that the sulfate plume related to the Site is discharging to and confined by small streams and tributaries immediately surrounding the site landfill, including a segment of Leak Branch and its tributaries. In addition to the sulfate source at the site, there are natural background sulfate levels in the formation that can discharge to surface streams.

The ground water flow and fate-and-transport models were set up to provide in-stream sulfate concentrations. The modeled sulfate concentrations at selected stream gauging stations are listed in Table 7. Modeled sulfate concentrations at stream stations SS-02, SS-40, and SS-60 exceed the North Carolina 2B Surface Water Standard of 250 mg/L for sulfate.

8.3 EXISTING DISSOLVED IRON PLUME DISTRIBUTIONS

Figure 8 presents the modeled existing dissolved iron plume distribution as of 2011. This is a snapshot of transient dissolved iron plume migration, assuming dissolved iron was first released at the site around 1986. An inset in this figure illustrates the 3-D dissolved iron plume in ground water. There are no private wells situated within the area affected by the site-related dissolved iron plume. It should be noted that the background dissolved iron concentrations in the region are well above the North Carolina 2L Ground Water Standard of 0.3 mg/L for dissolved iron.

Modeling indicates that the dissolved iron plume related to the site landfill is discharging to, and confined by, small streams and tributaries immediately surrounding the site landfill, including a segment of Leak Branch and its tributaries. Figure 8 suggests that dissolved iron from the site landfill area exceeding 1 mg/L is present slightly beyond one of the Leak Branch stream segments; however, this is believed to be an artifact of the modeling grid structure, given that background dissolved iron concentrations are also above 1 mg/L in ground water, and thus the regional dissolved iron background concentrations and those from the landfill cannot be differentiated.

8.4 EXISTING DISSOLVED MANGANESE PLUME DISTRIBUTIONS

Figure 9 presents the modeled existing dissolved manganese plume distribution as of 2011. The figure is a snapshot of the transient manganese plume migration process, assuming that manganese was first released from the landfill in 1986. An inset in this figure illustrates the 3-D manganese plume in ground water. There are no private wells situated within the area affected by the site-related manganese plume. Please note that background dissolved manganese concentrations in the region are well above the North Carolina 2L Ground Water Standard of 0.05 mg/L for manganese.

Modeling indicates that the site-related manganese plume is discharging to, and generally confined by, small streams and tributaries immediately surrounding the site landfill, including a segment of Leak Branch and its tributaries. Figure 9 suggests that manganese from the site landfill area exceeding 0.1 mg/L is present slightly beyond two of these

stream segments; however, this is believed to be an artifact of the modeling grid structure, given that background manganese concentrations are also above 0.1 mg/L in ground water, and thus the regional manganese background concentrations and those from the landfill cannot be differentiated.

8.5 MODEL UNCERTAINTIES

Although normal ground water flow models have a moderate degree of uncertainty, the overall well capture zones of this regional ground water flow model are relatively certain. This is because the regional ground water flow modeling approach relies on a watershed-wide water balance based on infiltration, rather than the conventional modeling basis of aquifer transmissivity, which has orders of magnitude of uncertainty (Shapiro, 2004). The infiltration rate, on the other hand, has been studied extensively by USGS and is considered to be relatively certain.

The ground water flow direction in fractured rock aquifers can be difficult to determine, because aquifer anisotropy can cause ground water to not necessarily flow in a downgradient direction based solely on piezometric head differences. The extensive concentration data available at the Site functioned essentially as 'tracer test' results that helped provide a relatively high degree of certainty for the actual ground water flow and plume migration directions.

There can be uncertainties associated with aquifer hydraulic conductivity, thickness, and effective porosity of fractured bedrock layers and zones. These parameters have limited effects on the capture zones and ground water flow directions that are the main foci of this modeling, because of the reasons stated above.

The fate-and-transport models are normally considered to have greater uncertainty than ground water flow models, and are generally considered to provide results with an order of magnitude of uncertainty because of the log-linear nature of plume distributions in aquifers. This is expected to be true in this case as well. The modeled concentrations in the aquifer are log-linearly distributed, and concentration can vary greatly in a relatively short horizontal distance and elevation. Therefore, the modeled concentrations should be viewed as having approximately an order of magnitude of uncertainty.

The sensitivity analysis was intended to study the impact on model outcomes of those parameters that are unknown and assumed. Because regional ground water modeling techniques have been used for this project, the number of unknown parameters is greatly reduced, because most inputs are based on regional stream data, the locations of which are well established by USGS.

9.0 SUMMARY AND CONCLUSIONS

Ground water flow and contaminant fate -and-transport models were developed to evaluate the extent of affected ground water migration from the Edwards Road Landfill site in the area where an off-site monitoring well required for site assessment could not be installed.

The modeling indicates that ground water at the Site discharges into Leak Branch and the unnamed tributaries directly downgradient of the perimeter of the landfill. These streams and tributaries near the perimeter of the landfill are the ultimate receptors for site-related COCs in ground water. The modeling indicates that the private water wells in the surrounding areas are not receiving ground water from the Edwards Road Landfill site. The simulated capture zones of the private water wells located east of Leak Branch do not extend to the Edwards Road landfill. This includes livestock well 4B (Don Stewart), located approximately 1,100 feet southeast of the Edwards Road Landfill, which is currently being routinely monitored for ground water quality.

10.0 REFERENCES

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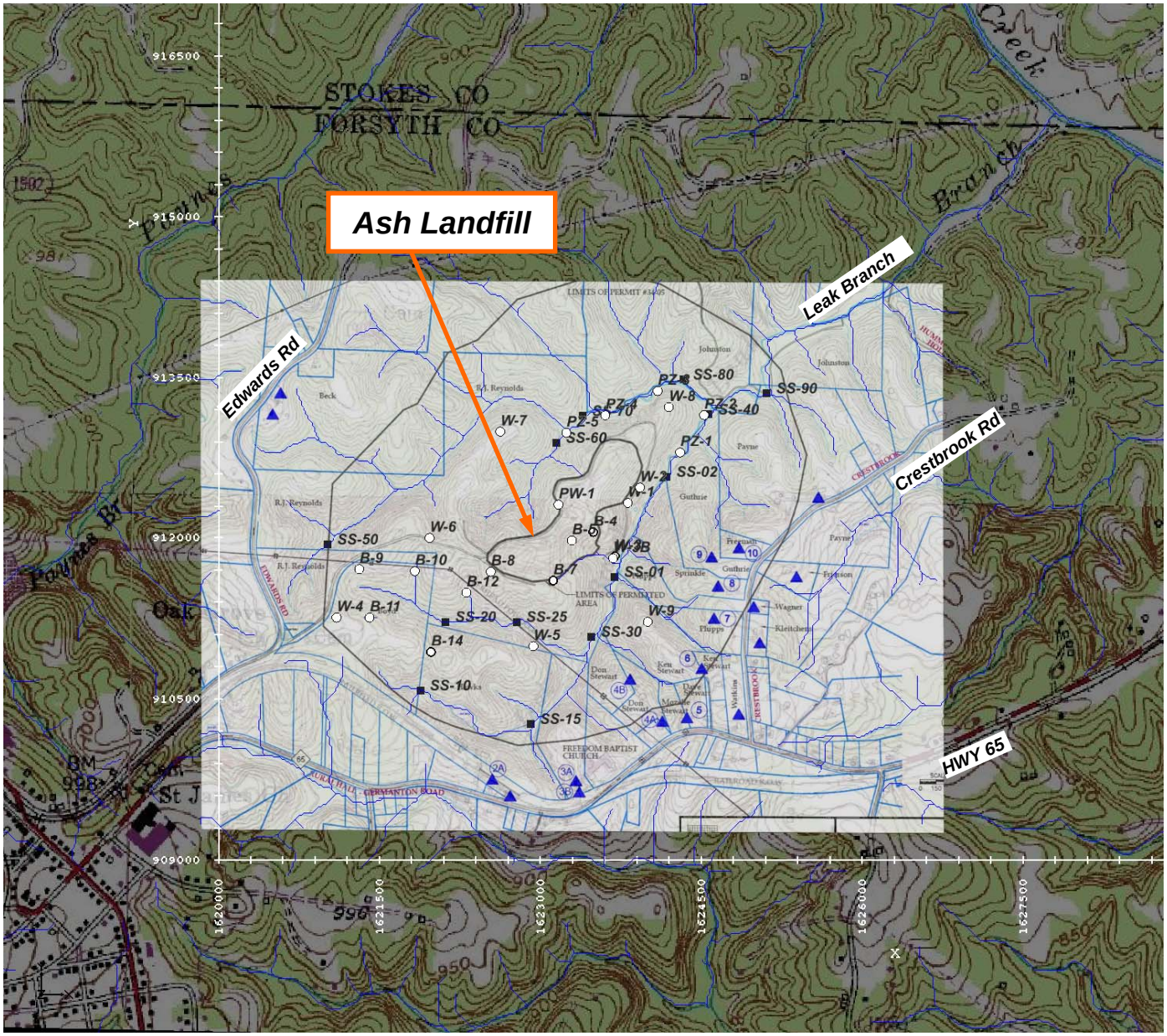
FIGURES



Legend

- Landfill boundary
- Monitoring wells
- Modeled streams
- Off-site residential wells
- Stream sampling locations

Notes:

A) Stream network developed using USGS DEM and watershed modeling

Scale: 1" = 1,500'

NAD 83 NC State Plane Coordinate System in feet

1618000, 917000, 907400

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Site Map and Well Locations
Ash Landfill - R.J. Reynolds Tobacco Company
Rural Hall, North Carolina

Figure 1

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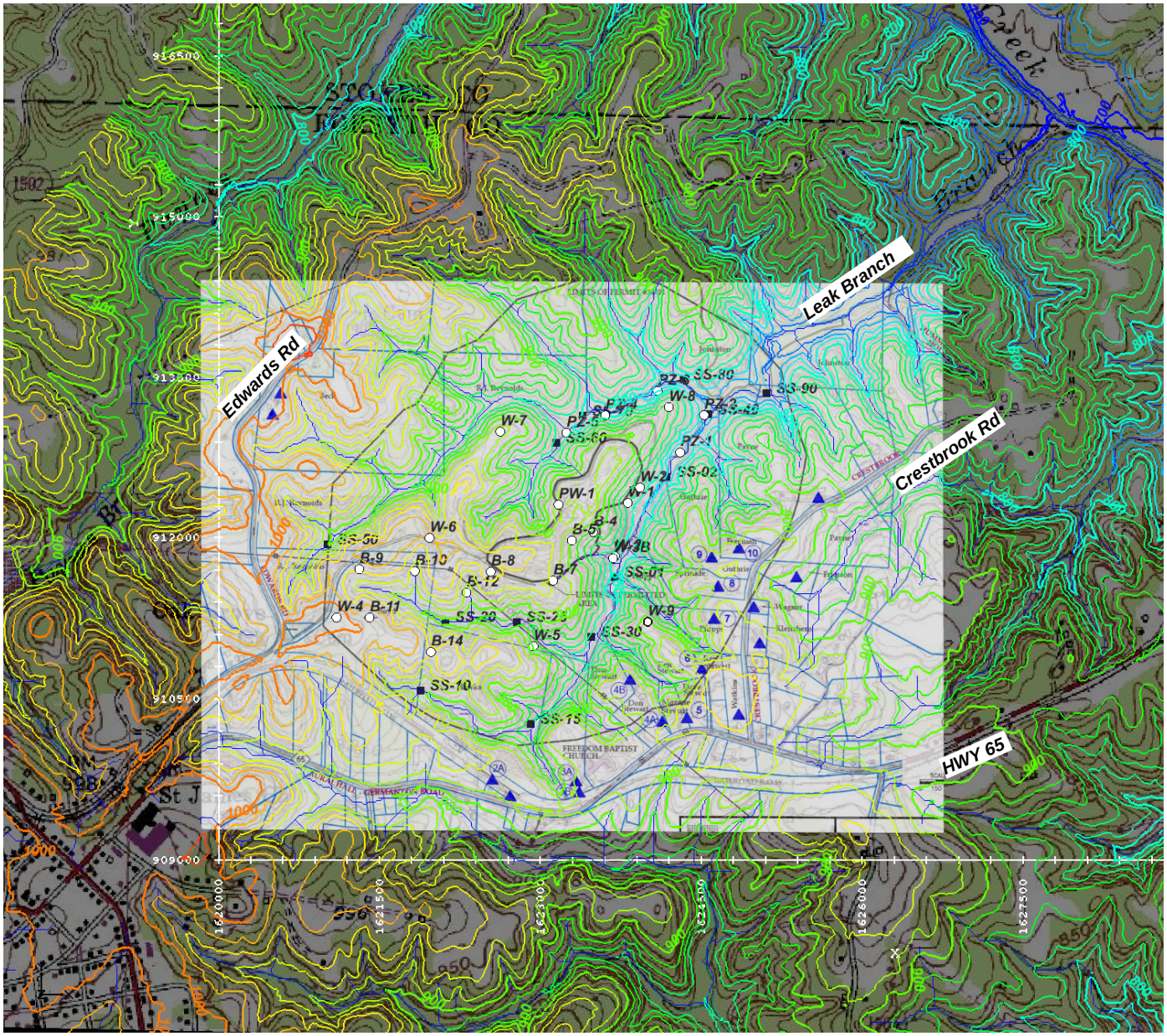

Legend

- Landfill boundary
- Monitoring wells
- Modeled streams
- Off-site residential wells
- Stream sampling locations
- Topographic contours, feet amsl

Notes:

A) Topographic contours developed using USGS DEM

Scale: 1" = 1,500'

NAD 83 NC State Plane Coordinate System in feet

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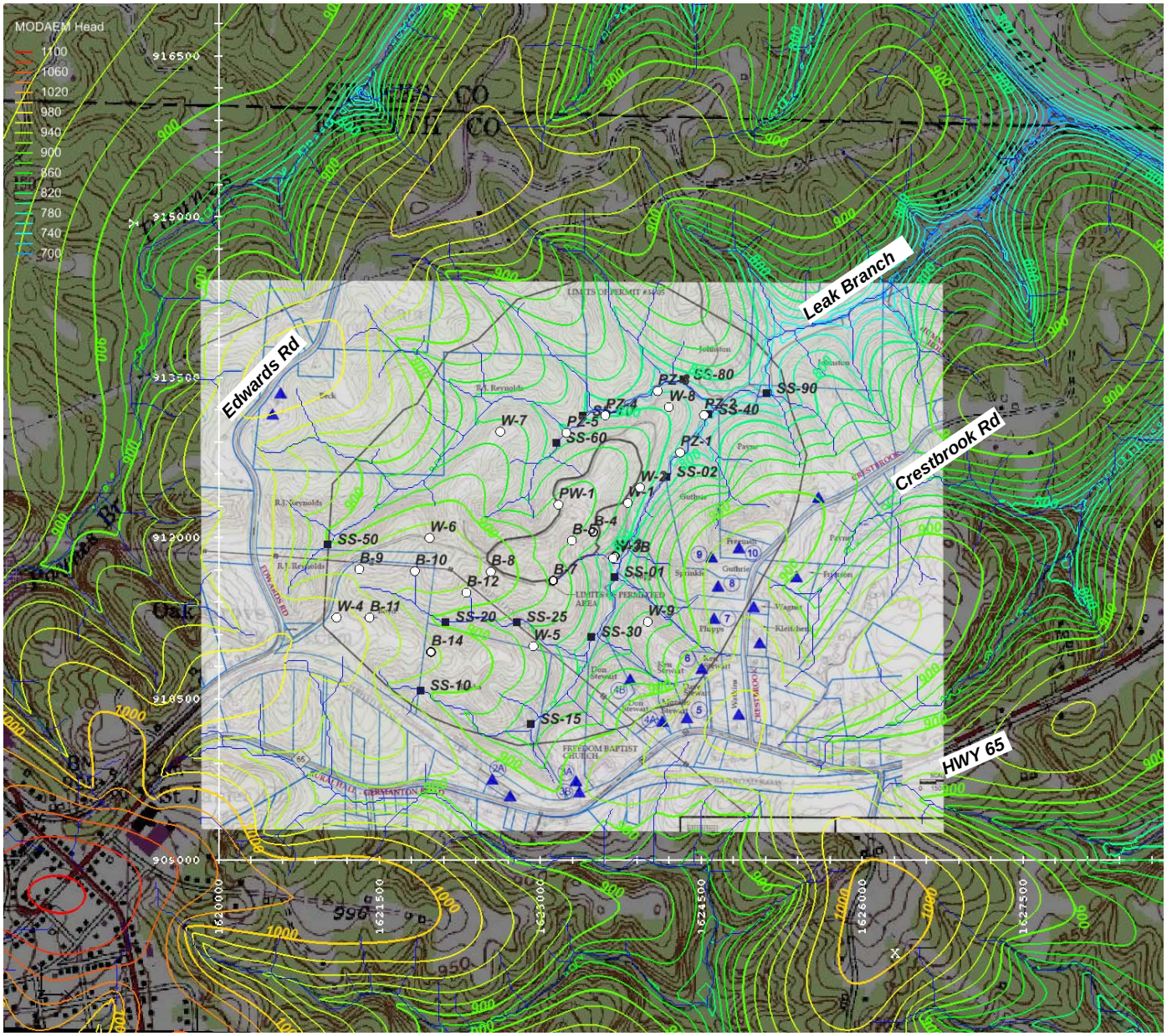
Regional Topographic Contours and Modeled Stream Network
Ash Landfill - R.J. Reynolds Tobacco Company
Rural Hall, North Carolina

Figure 2

0149451.02-02/0142012-HYH-M:RJ Reynolds/GMSmodel.ppt



Legend

- Landfill boundary
- Monitoring wells
- Modeled streams
- Off-site residential wells
- Stream sampling locations
- Modeled regional ground water contours, feet amsl

Notes:

A) Modeled regional average aquifer transmissivity of 60 ft2/d (±50%)

Scale: 1" = 1,500'

NAD 83 NC State Plane Coordinate System in feet

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N

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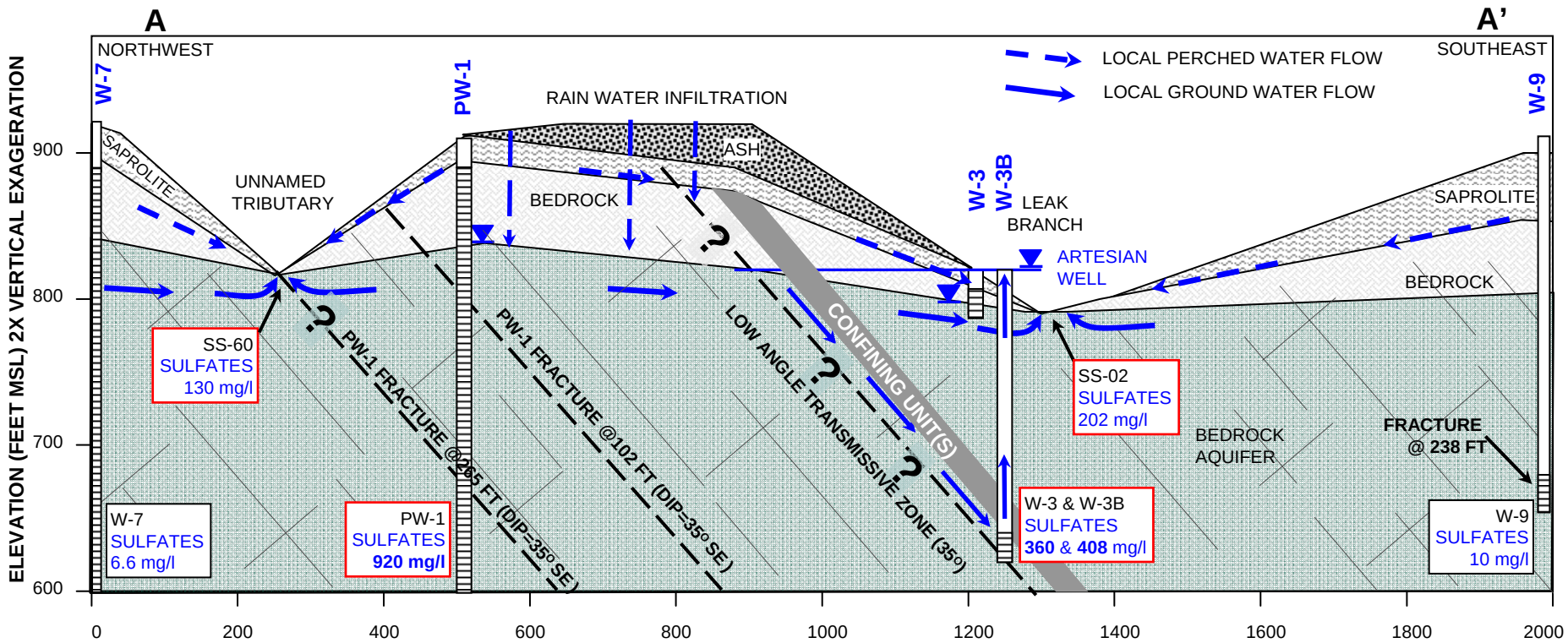
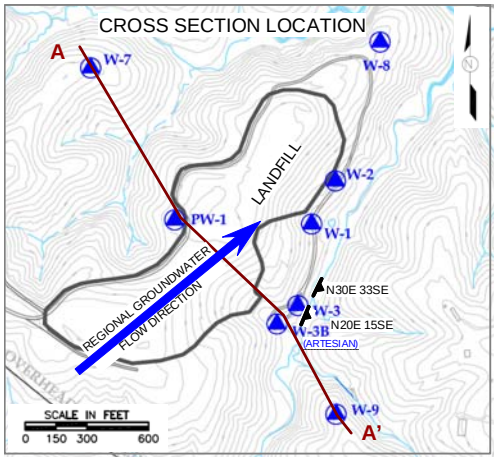
Modeled Regional Ground Water Flow Conditions
Ash Landfill - R.J. Reynolds Tobacco Company
Rural Hall, North Carolina

Figure 3

0149451.02-02/0142012-HYH-M:RJ Reynolds/GMSmodel.ppt





SULFATE CONCENTRATIONS - MOST RECENT (mg/L)

MONITORING WELLS		*PIEZOMETERS*		*SURFACE WATER*	
W-1	**1,150**	PZ-1*	30	SS-01	39.2
W-2	**365**	PZ-2*	82	SS-02	202
W-3	**360**	PZ-3*	25	SS-10**	11
W-3B	**460**	PZ-4*	24	SS-15**	7.5
W-6	11	PZ-5*	85	SS-20*	4.8
W-7*	6.6			SS-25*	5
W-8*	68			SS-30*	27
W-9*	10			SS-40*	110
PW-1*	**920**			SS-50*	3.7
				SS-60*	130
				SS-70*	23
				SS-80*	27
				SS-90*	56

NC Groundwater & Surface Water Standard = 250 mg/L
Sample collected in October 2011 unless otherwise noted
* Sample collected in April 2011
** Sample collected in August 2009

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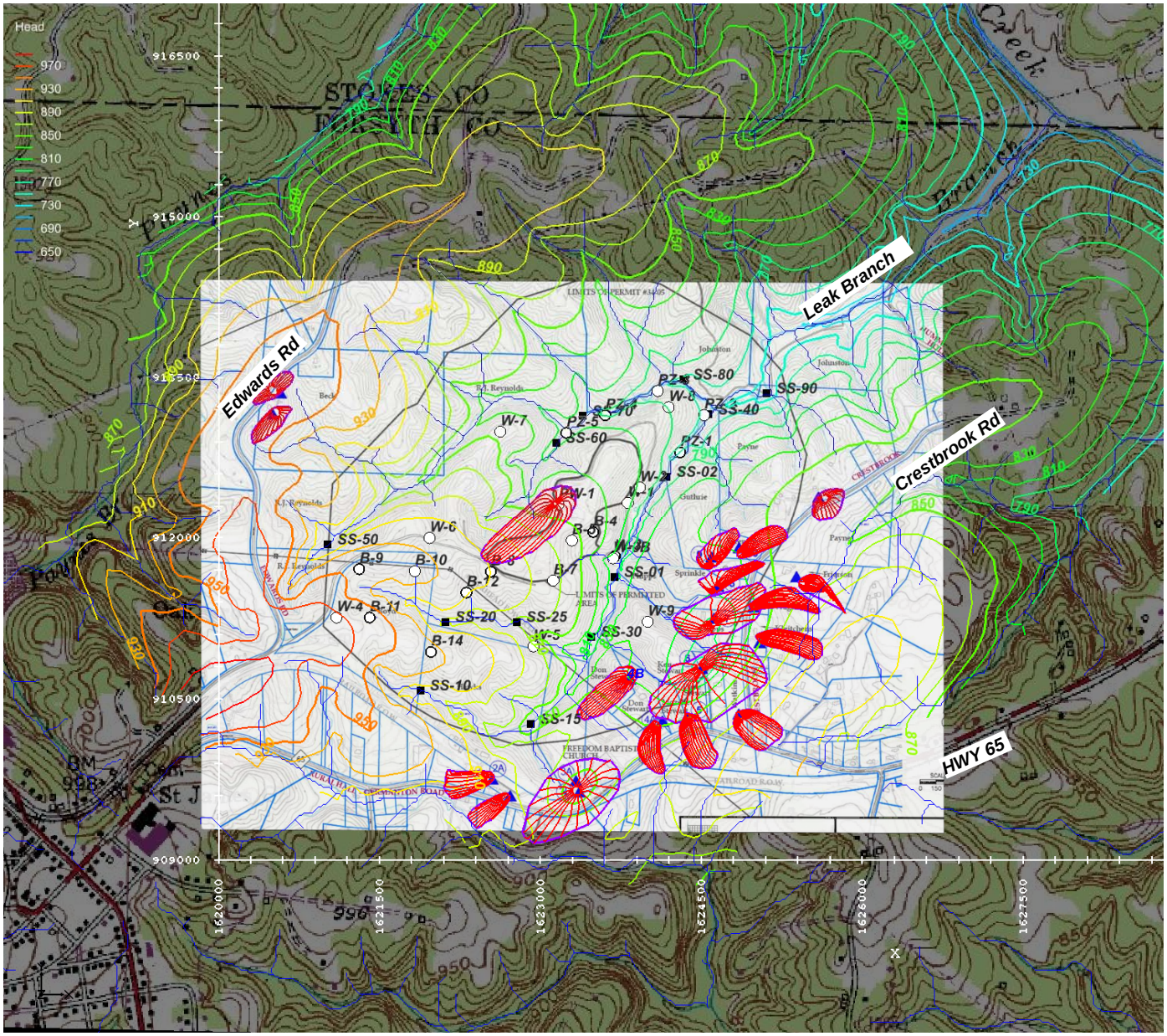
Hydrogeologic Conceptual Model
Ash Landfill - R.J. Reynolds Tobacco Company
Rural Hall, North Carolina

Figure 4



Legend

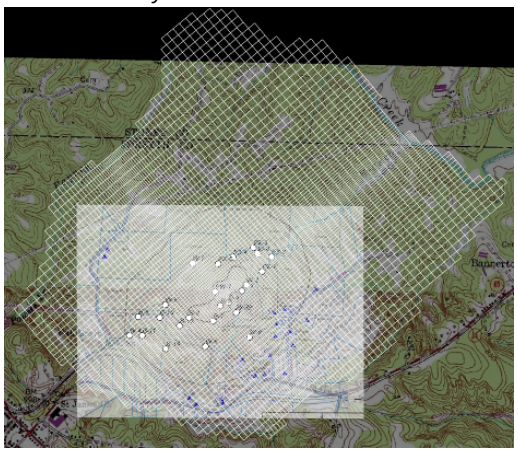
- Landfill boundary
- Monitoring wells
- Modeled streams
- Off-site residential wells
- Stream sampling locations
- Modeled ground water contours, feet amsl
- Modeled 3-D ground water flow lines and well capture zones

Notes:

A) 3-D multi-layer fractured rock flow model grid

B) None of the private wells receive ground water from the Site landfill

3-D Multi-layer Fractured Rock Flow Model Grid



Scale: 1" = 1,500'

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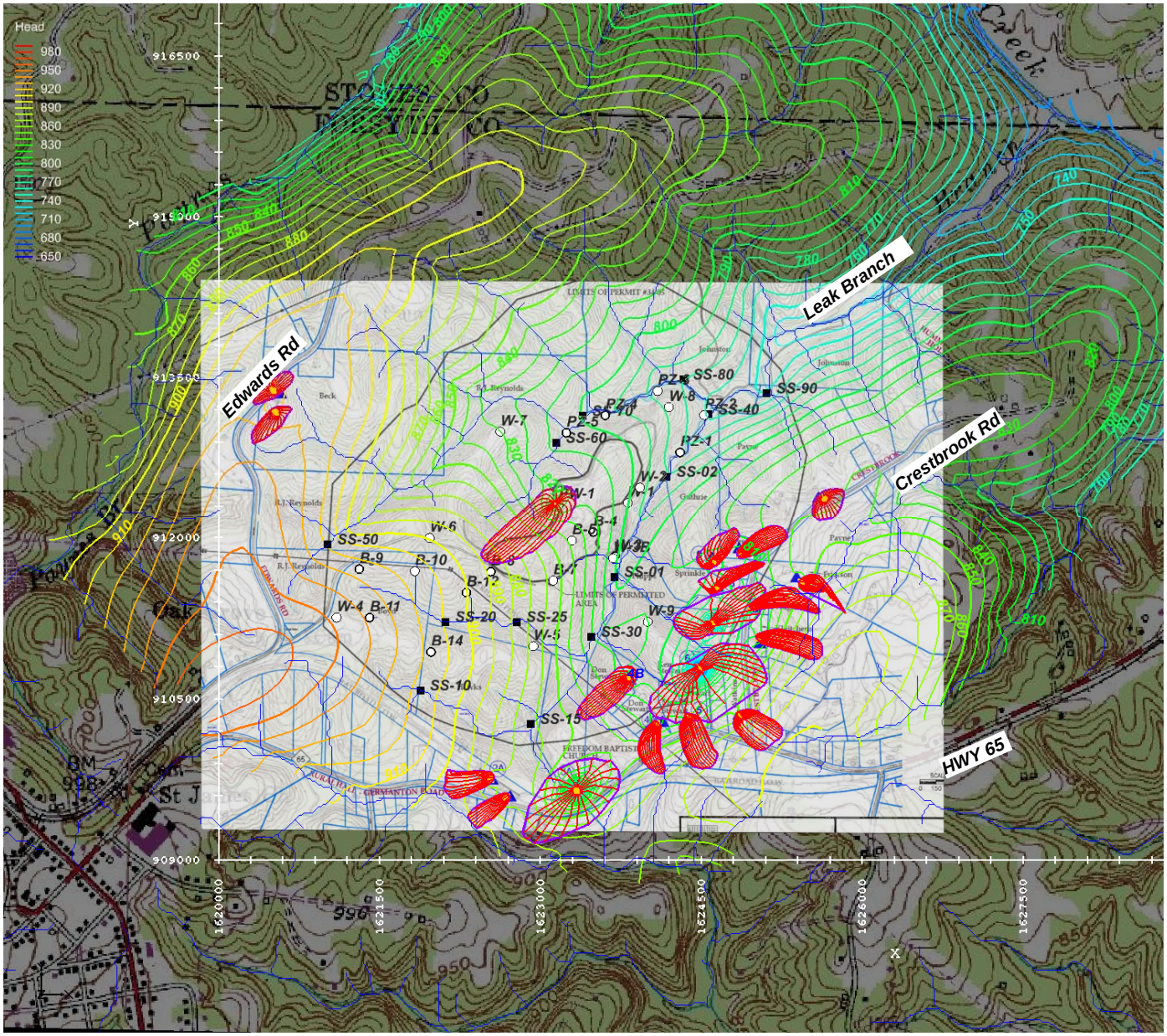
Modeled Ground Water Flow Conditions in Shallow Bedrock Zone
Ash Landfill - R.J. Reynolds Tobacco Company
Rural Hall, North Carolina

Figure 5

0149451.02-02/0142012-HYH-M:RJ Reynolds/GMSmodel.ppt



Legend

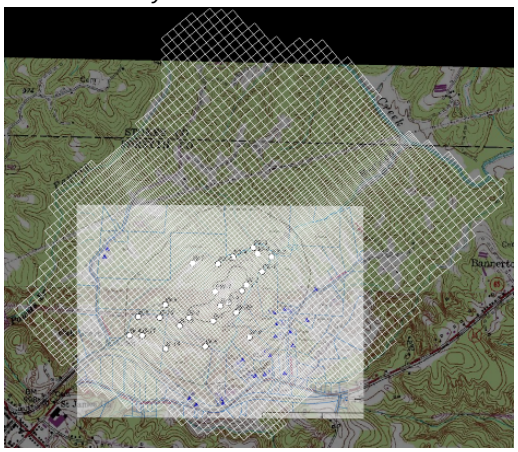
- Landfill boundary
- Monitoring wells
- Modeled streams
- Off-site residential wells
- Stream sampling locations
- Modeled ground water contours, feet amsl
- Modeled 3-D ground water flow lines and well capture zones

Notes:

A) 3-D multi-layer fractured rock flow model grid

B) None of the private wells receive ground water from the Site landfill

3-D Multi-layer Fractured Rock Flow Model Grid



Scale: 1" = 1,500'

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Modeled Ground Water Flow Conditions in Deep Bedrock Zone
Ash Landfill - R.J. Reynolds Tobacco Company
Rural Hall, North Carolina

Figure 6

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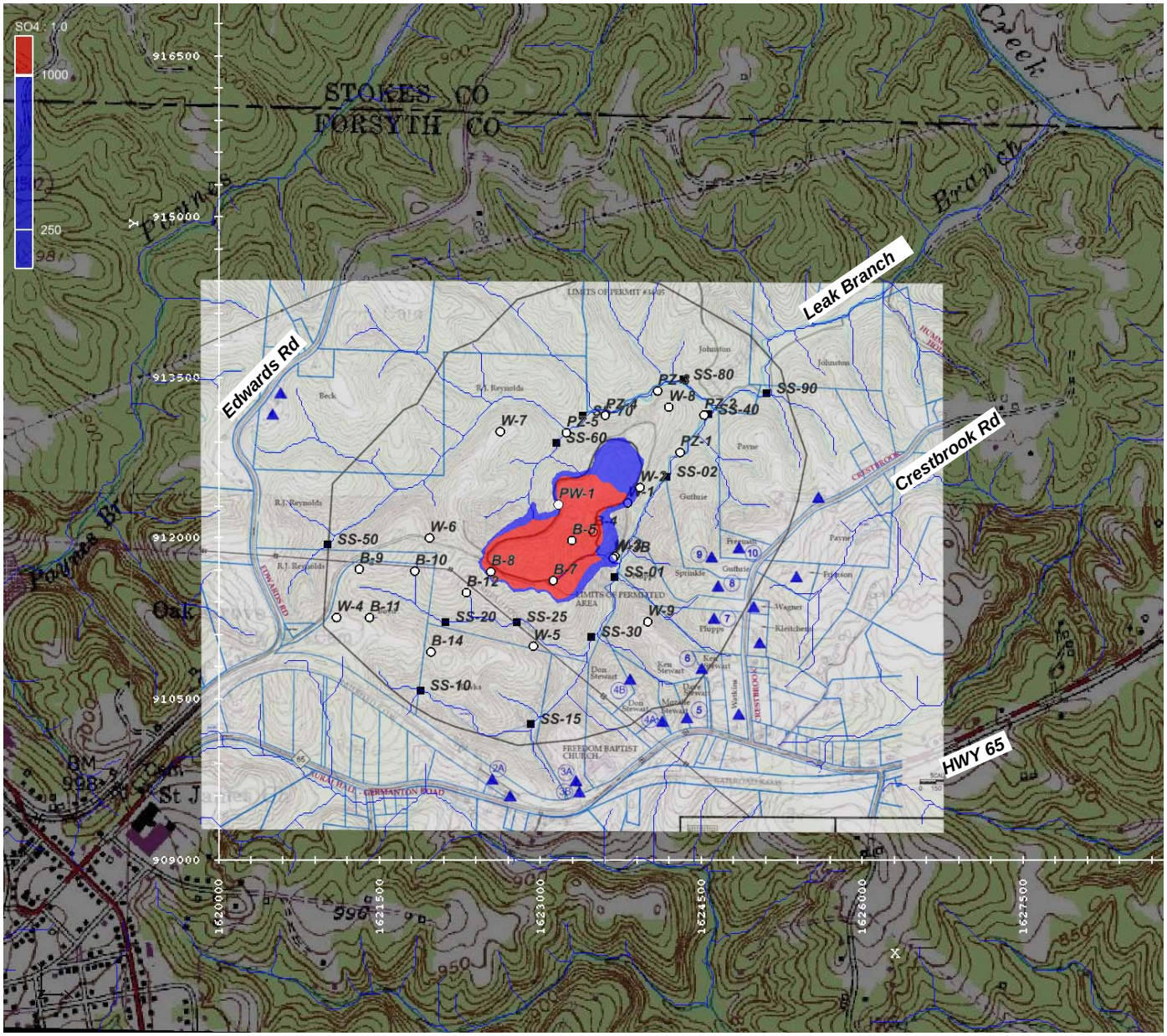
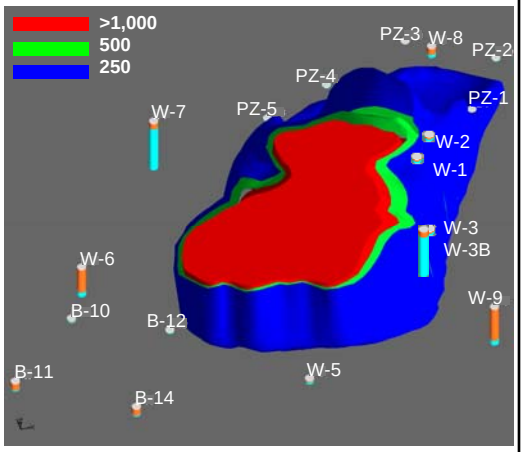


Legend

- Landfill boundary
- Monitoring wells
- Modeled streams
- Off-site residential wells
- Stream sampling locations
- Modeled concentration, mg/L
- >1,000
- 250 - 999

Modeled 3-D Concentration Isosurfaces, mg/L



Scale: 1" = 1,500'

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Modeled Current Distribution of Sulfate
Ash Landfill - R.J. Reynolds Tobacco Company
Rural Hall, North Carolina

Figure 7

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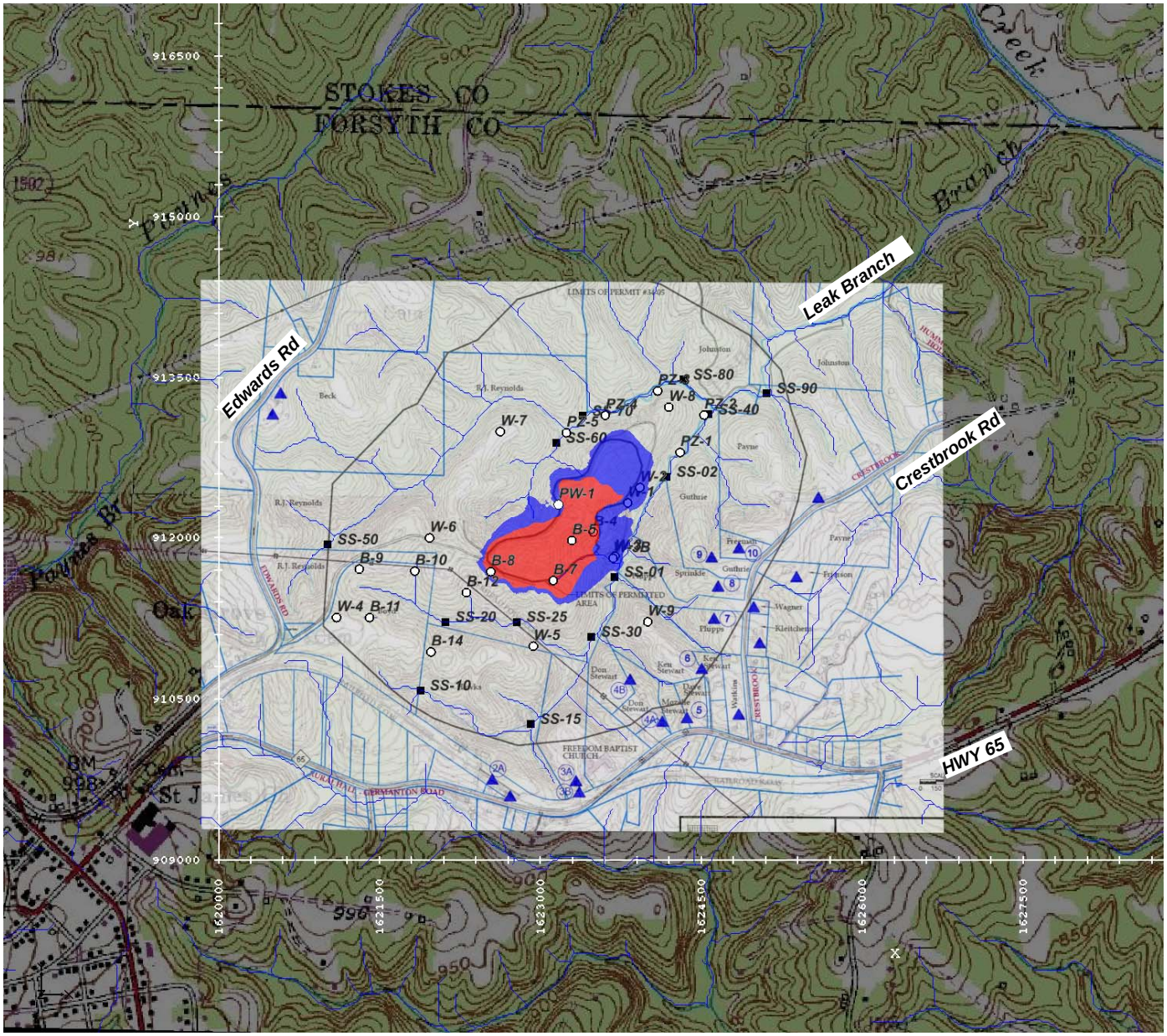


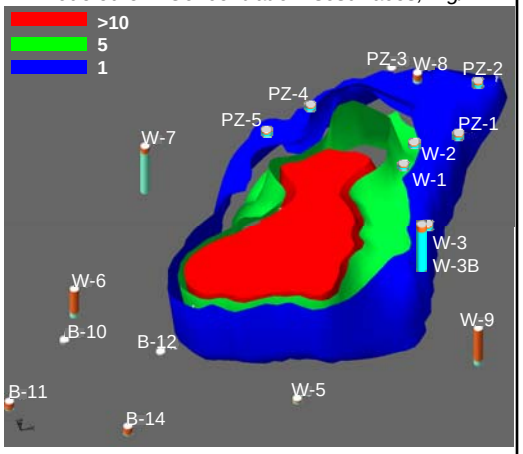
Legend

- Landfill boundary
- Monitoring wells
- Modeled streams
- Off-site residential wells
- Stream sampling locations
- Modeled concentration, mg/L
- >10
- 1 - 9.9

Notes:

A) Background iron concentrations are greater than 0.3 mg/L (NC 2L Standard).

Modeled 3-D Concentration Isosurfaces, mg/L



Scale: 1" = 1,500'

NAD 83 NC State Plane Coordinate System in feet

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Modeled Current Distribution of Dissolved Iron
Ash Landfill - R.J. Reynolds Tobacco Company
Rural Hall, North Carolina

Figure 8

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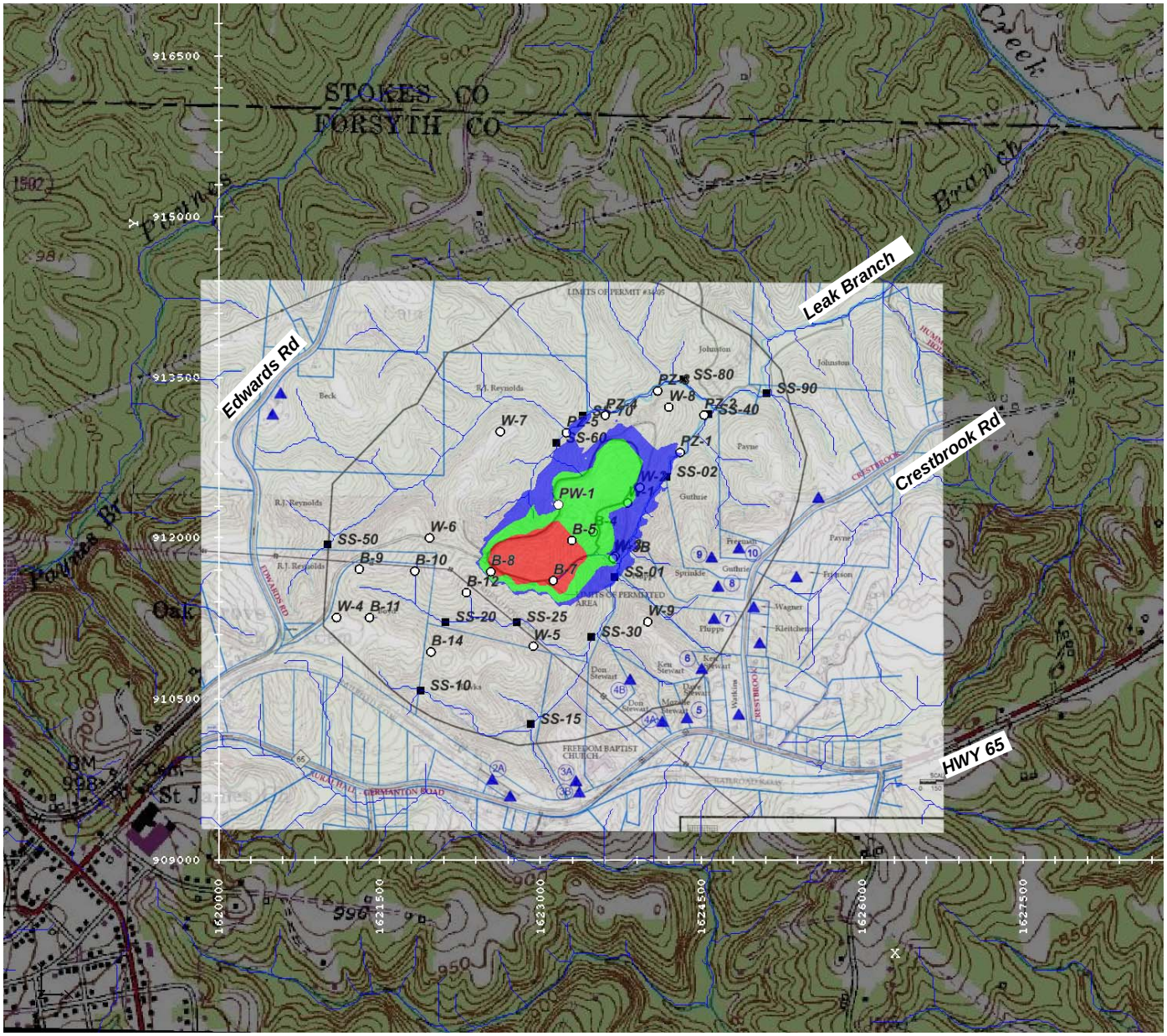


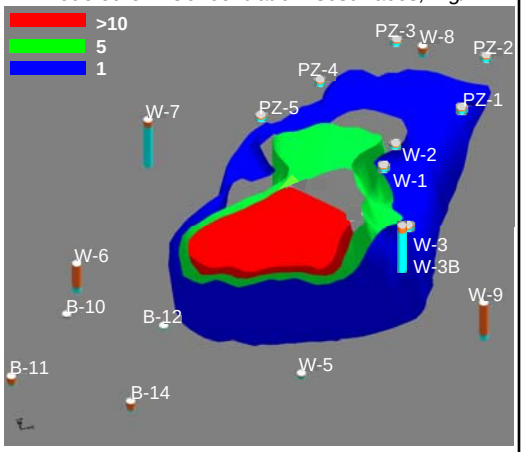
Legend

- Landfill boundary
- Monitoring wells
- Modeled streams
- Off-site residential wells
- Stream sampling locations
- Modeled concentration, mg/L
  - >10
  - 1 - 9.9
  - 0.1 - 0.99

Notes:

A) Background manganese concentrations are greater than 0.05 mg/L (NC 2L Standard).

Modeled 3-D Concentration Isosurfaces, mg/L



Scale: 1" = 1,500'

NAD 83 NC State Plane Coordinate System in feet

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Modeled Current Distribution of Manganese
Ash Landfill - R.J. Reynolds Tobacco Company
Rural Hall, North Carolina

Figure 9

0149451.02-02/0142012-HYH-M:RJ Reynolds/GMSmodel.ppt

TABLES

TABLE 1
MONITOR WELL CONSTRUCTION DETAILS
ASH LANDFILL - PERMIT 34-05
RURAL HALL, NORTH CAROLINA

Monitor Well	Installation Date	Northing	Easting	Ground Elevation (ft MSL)	TOC Elevation (ft MSL)	Boring Depth (ft BGL)	Outer Casing Depth (ft BGL)	Screened Interval (ft BGL)	Geologic Zone Screened	Comments
PW-1	5/26/87	912314.4964	1623168.8166	920.51	920.66	405 (soft bottom at 326)	21.5	21.5-405	Bedrock	Former supply well, pump removed (8/09): 6 inch dia. galv. casing; Construction details per Clayton Well Drilling log and video inspection by ERM (8/09 & 4/10); Open rock to 405 ft, Total well yield 25 gpm with no other obvious water-bearing zones below 103 ft (Clayton). Silted in to 326 ft (video).
W-1	10/13/87	912330.4235	1623815.4903	819.69	822.68	20.5	NA	10-20	Saprolite	2 inch dia. PVC, Well replaced 11/93, DWM permit-required sample location
W-2	12/6/89	912472.7625	1623927.6441	824.21	827.30	17	NA	7-17	Sap/PWR	2 inch dia. PVC, DWM permit-required sample location, (alternate IDs MW-1A, RH-MW-002)
W-3	12/7/89	911826.4895	1623693.8609	802.00	804.43	17	NA	7-17	Sap/PWR	2 inch dia. PVC, DWM permit-required sample location, (alternate IDs W-3A, W-2A, RH-MW-003)
W-3B	5/14/04	911806.8916	1623678.0188	801.23	804.53	210	Unknown	190-210	Bedrock	2 inch dia. PVC, DWM permit-required sample location, Artesian well
W-4	6/8/93	NE	NE	NE	NE	188	NA	138-188	Bedrock	2 inch dia. PVC, damaged, *abandoned 8/27/03, former background well, replaced with W-6 in 2003.*
W-5	5/17/93	NE	NE	NE	NE	24	NA	13-23.5	Bedrock	2 inch dia PVC, Phase 3 permanent MW
W-6	8/22/03	911995.8163	1621967.2266	977.93	980.71	200	NA	170-200	Bedrock	2 inch dia. PVC, DWM permit-required sample location, (alternate IDs MW-6), current background well, replaced W-4 as background well in 2003
W-7	12/15/10	912994.6847	1622626.2276	929.51	931.58	341	NA	42-341	Bedrock	6 inch dia. open-rock hole, 6" galavanized casing to 42 ft bgs, TOC value for 6" casing
W-8	12/14/10	913222.6284	1624196.9546	859.39	861.67	129	NA	45-65	PWR	2 inch dia. PVC
W-9	12/13/10	911216.1086	1624000.7073	909.35	911.38	259	NA	229-259	Bedrock	2 inch dia. PVC, Ken Stewart's pasture,
B-9	5/20/93	NE	NE	NE	NE	23	NA	18-22.5	Saprolite	2 inch dia PVC, Phase 3 temporary piezometer, no protective well box around well
B-10	5/19/93	NE	NE	NE	NE	14	NA	9-13.5	Saprolite	2 inch dia PVC, Phase 3 temporary piezometer, *not located October 2009*
B-11	5/20/93	NE	NE	NE	NE	54	NA	48-53	Saprolite	2 inch dia PVC, Phase 3 temporary piezometer, no protective well box around well
B-12	5/19/93	NE	NE	NE	NE	8.5	NA	3.5-8	Saprolite	2 inch dia PVC, Phase 3 temporary piezometer, no protective well box around well
B-14	5/20/93	NE	NE	NE	NE	54	NA	48-53	Saprolite	2 inch dia PVC, Phase 3 temporary piezometer, no protective well box around well
PZ-1	12/15/10	NE	NE	NE	NE	1.5	NA	1.0 - 1.5	Alluvium	1 inch dia PVC temporary piezometer
PZ-2	12/15/10	NE	NE	NE	NE	4.0	NA	3.0 - 4.0	Alluvium	1 inch dia PVC temporary piezometer
PZ-3	12/15/10	NE	NE	NE	NE	1.5	NA	0.5 - 1.5	Alluvium	1 inch dia PVC temporary piezometer
PZ-4	12/16/10	NE	NE	NE	NE	5.0	NA	4.2 - 5.0	Alluvium	1 inch dia PVC temporary piezometer
PZ-5	12/16/10	NE	NE	NE	NE	5.0	NA	3.0 - 5.0	Alluvium	1 inch dia PVC temporary piezometer

NE - Not Established
MSL - above mean sea level
BGL - Below ground level
TOC - Top of casing
PWR = Partially Weathered Rock
Survey data by Lawrence Associates, P.A., January 4, 2010, January 4, 2011 & February 28, 2011

TABLE 2
GROUND WATER ELEVATIONS
ASH LANDFILL - PERMIT 34-05
RURAL HALL, NORTH CAROLINA

Gauging Date	Depth ft BTOC	Elevation ft MSL	Depth ft BTOC	Elevation ft MSL	Depth ft BTOC	Elevation ft MSL	Depth ft BTOC	Elevation ft MSL	Depth ft BTOC	Elevation ft MSL	Depth ft BTOC	Elevation ft MSL	Depth ft BTOC	Elevation ft MSL	Depth ft BTOC	Elevation ft MSL
Well Identification	**PW-1**		**W-1**		**W-2**		**W-3**		**W-3B**		**W-5**		**W-6**		**W-7**	
TOC Elevation:	920.66		822.68		827.30		804.43		804.53		Not Established		980.71		931.58	
Screened Interval (Ft BGL)	21.5-405 (Open hole)		10-20		7-17		7-17		190-210		13-23.5		170-200		42-341 (Open hole)	
Geologic Zone Screened	Bedrock		Saprolite		Saprolite/PWR		Saprolite/PWR		Bedrock		Bedrock		Bedrock		Bedrock	
At Installation	NA	--	13.5	809.18	11	816.30	14	790.43	Artesian	> 804.53	6	--	50	930.71	240	691.58
Historical Data Not Presented	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
19-Oct-2006	--	--	11.59	811.09	13.32	813.98	7.54	796.89	Artesian	> 804.53	--	--	99.00	881.71	--	--
27-Apr-2007	--	--	10.88	811.80	13.96	813.34	6.98	797.45	Artesian	> 804.53	--	--	94.48	886.23	--	--
19-Nov-2007	--	--	13.29	809.39	16.08	811.22	7.78	796.65	Artesian	> 804.53	--	--	105.00	875.71	--	--
30-Apr-2008	--	--	12.84	809.84	14.68	812.62	7.04	797.39	Artesian	> 804.53	--	--	99.29	881.42	--	--
30-Apr-2009	--	--	13.23	809.45	15.18	812.12	7.12	797.31	Artesian	> 804.53	--	--	98.28	882.43	--	--
12-Oct-2009	72.00	848.66	14.53	808.15	17.50	809.80	7.63	796.80	[1] -1.22	805.75	10.08	--	99.64	881.07	--	--
19-Apr-2010	67.00	853.66	10.75	811.93	14.16	813.14	6.37	798.06	[1] -1.05	805.58	8.38	--	98.29	882.42	--	--
11-Oct-2010	--	--	12.04	810.64	15.85	811.45	6.99	797.44	[1] -0.89	805.42	9.73	--	98.93	881.78	--	--
5-Jan-2011	--	--	11.97	810.71	13.53	813.77	6.88	797.55	[1] -0.98	805.51	9.67	--	98.92	881.79	94.73	836.85
28-Feb-2011	65.30	855.36	11.66	811.02	14.57	812.73	6.65	797.78	[1] -1.37	805.90	9.50	--	99.01	881.70	94.59	836.99
20-Apr-2011	64.75	855.91	10.92	811.76	14.05	813.25	6.25	798.18	[1] -1.63	806.16	7.85	--	98.42	882.29	94.20	837.38
17-Oct-2011	--	--	12.55	810.13	15.18	812.12	7.24	797.19	[1] -1.36	805.89	--	--	99.41	881.30	--	--
6-Feb-2012	64.96	855.70	11.97	810.71	13.52	813.78	6.52	797.91	Artesian	> 804.53	--	--	99.22	881.49	94.71	836.87

TABLE 2
GROUND WATER ELEVATIONS
ASH LANDFILL - PERMIT 34-05
RURAL HALL, NORTH CAROLINA

Gauging Date	Depth ft BTOC	Elevation ft MSL	Depth ft BTOC	Elevation ft MSL	Depth ft BTOC	Elevation ft MSL	Depth ft BTOC	Elevation ft MSL	Depth ft BTOC	Elevation ft MSL	Depth ft BTOC	Elevation ft MSL	Depth ft BTOC	Elevation ft MSL	Depth ft BTOC	Elevation ft MSL
Well Identification	**W-8**		**W-9**		**B-9**		**B-10**		**B-11**		**B-12**		**B-14**		**Leak Creek Stream**	
TOC Elevation:	861.67		911.38		Not Established		Not Established		Not Established		Not Established		Not Established		787.16	
Screened Interval (Ft BGL)	45-65		229-259		18-22.5		9-13.5		48-53		3.5-8		48-53		Not Applicable	
Geologic Zone Screened	PWR		Bedrock		Bedrock		Saprolite		Saprolite		Saprolite		Saprolite		Stream Elevation	
At Installation	16.8	--	11.2	--	16.8	--	11.2	--	NA	--	6.4	--	NA	--	Iron rod installed in	
Historical Data Not Presented	--	--	--	--	--	--	--	--	--	--	--	--	--	--	stream bed 2/28/11	
19-Oct-2006	--	--	--	--	--	--	--	--	--	--	--	--	--	--	immediately east of	
27-Apr-2007	--	--	--	--	--	--	--	--	--	--	--	--	--	--	wells W-3 & W-3B. TOC	
19-Nov-2007	--	--	--	--	--	--	--	--	--	--	--	--	--	--	elevation represents top	
30-Apr-2008	--	--	--	--	--	--	--	--	--	--	--	--	--	--	of iron rod.	
30-Apr-2009	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
12-Oct-2009	--	--	--	--	20.40	--	Not located	--	--	--	10.26	--	--	--	--	--
19-Apr-2010	--	--	--	--	18.78	--	Not located	--	--	--	6.18	--	--	--	--	--
11-Oct-2010	--	--	--	--	21.63	--	Not located	--	--	--	9.40	--	--	--	--	--
5-Jan-2011	52.67	809.00	110.47	800.91	22.05	--	Not located	--	--	--	9.05	--	--	--	--	--
28-Feb-2011	53.45	808.22	112.03	799.35	22.63	--	Not located	--	--	--	--	--	--	--	1.50	785.66
20-Apr-2011	53.54	808.13	110.03	801.35	21.45	--	Not located	--	--	--	5.46	--	--	--	--	--
17-Oct-2011	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
6-Feb-2012	54.74	806.93	109.84	801.54	--	--	--	--	--	--	--	--	--	--	--	--

NE - Not Established
MSL - above mean sea level
BTOC = Below Top of Casing
PWR = Partially Weathered Rock
BGL - Below ground level
[1] - Artesian condition, Value represents water level above permanent TOC. Measured via temporary standpipe installed on permanent casing.

TABLE 3
WATER SUPPLY WELLS WITHIN 1,500 FEET
ASH LANDFILL - PERMIT 34-05
RURAL HALL, NORTH CAROLINA

MAP ID#	PARCEL ID#	PROPERTY OWNER	SITE OCCUPANT AND ADDRESS	WELL IN SERVICE?	DISTANCE/ DIRECTION / GRADIENT FROM LIMIT OF PERMIT NO. 34-05 LANDFILL (FEET)			CONSTRUCTION DETAILS / COMMENTS
1	6921-22-4389	R.J. Reynolds Tobacco 401 North Main St. Winston-Salem, NC 27101 *(as of 11/2010)*	***SUBJECT PROPERTY*** Edwards Road	No as of May 2009. Previously used for vehicle wash-down	70	W	Side	PW-1, 6" dia., pump removed 8/09. Per downhole video (8/09 & 4/10) 6" galv. casing to 21.5 ft, depth to rock estimated at 17 ft based on casing depth; total well depth = 405 ft (per Clayton Drilling), DTW = 72 ft, minor water-bearing fracture @ 42 ft, open fracture zone 102-103 ft, Total well yield 25 gpm with no other obvious water-bearing zones below 103 ft (Clayton). Silted in to 326 ft (video).
2A	6921-20-5455	Grady & Mary Hawks 810 Sixty Five Hwy, P.O. Box 651 Rural Hall, NC 27045	Grady & Mary Hawks 810 Sixty Five Hwy Phone: 336-969-6174	Yes serves Hawks' residence & florist shop	1,890	S-SW	Up	6" dia., total depth = 200 ft (est.), casing to 80 ft (est.), installed late 1970s; no pre-treatement system on well well located near florist's parcel (PIN # 6920-29-5624) well located near NWC of florist bldg
2B	6920-29-5624	Susan Gordon 840 Sixty Five Hwy, P.O. Box 651 Rural Hall, NC 27045	Hawks Florist 840 Sixty Five Hwy Phone: 336-969-6551	No previously served former trailer & florist's garden	2,035	S-SW	Up	6" dia., construction details unknown no pre-treatement system on well well located at SEC of florist's parcel near telephone pole
3A	6921-30-2220	Freedom Baptist Church 214 Dunleith Ave Winston-Salem, NC 27101 Phone: 336-969-6937	Freedom Baptist Church 1000 Sixty Five Hwy Contact: Jerry Beeson	Yes located in well house	1,860	S	Up	3A - 6" dia., construction details unknown
3B	6921-30-2220			Yes located in yard, 115 feet south of well house	1,975	S	Up	3B - 6" dia., total depth = 605 ft, casing to 61 ft, yield = 15 gpm, installed 1990, Wells 3A & 3B manifolded together then H2O routed thru softener & iron removal unit (sodium hydroxide) prior to delivery to church
4A	6921-40-1108 (residence)	Don Stewart 1160 Sixty Five Hwy Rural Hall, NC 27045 Phone: 336-969-6362	Same	Yes All water for house, except drinking/cooking (bottled for drinking/cooking)	1,670	SE	Up	4A - 6" dia., total depth 200 ft (est.), installed 1978 no pre-treatement system on well
4B	6921-30-9647 (at barn)			Yes Livestock, at barn	1,110	SE	Up	4B - 6" dia., total depth 425 ft, casing depth = 40 ft; yield = 3 gpm, installed 2004; no pre-treatement system on well
5	6921-40-2442	Mozelle Stewart 1180 Sixty Five Hwy Rural Hall, NC 27045 Phone: 336-969-5382	Same	Yes	1,700	SE	Up	6" dia., total depth = 185 ft, casing depth - unknown, installed 1970s, no pre-treatment system on well
6	6921-40-6606	Ken Stewart 1234 Sixty Five Hwy Rural Hall, NC 27045 Phone: 336-650-2408 (cell)	Same	Yes	1,450	SE	Up	6" dia., total depth = 285 ft, casing depth = 40 ft (est), installed 1985, Sediment filter for pre-treatment yield = 20 gpm

TABLE 3
WATER SUPPLY WELLS WITHIN 1,500 FEET
ASH LANDFILL - PERMIT 34-05
RURAL HALL, NORTH CAROLINA

MAP ID#	PARCEL ID#	PROPERTY OWNER	SITE OCCUPANT AND ADDRESS	WELL IN SERVICE?	DISTANCE/ DIRECTION / GRADIENT FROM LIMIT OF PERMIT NO. 34-05 LANDFILL (FEET)			CONSTRUCTION DETAILS / COMMENTS
7	6921-41-5108	Mack Phipps 8320 Crestbrook Rd Rural Hall, NC 27045 Phone: H: 336-969-5382, C: 336-978-2683	Same	Yes	1,210	SE	Up	6" dia., total depth = 358 ft, casing depth = unknown installed 1985, no pre-treatement system on well yield = 2.5 gpm
8	6921-41-4516	Michael & Susan Sprinkle 8390 Crestbrook Rd Rural Hall, NC 27045 Phone: 336-969-4440	Same	Yes	1,170	E	Side	6" dia., total depth = 405 ft, casing depth = 68 ft per tag installed 1988, no pre-treatement system on well yield = 7 gpm
9	6921-42-6412	Jack Guthrie 5340 Seward Cir Pfafftown, NC 27040 Phone: H: 336-924-5857, W: 336-716-4747, C:	Mildred Nunn 8420 Crestbrook Dr	Yes	1,090	E	Side	6" dia., total depth = >200 ft, casing depth = unknown sediment filter on well, no other pre-treatement system Ms. Nunn is Jack Guthrie's mother
10	6921-41-8950	Joshua & Tasha Freeman 8450 Crestbrooks Rd Rural Hall, NC 27045 Phone: 336-969-5369	Same	Yes	1,140	E	Side	6" dia., total depth = 705 ft, casing depth = 95 ft yield = 5 gpm, pump set at 300 ft, installed May 2005; Static water level = 180 ft; well info per tag on well head

TABLE 4
WATER SUPPLY WELL SAMPLING RESULTS
ASH LANDFILL - PERMIT 34-05
RURAL HALL, NORTH CAROLINA

Map ID	Owner	Water Supply Well Location	Distance/ Direction/ Gradient From Limit of Permit No. 34-05 Landfill (Feet)			Well Use	Sample Date	METALS by EPA METHOD 200.8 (mg/l)							SULFATES by EPA METHOD 300 (mg/l)	FIELD PARAMETERS[1]					
								Iron	Manganese	Selenium	Barium	Cadmium	Chromium (total)	Lead		pH (Standard Units)	Conductivity (mS/cm)	Dissolved Oxygen (mg/l)	Oxidation-Reduction Potential (millivolts)	Turbidity (NTUs)	Temperature (degrees Celsius)
							NC GROUND WATER STANDARD (2L)	0.300	0.050	0.020	0.700	0.002	0.010	0.015	250	6.5-8.5	NE	NE	NE	NE	NE
							EPA MAXIMUM CONTAMINANT LEVEL (MCL)	0.300 [2]	0.050 [2]	0.050	2.0	0.005	0.100	0.015	250 [2]	6.5-8.5 [2]	NE	NE	NE	NE	NE
							EPA TAPWATER SCREENING LEVEL [3]	26.0	0.880	0.180	7.30	0.018	NE	NE	NE	NE	NE	NE	NE	NE	NE
2A	Hawks	810 Sixty Five Hwy	1,890	S-SW	Up	Potable	7/21/09	<0.050	0.0052	<0.001	0.041	<0.001	<0.001	0.0014	4.3	7.5	0.334	0.00	87	7.1	16.8
2A	Hawks	810 Sixty Five Hwy	1,890	S-SW	Up	Potable	6/22/11	<0.040	0.0025	<0.001	0.0399	<0.0001	<0.001	0.0014	5.1	7.9	0.240	0.69	13.3	0.0	21.1
3A	Freedom Church	1000 Sixty Five Hwy	1,860	S	Up	Potable	7/20/09	<0.050	<0.005	<0.001	0.200	<0.001	0.0013	0.0040	4.0	5.6	1.15	3.62	186	16.9	16.9
3A	Freedom Church	1000 Sixty Five Hwy	1,860	S	Up	Potable	6/22/11	<0.040	0.0014	<0.001	0.0797	<0.0001	0.0013	0.0020	<5.0	6.1	0.142	5.15	140	0.0	22.0
3B	Freedom Church	1000 Sixty Five Hwy	1,975	S	Up	Potable	7/20/09	<0.050	<0.005	<0.001	0.086	<0.001	0.0012	0.0055	1.3	5.7	1.36	5.53	240	16.5	17.8
3B	Freedom Church	1000 Sixty Five Hwy	1,975	S	Up	Potable	6/22/11	<0.040	0.0017	<0.001	0.0829	<0.0001	0.0022	0.0023	<5.0	6.1	0.140	5.34	137	0.0	22.0
4A	Don Stewart	1160 Sixty Five Hwy	1,670	SE	Up	Potable	7/20/09	<0.050	<0.005	<0.001	0.150	<0.001	0.0013	**0.028**	<1.0	5.7	1.62	7.38	218	0.8	16.7
4A	Don Stewart	1160 Sixty Five Hwy	1,670	SE	Up	Potable	8/3/09	*Resampled well for lead - from spigot upstream of pressure tank after 20 mins*						**0.039**	--	6.0	0.17	7.61	255	58.0	17.8
4A	Don Stewart	1160 Sixty Five Hwy	1,670	SE	Up	Potable	8/3/09	--	*"First Draw" from back spigot for lead only* [4]				--	<0.005 [4]	--	--	--	--	--	--	--
4A	Don Stewart	1160 Sixty Five Hwy	1,670	SE	Up	Potable	8/3/09	**1.24**	<0.030	*From back spigot after 20 mins* [4]			--	**0.019** [4]	--	6.0	--	--	--	--	--
4A	Don Stewart	1160 Sixty Five Hwy	1,670	SE	Up	Potable	9/16/09	--	--	*From kitchen sink "first draw"* [4]			--	<0.005 [4]	--	--	--	--	--	--	--
4A	Don Stewart	1160 Sixty Five Hwy	1,670	SE	Up	Potable	9/16/09	--	--	*From kitchen sink after 5 mins* [4]			--	<0.005 [4]	--	--	--	--	--	--	--
4A	Don Stewart	1160 Sixty Five Hwy	1,670	SE	Up	Potable	9/16/09	--	--	*From kitchen sink after 15 mins* [4]			--	<0.005 [4]	--	--	--	--	--	--	--
4A	Don Stewart	1160 Sixty Five Hwy	1,670	SE	Up	Potable	6/23/11	<0.040	<0.001	<0.001	0.151	<0.0001	0.0018	0.0023	<5.0	6.0	0.14	7.03	174	0.0	22.3
4B	Don Stewart	1160 Sixty Five Hwy	1,110	SE	Up	Livestock	7/20/09	<0.050	<0.005	<0.001	0.039	<0.001	<0.001	<0.001	10	7.0	0.90	1.84	38	4.4	15.5
4B	Don Stewart	1160 Sixty Five Hwy	1,110	SE	Up	Livestock	6/23/11	0.126	**0.226**	<0.001	0.034	<0.0001	<0.001	0.003	52.8	7.9	0.34	0.19	-23	0.91	18.8
4B	Don Stewart	1160 Sixty Five Hwy	1,110	SE	Up	Livestock	8/2/11	**0.310**	**0.270**	<0.001	0.033	<0.0001	0.001	0.0058	60.6	8.6	0.34	2.32	-121	7.8	17.9
4B	Don Stewart	1160 Sixty Five Hwy	1,110	SE	Up	Livestock	10/18/11	**0.904**	**0.340**	<0.001	0.038	<0.0001	<0.001	0.0031	64.5	9.4	0.40	1.76	-82	10.3	19.4
4B	Don Stewart	1160 Sixty Five Hwy	1,110	SE	Up	Livestock	1/12/12	**0.520**	**0.460**	<0.001	0.032	<0.0001	0.001	**0.019**	66.4	7.1	0.37	4.96	205	5.0	13.2
5	Mozelle Stewart	1180 Sixty Five Hwy	1,700	SE	Up	Potable	7/20/09	0.110	<0.005	<0.001	0.170	<0.001	0.0017	<0.001	<1.0	5.8	3.35	5.93	189	4.9	16.1
5	Mozelle Stewart	1180 Sixty Five Hwy	1,700	SE	Up	Potable	6/23/11	<0.040	<0.005	<0.001	0.168	<0.0001	0.0021	<0.001	<5.0	6.2	0.18	6.21	179	0.0	17.2
6	Ken Stewart	1234 Sixty Five Hwy	1,450	SE	Up	Potable	7/20/09	<0.050	<0.005	<0.001	0.085	<0.001	0.0013	0.0013	1.2	6.5	1.46	4.95	214	2.1	15.3
6	Ken Stewart	1234 Sixty Five Hwy	1,450	SE	Up	Potable	6/23/11	<0.040	0.0016	<0.001	0.0825	<0.0001	0.0021	0.0016	<5.0	6.9	0.15	5.78	142	0.0	17.6

TABLE 4
WATER SUPPLY WELL SAMPLING RESULTS
ASH LANDFILL - PERMIT 34-05
RURAL HALL, NORTH CAROLINA

Map ID	Owner	Water Supply Well Location	Distance/ Direction/ Gradient From Limit of Permit No. 34-05 Landfill (Feet)			Well Use	Sample Date	METALS by EPA METHOD 200.8 (mg/l)							SULFATES by EPA METHOD 300 (mg/l)	FIELD PARAMETERS[1]					
								Iron	Manganese	Selenium	Barium	Cadmium	Chromium (total)	Lead		pH (Standard Units)	Conductivity (mS/cm)	Dissolved Oxygen (mg/l)	Oxidation-Reduction Potential (millivolts)	Turbidity (NTUs)	Temperature (degrees Celsius)
7	Phipps	8320 Crestbrook	1,210	SE	Up	Potable	7/20/09	<0.050	<0.005	<0.001	0.039	<0.001	<0.001	<0.001	7.1	7.3	0.99	3.50	191	6.1	15.6
7	Phipps	8320 Crestbrook	1,210	SE	Up	Potable	6/23/11	<0.040	0.0013	<0.001	0.0646	<0.0001	<0.001	0.0059	6.4	6.7	0.21	4.40	146	0.1	15.9
8	Sprinkle	8390 Crestbrook	1,170	E	Side	Potable	7/28/09	<0.050	<0.005	<0.001	0.099	<0.001	<0.001	**0.030**	2.5	5.1	0.12	meter error	376	4.9	15.8
8	Sprinkle	8390 Crestbrook	1,170	E	Side	Potable	8/3/09	*Resampled at well head for lead*			--	--	--	0.0011	--	6.0	0.147	7.22	329	1.0	17.2
8	Sprinkle	8390 Crestbrook	1,170	E	Side	Potable	8/3/09	*"First draw" sample from spigot at south side of house*					--	0.011	--	--	--	--	--	--	--
8	Sprinkle	8390 Crestbrook	1,170	E	Side	Potable	8/3/09	--	*"First Draw" from back spigot for lead only* [4]				--	0.006[4]	--	--	--	--	--	--	--
8	Sprinkle	8390 Crestbrook	1,170	E	Side	Potable	8/3/09	--	*First Draw at well head for lead or*			--	--	<0.005[4]	--	--	--	--	--	--	--
8	Sprinkle	8390 Crestbrook	1,170	E	Side	Potable	8/3/09	<0.100	<0.030	*From welll head after 35 mins* [4]			--	<0.005[4]	--	6.1	--	--	--	--	--
8	Sprinkle	8390 Crestbrook	1,170	E	Side	Potable	6/22/11	<0.040	<0.001	<0.001	0.103	<0.0001	<0.001	0.0012	<5.0	6.2	0.11	7.11	133	0.0	20.6
9	Guthrie	8420 Crestbrook	1,090	E	Side	Potable	7/20/09	<0.050	<0.005	<0.001	0.095	<0.001	<0.001	<0.001	6.4	6.4	0.90	5.44	235	9.1	16.5
9	Guthrie	8420 Crestbrook	1,090	E	Side	Potable	6/23/11	<0.040	0.0016	<0.001	0.0841	<0.0001	0.0013	0.0013	<5.0	6.2	0.165	5.31	175	0.0	24.2
10	Freeman	8450 Crestbrook	1,140	E	Side	Potable	7/21/09	<0.050	<0.005	<0.001	0.046	<0.001	<0.001	<0.001	1.9	5.9	0.90	6.09	236	35.6	15.5
10	Freeman	8450 Crestbrook	1,140	E	Side	Potable	6/22/11	0.132	0.0036	<0.001	0.0498	<0.0001	0.0016	<0.001	<5.0	6.3	0.119	5.89	118	1.3	21.0

mg/l = Milligrams per Liter
NE = Not established
< = Less than presented laboratory reporting limit (not detected)

Bold indicates concentration exceeds applicable NC Ground Water Standard

[1] - Field parameters measured via Horiba U-22 water quality meter
[2] - No primary MCL established, EPA secondary standard presented

[3] - EPA "Regional Screening Levels for Chemical Contaminants at Superfund Sites" for Tapwater (June 2011).
[4] - Sample collected and analyzed by Forsyth County Health Dept.

Table 5
Groundwater Flow and Fate and Transport Model Input Parameters
Ash Landfill - Permit #34-05
Rural Hall, NC

Input Parameter	Layer 1	Layer 2	Layer 3	Units	Note
Anisotropy orientation	60	60	60	N degrees E	Observation
Anisotropy ratio, horizontal	2	2	2	dimensionless	Model calibration
Anisotropy ratio, vertical	1	1	1	dimensionless	Model calibration
Dispersivity, lateral	10	10	10	ft	modified Xu and Eckstein, 1995
Dispersivity, longitudinal	1	1	1	ft	Fetter, 1994
Hydraulic conductivity, horizontal	0.008	0.08	0.08	ft/d	Model calibration
Layer base elevation	700	600	500	ft, amsl	Assumed
Porosity	0.02	0.02	0.02	dimensionless	Fetter, 1994
Recharge rate, equivalent	0.0018			ft/d	Derived from USGS stream flow rate online
Source concentration, Fe	2~28			mg/L	Model calibration
Source concentration, Mn	1.2~15			mg/L	Model calibration
Source concentration, SO4	350~4,600			mg/L	Model calibration
Specific storage	0.00001	0.00001	0.00001	1/ft	Fetter, 1994
Water level along boundaries	varies	varies	varies	ft, amsl	USGS

Private Well Pumping Rate

2A (Hawks)	2			gpm	Model calibration
2B (Hawks - inactive)	2			gpm	Model calibration
3A (Freedom Church)	2			gpm	Model calibration
3B (Freedom Church)	13			gpm	Model calibration
4A (D. Stewart - Residence)	2			gpm	Model calibration
4B (D. Stewart - Livestock)	4			gpm	Model calibration
5 (M. Stewart)	2			gpm	Model calibration
6 (K. Stewart)	16			gpm	Model calibration
7 (Phipps)	7			gpm	Model calibration
8 (Sprinkle)	2			gpm	Model calibration
9 (Guthrie)	2			gpm	Model calibration
10 (Freeman)	2			gpm	Model calibration
Beck A	2			gpm	Model calibration
Beck B	2			gpm	Model calibration
Frierson	2			gpm	Model calibration
Kleitchens	2			gpm	Model calibration
Payne	2			gpm	Model calibration
PW-1	6			gpm	ERM, 2011
Wagner	2			gpm	Model calibration
Watkins	2			gpm	Model calibration

Regional Model (additional)

Aquifer transmissivity	60			ft^2/d	Model calibration

Table 6

Groundwater Flow Model Calibration Results

Ash Landfill - Permit #34-05

Rural Hall, NC

Well	Groundwater Level		Residual	Relative Residual	Criteria
	Observed	Modeled			
Units	ft, amsl	ft, amsl	ft	%	%
B-9	944	943	-2		
B-12	910	912	1		
W-6	882	899	17		
W-5	872	871	0		
PW-1	856	840	-16		
W-7	837	845	8		
W-2	815	801	-14		
W-1	812	807	-4		
W-8	808	788	-20		
W-3B	806	800	-6		
W-9	801	811	9		
W-3	798	804	6		
Maximum	944				
Minimum	798				
Difference	146				
Average			***-2***	***1.2%***	***< 2 %***
Standard Deviation			***11***	***7.5%***	***<10 %***

Table 7
Fate and Transport Model Calibration Results
Ash Landfill - Permit #34-05
Rural Hall, NC

Location	Matrix	COCs	Observed Concentration	Modeled Concentration
Units			**mg/L**	**mg/L**
SS-01	Stream water	SO4	76.3	60
SS-02	Stream water	SO4	439	433
SS-40	Stream water	SO4	300	405
SS-60	Stream water	SO4	350	302
SS-01	Stream water	Mn	0.13	0.16
SS-02	Stream water	Mn	0.53	1.40
SS-40	Stream water	Mn	0.06	1.31
SS-60	Stream water	Mn	0.98	0.96
SS-01	Stream water	Fe	1.24	0.6
SS-02	Stream water	Fe	1.06	3.1
SS-40	Stream water	Fe	0.33	3.0
SS-60	Stream water	Fe	0.28	2.3
W-1	Groundwater	SO4	1,950	1,738
W-2	Groundwater	SO4	1,570	1,462
W-3	Groundwater	SO4	360	328
W-3B	Groundwater	SO4	590	1,406
PW-1	Groundwater	SO4	1,000	1,380
W-1	Groundwater	Fe	6	7.5
W-2	Groundwater	Fe	200	10
W-3	Groundwater	Fe	0.94	1.3
W-3B	Groundwater	Fe	1.95	1.6
PW-1	Groundwater	Fe	6.8	8.4
W-1	Groundwater	Mn	5	6
W-2	Groundwater	Mn	4.02	4
W-3	Groundwater	Mn	0.124	0.65
W-3B	Groundwater	Mn	1.32	4.5
PW-1	Groundwater	Mn	3	6

APPENDIX A HISTORICAL GROUND WATER AND SURFACE WATER ANALYTICAL RESULTS

TABLE A1
GROUND WATER ANALYTICAL RESULTS SUMMARY
ASH LANDFILL - PERMIT 34-05
RURAL HALL, NORTH CAROLINA

Sample Location / ID	Date	Aluminum	Arsenic	Barium	Cadmium	Chromium (Total)	Copper	Iron	Lead	Manganese	Mercury	Selenium	Silver	Zinc	Nitrate-nitrogen	Sulfate	Dissolved Solids	Total Organic Carbon	pH	Temperature (degrees Celsius)	Conductivity (µmhos/cm)	Turbidity (NTUs)	Oxidation-Reduction Potential (mV)	Dissolved Oxygen
NC 2L Ground Water Standard		NE	0.010	0.700	0.002	0.010	1.0	0.300	0.015	0.050	0.001	0.020	0.020	1.00	10.0	250	500	NE	6.5 - 8.5	NE	NE	NE	NE	NE
Solid Waste Section Limit		NE	0.010	0.100	0.001	0.010	0.010	0.300	0.010	0.050	0.0002	0.010	0.010	0.010	10.0	250	NE	NE	NE	NE	NE	NE	NE	NE
NC 2B Surface Water Standard		0.087	0.050	1.0 [1]	0.002	0.050	0.007	1.0	0.025	0.200 [1]	0.000012	0.005	0.00006	0.05	10.0 [1]	250 [1]	500 [1]	NE	6.0 - 9.0	NE	NE	NE	NE	NE
	4/29/88	8.03	<0.010	**0.235**	**0.008**	**0.016**	<0.020	**17.4**	<0.005	**1.10**	<0.00020	<0.010	<0.010	**0.031**	2.2	130	156	2.24	5.9					
W-1	7/13/89	--	<0.010	0.100	<0.002	<0.020	--	--	<0.005	--	<0.00020	0.005	<0.010	<0.020	--	--	--	--	--	--	--	--	--	--
	9/24/90	5.62	<0.010	**0.189**	<0.002	<0.020	<0.020	**8.90**	<0.005	**0.15**	<0.00020	**0.059**	<0.010	<0.020	0.71	14	185	13	6.3	19.3	195	--	--	--
	10/24/91	0.161	<0.010	**0.346**	<0.002	<0.020	<0.020	0.15	<0.005	**0.097**	<0.00020	**0.0239**	<0.010	<0.020	0.238	126	303	12.0	6.2	20.3	425	--	--	--
(RHMW-001)	3/26/92	2.85	<0.010	**0.736**	<0.002	<0.020	<0.020	**0.83**	<0.005	**1.83**	**0.00032**	**0.0219**	<0.010	**0.038**	1.25	123	482	14.0	6.6	9.3	682	--	--	--
	9/30/92		<0.010	**0.12**	<0.002	<0.020	<0.020		<0.005	**0.31**	<0.00020	**0.0320**	<0.010	<0.020	0.382	**292**	**798**	5.0	5.9	17.8	1,153	--	--	--
	3/31/93	0.364	<0.010	**0.137**	<0.002	<0.020	<0.020	**1.13**	<0.005	**2.23**	<0.00020	**0.0132**	<0.010	**0.033**	0.550	**486**	**1,169**	33.0	5.5	16.1	1,587	--	--	--
	9/17/93	28.6	<0.010	**0.697**	**0.0038**	<0.020	**0.044**	**59.7**	**0.013**	**3.49**	<0.00020	0.0051	<0.010	**0.195**	0.925	**565**	**1,643**	6.0	5.9	18	2,310	--	--	--
well replaced 11/93	3/30/94	5.32	<0.010	**0.545**	<0.002	<0.020	**0.02**	**18.8**	0.008	**0.51**	<0.00020	0.0060	<0.010	**0.107**	0.390	**633**	**1,680**		5.6	15.2	1,250	--	--	--
	9/30/94	1.81	<0.010	<0.250	<0.002	<0.020	**0.022**	**9.96**	<0.005	**4.47**	<0.00020	**0.0130**	<0.010	**0.019**	0.450	**758**	**2,420**	123	6.0	18.1	3,010	--	--	--
	3/31/95	24	<0.010	**1.25**	<0.002	<0.020	**0.026**	**53.9**	**0.011**	**1.58**	<0.00020	**0.0120**	<0.010	**0.115**	0.850	**797**	**2,140**		5.9	15.8	2,820	--	--	--
	9/29/95	7.65	<0.010	**0.367**	**0.004**	<0.020	**0.024**	**18.8**	0.01	**4.0**	<0.00020	**0.0120**	<0.010		1.000	**464**	**2,780**	4.04	4.5	16.2	3,720	--	--	--
	3/20/96	149	<0.010	**0.96**	**0.050**	**0.200**	**0.22**	---	**0.063**	**11.4**	<0.00020	<0.010	<0.010	**0.695**	---	**2,320**	**2,670**	8.75	6.5	15	3,060	--	--	--
	9/27/96	7.11	<0.010	<0.250	<0.002	<0.020	<0.020	**22.6**	0.007	**2.30**	<0.00020	<0.010	<0.010	**0.051**	1.520	**1,320**	**2,970**	3.81	6.1	19	3,350	--	--	--
	3/29/97	2.99	<0.010	<0.250	<0.002	<0.020	<0.020	---	**0.016**	**2.34**	<0.00020	<0.010	<0.010	**0.072**	1.200	**1,360**	**2,860**	6.87	6.0	14	1,890	--	--	--
	9/17/97	2.94	<0.010	<0.250	**0.003**	<0.020	<0.020	**12.9**	0.006	**3.68**	<0.00020	**0.0330**	<0.010	**0.136**	1.700	**1,300**	**3,110**	5.29	6.3	17	3,540	--	--	--
	3/27/98	2.40	<0.010	<0.250	<0.002	<0.020	<0.020	**7.83**	<0.005	**2.34**	<0.00020	**0.0160**	<0.010	<0.020	0.575	**1,060**	**3,040**	3.64	6.5	19.6	627	--	--	--
	9/30/98	2.35	<0.010	<0.250	<0.002	<0.020	<0.020	**5.18**	**0.015**	**2.71**	<0.00020	**0.0210**	<0.010	<0.020	1.050	**1,030**	**3,210**	17.5	6.2	20	1,250	--	--	--
	9/30/98	1.25	<0.010	<0.250	<0.002	<0.020	<0.020	**4.98**	<0.005	**2.72**	<0.00020	**0.030**	<0.010	<0.020	1.10	**1,040**	**3,320**	9.25	--	--	--	--	--	--
	3/31/99	1.82	<0.010	<0.250	<0.002	<0.020	<0.020	**4.69**	0.010	**2.45**	<0.00020	**0.0150**	<0.010	<0.020	0.750	**1,830**	**3,230**	8.82	5.6	17	1,610	--	--	--
duplicate	3/31/99	1.17	<0.010	<0.250	<0.002	<0.020	<0.020	**4.20**	<0.005	**2.56**	<0.00020	**0.018**	<0.010	<0.020	0.45	**1,920**	**3,230**	3.73	--	--	--	--	--	--
	9/29/99	1.65	<0.010	<0.250	<0.002	<0.020	<0.020	**4.78**	0.008	**2.79**	<0.00020	**0.0310**	<0.010	<0.020	0.440	2.1	**3,440**	3.73	5.7	19	1,980	--	--	--
	9/15/00	0.979	<0.010	<0.250	<0.002	<0.020	<0.020	**3.20**	0.008	**2.93**	<0.00020	**0.0220**	<0.010	<0.020	0.800	**1,540**	**3,480**	13.3	5.8	18	1,040	--	--	--
	3/16/00	1.82	<0.010	<0.250	<0.002	<0.020	<0.020	**3.36**	0.006	**2.84**	<0.00020	<0.010	<0.010	**0.031**	0.402	**1,390**	**3,330**	3.93	--	--	--	--	--	--
	3/23/01	0.226	<0.010	<0.250	<0.002	<0.020	<0.020	**1.86**	0.010	**3.18**	<0.00020	<0.010	<0.010	<0.020	0.370	**1,260**	**3,320**	6.13	6.2	17	1,090	--	--	--
	10/4/01	0.728	<0.010	<0.250	**0.002**	<0.020	<0.020	**3.14**	0.009	**2.89**	<0.00020	<0.010	<0.010	**0.037**	0.430	**1,420**	**3,380**	31	8.0	21	3,300	--	--	--
	3/28/02	1.01	<0.010	<0.250	<0.002	<0.020	**0.02**	**3.60**	0.008	**3.27**	--	<0.010	<0.010	**0.048**	0.350	**1,220**	**3,310**	3.43	6.0	15	1,090	--	--	--
duplicate	3/28/02	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	**5.45**	<0.005	**3.58**	--	<0.010	<0.010	<0.020	0.35	**1,050**	**2,920**	3.43	6.0	15	1,090	--	--	--
	10/3/02	8.96	<0.010	<0.250	**0.002**	<0.020	<0.020	**14.0**	0.008	**3.91**	<0.00020	<0.010	<0.010	**0.051**	0.740	**1,330**	**3,210**	3.19	6.3	18	1,280	--	--	--
	3/25/03	1.42	<0.010	<0.250	<0.002	<0.020	<0.020	**2.77**	0.007	**3.54**	<0.00020	<0.010	<0.010	**0.025**	1.210	**1,130**	**3,310**	3.21	6.4	19	910	--	--	--
	10/2/03	0.402	<0.010	**0.414**	<0.002	<0.020	<0.020	**2.33**	0.005	**3.84**	<0.00020	<0.010	<0.010	<0.020	1.97	**1,350**	**3,470**	3.52	5.9	20	3,210	--	--	--
	4/28/04	1.44	<0.010	<0.250	<0.002	<0.020	<0.020	**6.89**	**0.012**	**3.92**	<0.00020	<0.010	<0.010	<0.020	1.130	**1,350**	**3,580**	5.13	--	15.1	3,670	--	--	--
	10/26/04	7.45	<0.010	<0.250	<0.002	<0.020	**0.021**	**20.1**	0.010	**4.80**	<0.00020	<0.010	<0.010	<0.020	0.438	**1,310**	**3,630**	3.10	--	--	3,510	--	--	--
	4/27/05	0.697	<0.010	<0.250	**0.002**	<0.020	<0.020	**3.99**	0.010	**4.08**	<0.00020	<0.010	<0.010	<0.020	0.408	**1,820**	**3,601**	3.45	--	--	3,610	--	--	--
	10/20/05	9.03	<0.010	<0.250	<0.002	<0.020	**0.283**	**18.4**	**0.015**	**3.92**	<0.00020	<0.010	<0.010	**0.104**	0.449	**790**	**3,520**	52.0	--	--	2,370	--	--	--
	10/19/06	0.214	<0.010	<0.250	<0.002	<0.020	<0.020	**0.926**	0.006	**4.16**	<0.00020	<0.010	<0.010	**0.056**	0.383	**1,790**	**3,310**	3.74	--	--	2,120	--	--	--
	4/27/07	0.787	<0.010	<0.250	<0.002	<0.020	<0.020	**1.250**	<0.005	**3.55**	<0.00020	<0.010	<0.010	<0.020	0.484	**1,300**	**3,390**	6.35	--	--	4,510	--	--	--
	11/19/07	0.186	<0.010	<0.250	<0.002	<0.020	<0.020	**0.778**	<0.005	**4.08**	<0.00020	<0.010	<0.010	<0.020	0.178	**1,950**	**3,430**	3.95	--	--	3,460	--	--	--
	4/30/08	0.291	<0.010	<0.250	<0.002	<0.020	<0.020	**0.536**	<0.005	**3.87**	<0.00020	<0.010	<0.010	<0.020	0.158	**1,920**	**3,410**	2.99	--	--	3,590	--	--	--
duplicate	4/30/08	0.349	<0.010	<0.250	<0.002	<0.020	<0.020	**0.698**	<0.005	**3.91**	<0.00020	<0.010	<0.010	<0.020	0.149	**1,860**	**3,380**	2.85	--	--	3,600	--	--	--
	10/29/08	<0.100	<0.010	0.0258	0.00032	<0.010	<0.010	**0.427**	0.0049	**3.99**	<0.0002	<0.010	<0.010	<0.010	0.240	**1,640**	**3,310**	4.95	--	--	3,840	--	--	--
	4/30/09	<0.100	<0.010	0.0305	**0.00344**	<0.010	0.0049	**0.599**	**0.0131**	**4.56**	<0.0002	<0.010	0.00144	<0.010	0.101	**1,890**	**3,370**	6.06	--	--	3,860	--	--	--
	10/12/09	0.098	0.0029	0.022	<0.001	0.002	0.0011	**0.410**	<0.005	**4.00**	<0.0002	<0.020	0.0005	<0.30	0.280	**1,500**	**3,100**	77.9	6.1	14.9	4,620	14.0	87	3.32
	4/20/10	3.5	<0.010	**0.13**	<0.001	**0.012**	<0.010	**6.00**	<0.005	**4.20**	<0.0002	<0.020	<0.005	<0.030	0.670	**1,500**	**3,100**	56.5	6.1	16.5	11,800	57.9	119	0.00
	10/11/10	0.063	0.0067	0.027	<0.001	0.0009	<0.025	0.30	0.0013	**5.00**	<0.0002	**0.033**	0.0013	**0.012**	0.780	**1,400**	**3,100**	26.6	6.1	20.4	2,990	110	147	0.00
	4/22/11	0.47	0.0068	0.043	<0.0001	<0.005	**0.015**	**2.90**	<0.001	**4.80**	<0.0001	**0.030**	<0.001	<0.010	0.530	**1,300**	**3,000**	3.4	6.2	13.1	2,780	406	150	0.58
	10/17/11	1.55	<0.005	0.0662	<0.001	<0.005	**0.0517**	**2.64**	<0.005	**4.40**	<0.00020	<0.010	<0.005	<0.010	<0.20	**1,150**	**2,620**	25.7	6.7	20.1	3,740	73	130	0.64

TABLE A1
GROUND WATER ANALYTICAL RESULTS SUMMARY
ASH LANDFILL - PERMIT 34-05
RURAL HALL, NORTH CAROLINA

Sample Location / ID	Date	Aluminum	Arsenic	Barium	Cadmium	Chromium (Total)	Copper	Iron	Lead	Manganese	Mercury	Selenium	Silver	Zinc	Nitrate-nitrogen	Sulfate	Dissolved Solids	Total Organic Carbon	pH	Temperature (degrees Celsius)	Conductivity (µmhos/cm)	Turbidity (NTUs)	Oxidation-Reduction Potential (mV)	Dissolved Oxygen
NC 2L Ground Water Standard		NE	0.010	0.700	0.002	0.010	1.0	0.300	0.015	0.050	0.001	0.020	0.020	1.00	10.0	250	500	NE	6.5 - 8.5	NE	NE	NE	NE	NE
Solid Waste Section Limit		NE	0.010	0.100	0.001	0.010	0.010	0.300	0.010	0.050	0.0002	0.010	0.010	0.010	10.0	250	NE	NE	NE	NE	NE	NE	NE	NE
NC 2B Surface Water Standard		0.087	0.050	1.0 [1]	0.002	0.050	0.007	1.0	0.025	0.200 [1]	0.000012	0.005	0.00006	0.05	10.0 [1]	250 [1]	500 [1]	NE	6.0 - 9.0	NE	NE	NE	NE	NE
W-2 (RHMW-002, MW-1A)	1/16/90	--	<0.010	**0.21**	<0.002	<0.020	--	--	<0.005	--	0.00020	<0.010	<0.010	--	--	--	--	--	6.1	--	--	--	--	--
	9/24/90	0.85	<0.010	**0.219**	**0.0083**	<0.020	<0.020	**1.40**	<0.005	**9.90**	<0.00020	<0.010	<0.010			41	**533**	14.0	6.2	16.7	717	--	--	--
	10/24/91	0.169	<0.010	0.082	<0.002	<0.020	<0.020	**9.30**	0.0074	**16.5**	<0.00020	<0.010	<0.010		1.67	**1,150**	**1,937**	15.0	6.0	18.7	2,080	--	--	--
	3/26/92	2.79	<0.010	<0.250	**0.0034**	<0.020	<0.020	**38.4**	**0.016**		<0.00020	<0.010	<0.010			**1,860**	**2,611**	12.0	5.8	13.8	2,880	--	--	--
	9/30/92		<0.010	<0.250	<0.002	<0.020	<0.020		<0.005	**21.3**	<0.00020	<0.010	<0.010		1.03	**1,320**	**2,525**	6.0	6.1	17.9	2,670	--	--	--
	3/31/93	0.417	<0.010	**0.177**	<0.002	<0.020	<0.020	**1.28**	0.0076	**0.053**	<0.00020	<0.010	<0.010	**0.04**	0.05	**600**	**948**	2.0	5.6	15.2	167	--	--	--
	9/17/93	5.65	<0.010	**0.508**	**0.0038**	<0.020	**0.079**	**34.7**	**0.012**	**22.3**	<0.00020	<0.010	<0.010	**0.062**	0.166	**1,570**	**3,350**	12.0	6.4	20.8	4,030	--	--	--
	3/30/94	18.7	<0.010	**2.77**	**0.003**	**0.076**	<0.020	**50.9**	**0.034**	**2.40**	<0.00020	<0.010	<0.010	**0.025**	6	200	**555**		5.7	16	1,640	--	--	--
	9/30/94	21.4	<0.010	**0.942**	<0.002	**0.037**	**0.058**	**0.36**	**0.013**	**3.71**	<0.00020	<0.010	<0.010	**0.088**	0.45	**415**	**969**	15.9	6.2	18.3	1,440	--	--	--
	3/31/95	45	<0.010	**1.71**	<0.002	**0.078**	**0.058**	**5.05**	**0.028**	**3.66**	<0.00020	<0.010	<0.010	**0.172**	0.85	155	460		6.2	13.7	930	--	--	--
	9/29/95	109	<0.010	**3.95**	**0.03**	**0.209**	**0.142**	**206**	**0.068**	**3.75**	<0.00020	0.005	<0.010	**0.292**	0.313	**379**	**944**	7.37	5.6	16.4	1,345	--	--	--
	3/30/96	66.5	<0.010	**1.25**	**0.012**	**0.105**	**0.078**	**96.6**	**0.044**	**3.61**	<0.00020	<0.010	<0.010	**0.183**	---	13	127	4.68	5.6	14	316	--	--	--
	9/27/96	89.1	<0.010	**1.51**	<0.002	<0.020	0.0088	**150**	**0.015**	**3.06**	<0.00020	<0.010	<0.010	**0.098**	0.11	---	373	9.22	7.0	21	840	--	--	--
	3/29/97	64.4	<0.010	**1.10**	**0.02**	**0.102**	**0.072**	**98**	**0.047**	**2.50**	<0.00020	<0.010	<0.010	**0.15**	0.09	**1,010**	**2,020**	10.8	6.4	14	1,300	--	--	--
	9/17/97	56.5	<0.010	**1.62**	**0.013**	**0.087**	**0.088**	**99.9**	**0.035**	**20.20**	<0.00020	<0.005	<0.010	**0.201**	1.13	**1,410**	**3,600**	11.3	6.6	17	3,780	--	--	--
	3/27/98	10.9	<0.010	**0.584**	<0.002	<0.020	<0.020	**26.0**	<0.005	**6.16**	<0.00020	<0.010	<0.010	<0.020	<0.050	116	**1,130**	6.34	6.8	19.9	743	--	--	--
	9/30/98	15.4	<0.010	**0.518**	<0.002	**0.039**	**0.034**	**28.8**	**0.022**	**15.0**	<0.00020	<0.010	<0.010	**0.060**	0.78	**762**	**3,380**	15.7	6.4	21	753	--	--	--
	3/31/99	2.38	<0.010	**0.852**	<0.002	**0.045**	**0.035**	**47.0**	**0.021**	**6.92**	<0.00020	<0.010	<0.010	**0.073**	0.32	26	262	1.41	6.2	18	126	--	--	--
	9/29/99	9.7	<0.010	**0.296**	<0.002	**0.036**	<0.020	**26.9**	0.009	**0.20**	<0.00020	<0.010	<0.010	<0.020	0.08	**293**	458	15.3	6.2	20	182	--	--	--
	9/15/00	5.49	<0.010	**0.508**	<0.002	<0.020	<0.020	**1.60**	0.007	**1.140**	<0.00020	<0.010	<0.010	<0.020	0.06	93	374	1.89	6.6	19	170	--	--	--
	3/16/00	12.70	<0.010	**0.434**	<0.002	**0.028**	**0.025**	**19.4**	<0.005	**2.160**	<0.00020	<0.010	<0.010	**0.028**	0.136	**281**	**642**	7.36	--	--	--	--	--	--
	3/23/01	2.60	<0.010	<0.250	<0.002	<0.020	<0.020	**4.74**	0.006	**0.234**	<0.00020	<0.010	<0.010	**0.037**	0.08	26	173	6.82	6.5	18	270	--	--	--
	3/28/02	17.9	<0.010	<0.250	<0.002	**0.047**	**0.046**	**45.3**	**0.016**	**3.03**	--	<0.010	<0.010	**0.088**	<0.050	23	219	11.9	6.7	14	140	--	--	--
	10/3/02	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	3/25/03	6.07	<0.010	**0.264**	<0.002	<0.020	<0.020	**8.42**	<0.005	**0.115**	<0.00020	<0.010	<0.010	**0.025**	0.069	14	118	5.29	6.1	18	140	--	--	--
	10/2/03	4.63	<0.010	**0.277**	<0.002	<0.020	<0.020	**10.9**	0.008	**11.1**	<0.00020	<0.010	<0.010	<0.020	0.122	**1,270**	**3,380**	7.78	6.1	20	3,020	--	--	--
	4/28/04	3.6	<0.010	<0.250	<0.002	<0.020	<0.020	**11.0**	0.006	**2.63**	<0.00020	<0.010	<0.010	**0.036**	0.193	233	**634**	8.13	--	14.4	1,460	--	--	--
	10/26/04	30.2	<0.010	**2.14**	**0.009**	**0.112**	**0.083**	**65.6**	**0.021**	**5.08**	<0.00020	<0.010	<0.010	**0.144**	4.17	**1,710**	**3,800**	7.22	--	--	3,690	--	--	--
	4/27/05	2.75	<0.010	<0.250	**0.006**	<0.020	<0.020	**9.15**	0.008	**8.95**	<0.00020	<0.010	<0.010	**0.026**	1.08	**1,260**	**2,868**	13.8	--	--	3,170	--	--	--
	10/20/05	9.38	<0.010	**0.377**	**0.002**	**0.020**	**0.203**	**26.2**	0.009	**6.8**	<0.00020	<0.010	<0.010	**0.116**	0.550	**1,510**	**1,700**	22	--	--	1,110	--	--	--
	10/19/06	3.63	<0.010	<0.250	<0.002	<0.020	<0.020	**8.08**	0.006	**1.90**	<0.00020	<0.010	<0.010	**0.044**	0.133	**749**	**1,210**	8.99	--	--	1,050	--	--	--
	4/27/07	46.5	<0.010	**0.451**	<0.002	0.002		**55.9**			<0.00020	<0.010	<0.010	**0.046**	0.452	**1,570**	**2,800**	9.01	--	--	1,880	--	--	--
	11/19/07	5.75	<0.010	<0.250	<0.002	<0.020	<0.020	**12.0**	0.008	**3.03**	<0.00020	<0.010	<0.010	<0.020	<0.050	**1,330**	**1,310**	9.71	--	--	1,330	--	--	--
	4/30/08	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	**4.45**	0.005	**0.334**	<0.00020	<0.010	<0.010	**0.072**	0.071	246	330	7.26	--	--	609	--	--	--
	4/30/09	5.17	<0.010	**0.268**	<0.001	**0.0139**	**0.0113**	**12.5**	**0.0118**	**0.441**	<0.0002	<0.010	<0.010	**0.0375**	0.072	10.4	157	7.57	--	--	93.7	--	--	--
	10/15/09	30	**0.013**	**1.6**	**0.0048**	**0.1100**	**0.0670**	**200**	**0.0360**	**3.40**	<0.0002	**0.042**	<0.005	**0.41**	Not sampled - insufficient sample volume				6.4	15.9	900	30	-145	1.21
	4/20/10	0.43	<0.010	**0.18**	<0.001	<0.005	<0.010	**0.49**	<0.005	**2.40**	<0.0002	<0.020	<0.005	<0.030	<0.20	**830**	**1,900**	48.8	8.0	13.8	1,880	411	15	5.88
	10/11/10	2.30	0.0024	**0.240**	0.00068	0.0087	**0.011**	**6.60**	0.0017	**2.30**	<0.0002	**0.011**	<0.005	**0.081**	0.21	**660**	**1,400**	10.1	6.3	17.0	1,340	712	46	3.99
	4/22/11	1.70	0.0023	**0.15**	<0.0001	<0.005	0.0018	**2.10**	<0.001	**4.00**	<0.0001	**0.014**	<0.001	<0.010	0.033	**760**	**1,700**	8.6	Not measured - insufficient sample volume due to limited recharge					
	10/17/11	2.18	<0.005	**0.113**	<0.001	<0.005	0.0061	**2.71**	<0.005	**4.02**	<0.00020	<0.010	0.0058	<0.005	<0.20	**365**	**842**	18.7	Not measured - insufficient sample volume due to limited recharge					

TABLE A1
GROUND WATER ANALYTICAL RESULTS SUMMARY
ASH LANDFILL - PERMIT 34-05
RURAL HALL, NORTH CAROLINA

Sample Location / ID	Date	Aluminum	Arsenic	Barium	Cadmium	Chromium (Total)	Copper	Iron	Lead	Manganese	Mercury	Selenium	Silver	Zinc	Nitrate-nitrogen	Sulfate	Dissolved Solids	Total Organic Carbon	pH	Temperature (degrees Celsius)	Conductivity (µmhos/cm)	Turbidity (NTUs)	Oxidation-Reduction Potential (mV)	Dissolved Oxygen
NC 2L Ground Water Standard		NE	0.010	0.700	0.002	0.010	1.0	0.300	0.015	0.050	0.001	0.020	0.020	1.00	10.0	250	500	NE	6.5 - 8.5	NE	NE	NE	NE	NE
Solid Waste Section Limit		NE	0.010	0.100	0.001	0.010	0.010	0.300	0.010	0.050	0.0002	0.010	0.010	0.010	10.0	250	NE	NE	NE	NE	NE	NE	NE	NE
NC 2B Surface Water Standard		0.087	0.050	1.0 [1]	0.002	0.050	0.007	1.0	0.025	0.200 [1]	0.000012	0.005	0.00006	0.05	10.0 [1]	250 [1]	500 [1]	NE	6.0 - 9.0	NE	NE	NE	NE	NE
W-3 (RHMW-003 / 003A, W-2A)	1/16/90	--	<0.010	**0.300**	<0.002	<0.020	--	--	<0.005	--	<0.00020	<0.010	<0.010	--	--	--	--	--	7.0	--	--	--	--	--
	9/6/90	--	<0.010	**8.990**	**0.02**	**0.81**	--	--	**0.33**	--	**0.0005**	0.0059	<0.005	--	--	--	--	--	6.7	--	--	--	--	--
	9/21/90	2.17	<0.010	**0.134**	**0.0081**	<0.040	<0.020	**2.00**	<0.005	**0.08**	<0.00020	<0.005	<0.010	<0.020	0.67	8.5	174	12	6.5	16.2	238	--	--	--
	10/23/91	0.213	<0.010	**0.149**	<0.002	<0.040	<0.020	0.24	**0.33**	**0.116**	<0.00020	<0.005	<0.010	<0.020	<0.050	<10.00	214	12	6.7	19.7	207	--	--	--
	3/25/92	<0.200	<0.010	**0.119**	<0.002	<0.020	<0.020	<0.100	<0.005	<0.020	<0.00020	<0.005	<0.010	<0.020	6.81	22.5	136	10	6.1	13.1	307	--	--	--
	9/29/92	0.67	<0.010	**0.120**	<0.002	<0.020	<0.020	**0.580**	<0.005	**0.410**	**0.0003**	<0.005	<0.010	<0.020	0.232	20	189	1	5.9	17.1	223	--	--	--
	3/31/93	1.17	<0.010	**0.180**	<0.002	<0.020	<0.020	**2.30**	<0.005	<0.020	<0.00020	<0.005	<0.010	**0.055**	<0.050	14.9	163	2	5.5	15.7	207	--	--	--
	9/17/93	9.46	<0.010	**0.444**	**0.0028**	<0.020	**0.071**	**20.7**	0.010	**0.173**	<0.00020	<0.005	<0.010	**0.106**	0.25	12	207	2	6.2	18.3	282	--	--	--
	3/30/94	4.42	<0.010	**0.259**	<0.002	<0.020	**0.024**	**10.7**	**0.15**	**0.264**	<0.00020	<0.005	<0.010	**0.107**	1.48	17	180	<5	5.7	15.9	180	--	--	--
	9/30/94	25.4	<0.010	**0.485**	<0.002	**0.026**	**0.067**	**32.0**	**0.017**	**0.526**	<0.00020	<0.005	<0.010	**0.086**	<0.050	<20	193	26.1	6.3	18	202	--	--	--
	3/31/95	31.3	<0.010	**0.466**	<0.002	**0.027**	**0.055**	**36.4**	**0.025**	**0.430**	<0.00020	<0.005	<0.010	**0.186**	0.28	133	206	<5	6.6	12.7	220	--	--	--
	9/29/95	55.4	<0.010	**0.813**	**0.007**	**0.051**	**0.122**	**70.1**	**0.042**	**1.020**	<0.00020	<0.005	<0.010	**0.183**	0.2	139	302	1.32	5.4	15.4	245	--	--	--
	3/30/96	17.1	<0.010	**0.436**	**0.002**	**0.02**	**0.046**	**25.9**	**0.019**	**0.409**	<0.00020	<0.005	<0.010	**0.1**	1.25	20	217	3.41	5.6	13	285	--	--	--
	9/27/96	11.2	<0.010	**0.257**	<0.002	<0.020	<0.020	**16.4**	**0.015**	**0.235**	<0.00020	<0.005	<0.010	**0.094**	0.11	59.8	215	1.1	7.8	18	243	--	--	--
	3/29/97	16.4	<0.010	**0.347**	**0.003**	<0.020	**0.043**	**23.0**	**0.013**	**0.384**	<0.00020	<0.005	<0.010	**0.051**	0.12	21	223	7.86	6.6	12	153	--	--	--
	9/17/97	32.2	<0.010	**0.478**	**0.004**	**0.027**	**0.067**	**40.2**	**0.024**	**0.590**	<0.00020	<0.005	<0.010	**0.280**	1.10	89	262	1.29	6.9	16	366	--	--	--
	3/27/98	12.2	<0.010	**0.491**	<0.002	<0.020	<0.020	**21.3**	<0.005	**0.604**	<0.00020	<0.010	<0.010	<0.020	0.130	19.1	248	1.26	6.1	19.9	542	--	--	--
	9/30/98	4.15	<0.010	<0.250	<0.002	<0.020	<0.020	**5.69**	<0.005	**0.151**	<0.00020	<0.010	<0.010	**0.039**	0.300	5.1	238	1.34	6.8	20	276	--	--	--
	3/31/99	2.38	<0.010	<0.250	<0.002	<0.020	<0.020	**3.93**	<0.005	**0.126**	<0.00020	<0.010	<0.010	**0.073**	0.32	26.3	262	1.41	6.2	18	126	--	--	--
	9/29/99	2.13	<0.010	<0.250	<0.002	<0.020	<0.020	**4.23**	<0.005	**0.090**	<0.00020	<0.010	<0.010	<0.020	0.21	27.3	272	1.71	6.8	19	315	--	--	--
	9/15/00	6.59	<0.010	**0.323**	<0.002	<0.020	**0.026**	**9.90**	**0.011**	**0.309**	<0.00020	**0.017**	<0.010	<0.020	0.12	20.9	187	1.53	6.7	18	390	--	--	--
	3/16/00	11.7	<0.010	**0.356**	<0.002	<0.020	**0.035**	**15.70**	0.007	**0.334**	<0.00020	**0.016**	<0.010	**0.036**	0.208	17.8	193	2.63	--	--	--	--	--	--
	3/23/01	0.828	<0.010	<0.250	<0.002	<0.020	<0.020	**1.02**	0.009	0.045	<0.00020	<0.010	<0.010	**0.023**	0.20	27.4	175	1.56	6.7	17	310	--	--	--
	10/4/01	3.64	<0.010	<0.250	<0.002	<0.020	<0.020	**6.02**	0.008	**0.221**	<0.00020	**0.013**	<0.010	<0.020	0.22	24.7	186	3.2	6.1	17	200	--	--	--
	3/28/02	1.72	<0.010	<0.250	<0.002	<0.020	<0.020	**2.82**	<0.005	**0.100**	--	<0.010	<0.010	<0.020	0.40	38.5	203	1.45	6.7	14	470	--	--	--
	3/28/02	2.37	<0.010	<0.250	<0.002	<0.020	<0.020	**2.82**	<0.005	**0.100**	<0.00020	**0.017**	<0.010	<0.020	0.287	25.6	177	<1.0	--	--	238	--	--	--
duplicate	10/3/02	8.77	<0.010	**0.387**	<0.002	<0.020	**0.022**	**16.4**	<0.005	**0.450**	<0.00020	<0.010	<0.010	**0.035**	0.35	58.2	231	1.02	8.1	19	210	--	--	--
	3/25/03	15.3	<0.010	**0.362**	<0.002	<0.020	**0.026**	**23.8**	0.008	**0.622**	<0.00020	<0.010	<0.010	**0.045**	0.520	42.6	194	<1.0	6.2	19	210	--	--	--
	10/2/03	2.46	<0.010	**0.646**	<0.002	<0.020	<0.020	**4.08**	<0.005	**0.212**	<0.00020	<0.010	<0.010	<0.020	0.371	28.3	199	<1.0	6.7	17	243	--	--	--
	4/28/04	1.49	<0.010	<0.250	<0.002	<0.020	<0.020	**2.82**	<0.005	**0.080**	<0.00020	**0.013**	<0.010	<0.020	0.259	**1,350**	171	<1.0	--	14.6	225	--	--	--
	10/26/04	2.37	<0.010	<0.250	<0.002	<0.020	<0.020	**3.49**	<0.005	**0.129**	<0.00020	**0.017**	<0.010	<0.020	0.287	25.6	177	<1.0	--	--	238	--	--	--
	4/27/05	0.874	<0.010	<0.250	<0.002	<0.020	<0.020	**1.58**	<0.005	**0.066**	<0.00020	**0.016**	<0.010	**0.040**	0.254	34.4	192	0.74	--	--	277	--	--	--
	10/20/05	3.50	<0.010	**0.252**	<0.002	<0.020	**0.107**	**4.23**	<0.005	**0.072**	<0.00020	**0.030**	<0.010	**0.071**	0.356	44.0	218	18	--	--	317	--	--	--
	10/19/06	0.553	<0.010	**0.277**	<0.002	<0.020	<0.020	**1.02**	<0.005	0.037	<0.00020	**0.048**	<0.010	<0.020	0.389	70.4	237	0.69	--	--	330	--	--	--
	4/27/07	<0.10	<0.010	**0.262**	<0.002	<0.020	<0.020	**0.708**	<0.005	<0.010	<0.00020		<0.010	<0.020	0.452	89.4	251	1.51	--	--	388	--	--	--
	11/19/07	0.124	<0.010	**0.263**	<0.002	<0.020	<0.020	0.156	<0.005	<0.010	<0.00020	**0.065**	<0.010	<0.020	0.190	53.0	293	0.86	--	--	403	--	--	--
duplicate	11/19/07	0.139	<0.010	**0.254**	<0.002	<0.020	<0.020	0.158	<0.005	0.012	<0.00020	**0.065**	<0.010	<0.020	0.203	64.2	278	0.88	--	--	402	--	--	--
	4/30/08	<0.100	<0.010	**0.261**	<0.002	<0.020	<0.020	0.148	<0.005	<0.010	<0.00020	**0.094**	<0.010	<0.020	0.553	91.0	331	0.76	--	--	470	--	--	--
	10/29/08	<0.100	<0.010	**0.274**	0.00033	**0.0106**	<0.010	0.216	0.0033	**0.124**	0.00010	**0.0955**	0.00515	<0.010	0.474	96.0	360	1.04	--	--	571	--	--	--
	4/30/09	0.442	<0.010	**0.368**	<0.001	<0.010	<0.010	**0.638**	0.0085	**0.0616**	<0.0002	**0.154**	<0.010	**0.0682**	0.535	199	399	0.94	--	--	603	--	--	--
duplicate	4/30/09	0.571	<0.010	**0.268**	<0.0010	<0.010	0.0025	**0.332**	0.0071	0.0308	<0.0002	**0.153**	<0.010	**0.0324**	0.510	203	389	1.07	--	--	617	--	--	--
	10/12/09	0.026	0.0027	**0.160**	<0.0010	0.0009	<0.010	<0.050	<0.005	0.016	0.00008	**0.150**	<0.005	<0.30	0.740	140	430	15.8	5.9	15.2	>99,000	8.6	121	2.82
	4/20/10	0.87	<0.010	**0.28**	<0.0010	<0.005	<0.010	**0.94**	<0.005	0.049	<0.0002	**0.10**	<0.005	<0.030	0.71	100	380	9.0	6.0	12.5	644	23.2	264	3.74
	10/11/10	<0.250	<0.005	**0.110**	<0.001	0.0013	<0.025	0.021	<0.005	0.0016	<0.0002	**0.077**	<0.005	**0.020**	0.79	89	310	4.0	5.9	18.0	497	6.7	256	1.39
	4/21/11	<0.040	0.0021	**0.140**	<0.0001	<0.005	<0.001	0.210	<0.001	**0.067**	<0.0001	**0.100**	<0.001	<0.010	0.85	120	330	1.0	5.8	13.1	399	<1	299	3.68
	10/18/11	0.380	<0.005	**0.195**	<0.005	<0.005	<0.005	0.262	<0.005	0.0221	<0.00020	**0.102**	<0.005	<0.010	1.10	**360**	413	7.7	6.9	17	764	6.3	128	1.76

TABLE A1
GROUND WATER ANALYTICAL RESULTS SUMMARY
ASH LANDFILL - PERMIT 34-05
RURAL HALL, NORTH CAROLINA

Sample Location / ID	Date	Aluminum	Arsenic	Barium	Cadmium	Chromium (Total)	Copper	Iron	Lead	Manganese	Mercury	Selenium	Silver	Zinc	Nitrate-nitrogen	Sulfate	Dissolved Solids	Total Organic Carbon	pH	Temperature (degrees Celsius)	Conductivity (µmhos/cm)	Turbidity (NTUs)	Oxidation-Reduction Potential (mV)	Dissolved Oxygen
NC 2L Ground Water Standard		NE	0.010	0.700	0.002	0.010	1.0	0.300	0.015	0.050	0.001	0.020	0.020	1.00	10.0	250	500	NE	6.5 - 8.5	NE	NE	NE	NE	NE
Solid Waste Section Limit		NE	0.010	0.100	0.001	0.010	0.010	0.300	0.010	0.050	0.0002	0.010	0.010	0.010	10.0	250	NE	NE	NE	NE	NE	NE	NE	NE
NC 2B Surface Water Standard		0.087	0.050	1.0 [1]	0.002	0.050	0.007	1.0	0.025	0.200 [1]	0.000012	0.005	0.00006	0.05	10.0 [1]	250 [1]	500 [1]	NE	6.0 - 9.0	NE	NE	NE	NE	NE
W-3B	10/26/04	2.33	<0.010	<0.250	<0.002	<0.020	<0.020	**3.17**	<0.005	**0.157**	<0.00020	<0.010	<0.010	**0.024**	<0.050	174	**545**	2.71	--	--	862	--	--	--
	4/27/05	0.203	<0.010	<0.250	**0.002**	<0.020	<0.020	**1.83**	**0.015**	**0.907**	<0.00020	**0.041**	<0.010	**0.036**	<0.050	**590**	**840**	10.1	--	--	1,180	--	--	--
	10/20/05	3.63	<0.010	<0.250	<0.002	<0.020	**0.029**	**4.29**	0.005	**0.068**	<0.00020	<0.010	<0.010	**0.075**	<0.050	146	**627**	30	--	--	550	--	--	--
	10/19/06	0.135	<0.010	<0.250	<0.002	<0.020	<0.020	**0.95**	0.005	**0.811**	<0.00020	<0.010	<0.010	**0.042**	<0.050	**318**	**750**	5.24	--	--	739	--	--	--
(RHMW-003B)	4/27/07	0.238	<0.010	<0.250	<0.002	<0.020	<0.020	**0.901**	<0.005	**1.28**	<0.00020	<0.010	<0.010	<0.020	<0.050	**475**	**1,050**	2.57	--	--	1,240	--	--	--
	11/19/07	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	**1.17**	<0.005	**1.27**	<0.00020	<0.010	<0.010	<0.020	<0.050	**582**	101	22.6	--	--	1,310	--	--	--
	4/30/08	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	**0.505**	<0.005	**1.01**	<0.00020	<0.010	<0.010	<0.020	<0.050	**570**	**955**	1.18	--	--	1,270	--	--	--
	10/29/08	<0.100	<0.010	0.048	<0.001	0.0049	<0.010	**1.95**	<0.010	**0.946**	0.00007	<0.010	<0.010	**0.0105**	<0.05	**305**	**760**	0.83	--	--	1,080	--	--	--
	4/30/09	<0.100	<0.010	0.0426	<0.001	<0.010	<0.010	**0.49**	**0.0105**	**0.999**	<0.0002	0.0097	0.0015	0.0087	<0.050	185	**827**	5.56	--	--	1,150	--	--	--
	10/12/09	0.039	0.0036	0.0430	<0.001	0.0009	<0.010	**0.33**	<0.005	**0.880**	<0.0002	<0.020	<0.0050	<0.30	<0.20	250	**780**	16.1	7.2	14.6	>99,000	14.4	-42	3.40
	4/20/10	<0.10	<0.010	0.0490	<0.0010	<0.0050	<0.010	**0.50**	<0.005	**0.970**	<0.0002	<0.020	<0.0050	<0.30	<0.20	**280**	**770**	11.2	6.8	17.5	2,320	108	-51	0.23
	10/11/10	<0.250	0.005	0.0450	<0.005	<0.005	<0.025	**0.500**	<0.005	**0.980**	<0.0002	0.0099	<0.005	<0.050	0.14	**300**	**830**	<0.20	6.7	17.5	1,010	41.3	-25	0.00
	4/21/11	<0.040	0.0025	0.0510	<0.0001	<0.005	<0.001	**0.970**	<0.001	**1.20**	<0.0001	**0.012**	<0.001	<0.010	0.085	**370**	**890**	1.1	6.6	15.4	956	<1	-72	0.48
	10/18/11	<0.050	<0.005	0.0520	<0.001	<0.005	<0.005	**0.606**	<0.005	**1.32**	<0.00020	<0.010	<0.005	<0.010	<0.20	**460**	**1,090**	9.7	9.5	15.0	1,750	9.4	-86	<0.01
duplicate	10/18/11	<0.100	<0.005	0.0509	<0.001	<0.005	<0.005	**0.587**	<0.005	**1.28**	<0.00020	<0.010	<0.005	<0.010	<0.20	**408**	**1,050**	8.0	9.5	15.0	1,750	9.4	-86	<0.01
W-4	4/4/95	9.72	<0.010	<0.250	<0.002	<0.020	<0.020	**15.6**	0.007	**0.564**	<0.00020	<0.010	<0.010	**0.058**	1	7.88	231	136	6.1	19	234	--	--	--
	9/17/97	4.42	<0.010	<0.250	**0.002**	<0.020	<0.020	**10.0**	0.006	**0.406**	<0.00020	<0.010	<0.010	**0.190**	0.550	8.86	212	3.19	7.5	18	366	--	--	--
	3/27/98	3.41	<0.010	<0.250	<0.002	<0.020	<0.020	**6.25**	<0.005		<0.00020	<0.010	<0.010	**0.044**	<0.050	7.12	226	2.69	6.7	19.2	390	--	--	--
	9/30/98	0.219	<0.010	<0.250	<0.002	<0.020	<0.020	**1.61**	<0.005	**0.299**	<0.00020	<0.010	<0.010	<0.020	<0.050	6.42	200	7.26	5.9	21	322	--	--	--
(Background)	3/31/99	0.637	<0.010	<0.250	<0.002	<0.020	<0.020	**2.15**	<0.005	**0.285**	<0.00020	<0.010	<0.010	<0.020	<0.050	5.71	202	8.53	6.5	16	279	--	--	--
(damaged &	9/29/99	0.127	<0.010	<0.250	<0.002	<0.020	<0.020	**1.44**	0.005	**0.271**	<0.00020	<0.010	<0.010	**0.024**	<0.050	<5.00	207	2.85	6.4	18	315	--	--	--
replaced 2003 with	3/16/00	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	**1.47**	<0.005	**0.298**	<0.00020	<0.010	<0.010	<0.020	<0.050	<5.00	191	6.05				--	--	--
W-6)	9/15/00	0.165	<0.010	<0.250	<0.002	<0.020	<0.020	**1.09**	<0.005	**0.252**	<0.00020	<0.010	<0.010	<0.020	0.08	5.30	241	15.5	6.2	17	310	--	--	--
	3/23/01	2.75	<0.010	<0.250	**0.004**	<0.020	<0.020	**9.91**	**0.016**	**0.447**	<0.00020	<0.010	<0.010	**0.028**	<0.050	6.53	219	5.99	6.4	16	240	--	--	--
	10/4/01	0.204	<0.010	<0.250	<0.002	<0.020	<0.020	**0.915**	0.007	**0.229**	<0.00020	<0.010	<0.010	<0.020	<0.05	<5.00	186	7.8	6.3	20	300	--	--	--
	3/28/02	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	**1.46**	<0.005	**0.212**	--	<0.010	<0.010	<0.020	<0.050	5.16	196	1.68	6.2	14	190	--	--	--
	10/3/02	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	**1.13**	<0.005	**0.237**	<0.00020	<0.010	<0.010	**0.029**	<0.050	5.08	202	4.07	6.1	19	280	--	--	--
	3/25/03	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	**0.976**	<0.005	**0.212**	<0.00020	<0.010	<0.010	<0.020	<0.050	6.05	185	1.61	6.2	16	260	--	--	--
W-6	10/2/03	1.92	<0.010	<0.250	<0.002	**0.268**	**0.024**	**3.22**	<0.005	**0.154**	<0.00020	<0.010	<0.010	**0.44**	0.207	95	466	34	7.3	19	661	--	--	--
	4/28/04	1.16	<0.010	<0.250	<0.002	**0.030**	**0.026**	**0.917**	0.007	0.037	<0.00020	<0.010	<0.010	**0.149**	0.137	**370**	**692**	139	--	14.7	937	--	--	--
	10/26/04	0.790	<0.010	<0.250	<0.002	**0.089**	**0.032**	0.259	<0.005	0.012	<0.00020	<0.010	<0.010	**0.087**	0.096	116	**630**	79.2	--	--	917	--	--	--
	4/27/05	0.389	<0.010	<0.250	<0.002	<0.020	<0.020	<0.100	0.005	<0.010	<0.00020	<0.010	<0.010	**0.056**	<0.050	87.5	**565**	13.2	--	--	932	--	--	--
(Background)	10/20/05	<0.100	<0.010	<0.250	<0.002	<0.020	**0.040**	**0.3557**	<0.005	<0.010	<0.00020	<0.010	<0.010	**0.060**	0.064	35.4	**553**	27	--	--	939	--	--	--
Replaced W-4	10/19/06	0.529	<0.010	<0.250	<0.002	<0.020	<0.020	0.077	<0.005	0.012	<0.00020	<0.010	<0.010	**0.066**	<0.050	46.4	471	29.3	--	--	655	--	--	--
9/2003	4/27/07	2.66	<0.010	<0.250	<0.002	**0.029**	<0.020	**2.79**	<0.005	**0.106**	<0.00020	<0.010	<0.010	**0.168**	<0.050	29.5	442	8.84	--	--	776	--	--	--
	11/19/07	0.627	<0.010	<0.250	<0.002	<0.020	<0.020	**0.711**	<0.005	0.024	<0.00020	<0.010	<0.010	**0.038**	<0.050	11.2	431	8.98	--	--	694	--	--	--
	4/30/08	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	<0.100	<0.005	<0.010	<0.00020	<0.010	<0.010	**0.037**	<0.050	<10.0	392	5.61	--	--	615	--	--	--
	10/29/08	0.235	<0.010	0.0358	0.00041	0.0068	<0.010	0.268	<0.010	0.0093	<0.00020	<0.010	<0.010	**0.067**	<0.050	<10.0	393	4.13	--	--	724	--	--	--
duplicate	10/29/08	0.222	<0.010	**0.293**	0.001	<0.010	0.0027	**0.460**	0.0049	**0.0846**	0.00016	**0.101**	<0.010	<0.010	0.488	98.8	384	0.860	--	--	574	--	--	--
	4/30/09	0.139	<0.010	0.0366	<0.001	0.007	<0.010	0.0331	0.0029	0.0015	<0.0002	0.0081	<0.010	**0.0332**	<0.050	10.5	463	10.3	--	--	807	--	--	--
	10/12/09	0.140	0.0023	0.028	<0.001	0.0055	0.0043	0.044	<0.0050	0.0017	<0.0002	**0.046**	<0.005	<0.300	<0.200	17.0	380	11.1	10.6	18.9	1,020	33.1	-243	0.16
	4/20/10	1.7	<0.010	0.059	<0.001	**0.400**	**0.014**	**3.2**	<0.005	**0.087**	<0.0002	<0.020	<0.005	**0.069**	<0.20	16.0	450	9.1	10.7	18.9	930	209	-227	0.03
	10/11/10	0.320	<0.005	0.037	<0.001	**0.420**	**0.019**	**2.8**	<0.005	**0.056**	<0.0002	<0.005	<0.005	**0.063**	0.12	13.0	410	3.9	10.6	17.7	816	36	-250	0.00
	4/22/11	0.260	0.0012	0.033	<0.001	**0.190**	0.007	**1.0**	0.0013	0.028	<0.0001	0.0011	<0.001	**0.017**	0.021	16.0	410	3.8	11.1	13.9	562	10	-189	1.01
	10/18/11	0.421	<0.005	0.0269	<0.001	**0.0609**	**0.089**	**0.311**	<0.005	0.0068	<0.0002	<0.010	<0.005	**0.0601**	<0.20	11.0	414	6.1	12.2	18.1	1,040	9	-313	0.37

TABLE A1
GROUND WATER ANALYTICAL RESULTS SUMMARY
ASH LANDFILL - PERMIT 34-05
RURAL HALL, NORTH CAROLINA

Sample Location / ID	Date	Aluminum	Arsenic	Barium	Cadmium	Chromium (Total)	Copper	Iron	Lead	Manganese	Mercury	Selenium	Silver	Zinc	Nitrate-nitrogen	Sulfate	Dissolved Solids	Total Organic Carbon	pH	Temperature (degrees Celsius)	Conductivity (µmhos/cm)	Turbidity (NTUs)	Oxidation-Reduction Potential (mV)	Dissolved Oxygen
NC 2L Ground Water Standard		NE	0.010	0.700	0.002	0.010	1.0	0.300	0.015	0.050	0.001	0.020	0.020	1.00	10.0	250	500	NE	6.5 - 8.5	NE	NE	NE	NE	NE
Solid Waste Section Limit		NE	0.010	0.100	0.001	0.010	0.010	0.300	0.010	0.050	0.0002	0.010	0.010	0.010	10.0	250	NE	NE	NE	NE	NE	NE	NE	NE
NC 2B Surface Water Standard		0.087	0.050	1.0 [1]	0.002	0.050	0.007	1.0	0.025	0.200 [1]	0.000012	0.005	0.00006	0.05	10.0 [1]	250 [1]	500 [1]	NE	6.0 - 9.0	NE	NE	NE	NE	NE
W-7	1/6/11	--	--	**0.11**	<0.0001	<0.0050	--	0.20	<0.010	**0.12**	--	<0.010	--	--	--	9.3	200	--	7.1	15.4	298	5.2	83	2.00
Open borehole 42'-341'	4/21/11	0.092	<0.001	0.08	<0.0001	<0.005	<0.001	**0.52**	<0.001	**0.16**	<0.0001	<0.001	<0.001	<0.010	0.044	6.6	190	<0.001	7.3	15.24	301	<1	12	0.62
W-8	1/6/11	--	--	**0.33**	0.00012	<.0050	--	**2.9**	<0.010	**0.065**	--	<0.010	--	--	--	73	210	--	7.5	14.8	300	49.6	182	7.88
	4/20/11	0.390	0.0012	**0.18**	<0.0001	<0.005	<0.001	**0.94**	<0.001	0.020	<0.0001	0.0089	<0.001	<0.010	0.24	68	240	1.1	5.7	15.1	391	133	203	7.06
W-9	1/5/11	--	--	0.027	<0.0001	<0.0050	--	**0.44**	<0.010	0.032	--	<0.010	--	--	--	16	150	--	8.4	15.9	274	119	22	0.00
	4/20/11	0.083	<0.001	0.039	<0.0001	<0.005	<0.001	0.17	<0.001	0.023	<0.0001	<0.001	<0.001	<0.010	0.042	10	130	<1.0	8.8	16.8	286	121	-10	0.45
PW-1 Open Borehole 21'-326'	4/29/88	0.152	<0.011	0.059	**0.008**	<0.016	**0.057**	0.06	<0.024	**0.314**	<0.00020	<0.005	<0.014	**0.576**	1.520	37	500	1.28	6.9	--	--	--	--	--
	7/13/89	--	<0.010	0.100	<0.008	--	<0.020	--	<0.100	--	<0.00020	<0.005	<0.006	--	--	--	--	--	--	--	--	--	--	--
	9/6/90	--	<0.010	0.090	<0.0010	<0.010	--	--	0.0099	--	<0.00020	<0.005	<0.005	--	--	--	--	--	6.8	--	--	--	--	--
	10/23/91	0.130	<0.010	<0.080	<0.002		<0.020	**0.62**	<0.005	**1.2**	<0.00020	<0.005	<0.010	**3.31**	0.050	**460**	**850**	8	6.4	15.1	1,247	--	--	--
	8/10/09	--	--	0.035	<0.0010	<0.005	--	**4.8**	<0.005	**1.8**	--	<0.020	--	--	--	**680**	--	--	7.0	15.3	2,860	32.1	13	0.0
Packer interval - 95'-115'	5/14/10	<0.100	<0.010	0.034	<0.0010	<0.005	<0.010	**2.9**	<0.005	**2.0**	<0.00020	<0.020	<0.005	**0.56**	--	**800**	**1,900**	--	6.8	15.0	2,430	217.0	-20	14.9
acker interval - 180'-200'	5/14/10	<0.100	<0.010	0.044	<0.0010	<0.005	<0.010	**6.3**	0.0094	**2.4**	<0.00020	<0.020	<0.005	**21.0**	--	**940**	**2,100**	--	6.8	16.1	2,570	166	-50	13.2
acker interval - 250'-270'	5/13/10	<0.100	<0.010	0.046	<0.0010	<0.005	<0.010	**6.8**	<0.005	**2.5**	<0.00020	<0.020	<0.005	**5.1**	--	**1,000**	**2,100**	--	6.7	16.5	2,580	215	-54	13.5
acker interval - 300'-326'	5/13/10	Dry interval, no sample collected.				--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Open borehole - 21'-326'	4/21/11	0.280	**0.011**	0.046	<0.0001	<0.005	<0.001	**4.4**	<0.001	**3.0**	<0.0001	**0.054**	<0.001	<0.010	<0.020	**920**	**2,000**	2.1	6.2	16.6	2,250	<1	24	0.6
PZ-1	1/4/11	--	--	0.081	<0.0001	<0.0050	--	**1.6**	<0.010	**0.078**	--	<0.010	--	--	--	98	180	--	--	--	--	--	--	--
	4/20/11	0.040	<0.001	0.063	<0.0001	<0.005	0.0019	**2.7**	0.0016	**0.11**	<0.0001	<0.001	<0.001	<0.010	0.11	30	100	4.2	--	--	--	--	--	--
PZ-2	1/4/11	--	--	**0.12**	<0.0001	<0.0050	--	**0.77**	<0.010	**0.41**	--	<0.010	--	--	--	180	360	--	--	--	--	--	--	--
	4/20/11	4.2	<0.001	0.0099	<0.0001	0.0069	0.0027	**7.4**	0.0034	**0.41**	0.00014	<0.001	<0.001	<0.010	0.10	82	250	6.7	--	--	--	--	--	--
PZ-3	1/5/11	--	--	**0.14**	<0.0001	0.0094	--	**14**	<0.010	**1.7**	--	<0.010	--	--	--	24	140	--	--	--	--	--	--	--
	4/21/11	<0.04	<0.001	0.055	<0.0001	<0.005	<0.001	**6.7**	<0.001	**0.56**	<0.0001	<0.001	<0.001	<0.010	0.049	25	100	3.0	--	--	--	--	--	--
PZ-4	1/5/11	--	--	**0.17**	<0.0001	**0.012**	--	**10**	<0.010	**0.089**	--	<0.010	--	--	--	46	190	--	--	--	--	--	--	--
	4/21/11	0.17	<0.001	0.058	<0.0001	<0.005	<0.001	**0.45**	<0.001	0.015	<0.0001	<0.001	<0.001	<0.010	0.052	24	<10	2.3	--	--	--	--	--	--
PZ-5	1/5/11	--	--	0.092	<0.0001	<0.0050	--	**1.3**	<0.010	**1.3**	--	<0.010	--	--	--	130	**510**	--	--	--	--	--	--	--
	4/21/11	5.3	<0.001	0.081	<0.0001	0.010	**0.014**	**13**	0.0029	**0.71**	<0.0001	0.0022	<0.001	**0.020**	0.060	85	230	11	--	--	--	--	--	--

All concentrations in milligrams per liter.
-- - Not sampled
NE - Not established
[1] - No freshwater aquatic life standard established. Water Supply criteria presented.
Bold indicates exceedance of Solid Waste Section Limits (SWSL)
Gray background indicates exceedance of NC Ground Water Standard

TABLE A2
SURFACE WATER ANALYTICAL RESULTS SUMMARY
ASH LANDFILL - PERMIT 34-05
RURAL HALL, NORTH CAROLINA

Sample Location / ID	Date	Aluminum	Arsenic	Barium	Cadmium	Chromium (Total)	Copper	Iron	Lead	Manganese	Mercury	Selenium	Silver	Zinc	Nitrate-nitrogen	Sulfate	Dissolved Solids	Total Organic Carbon	pH	Temperature (degrees Celsius)	Conductivity (µmhos/cm)	Turbidity (NTUs)	Oxidation-Reduction Potential (mV)	Dissolved Oxygen
NC 2L Ground Water Standard		NE	0.010	0.700	0.002	0.010	1.0	0.300	0.015	0.050	0.001	0.020	0.020	1.00	10.0	250	500	NE	6.5 - 8.5	NE	NE	NE	NE	NE
Solid Waste Section Limit		NE	0.010	0.100	0.001	0.010	0.010	0.300	0.010	0.050	0.0002	0.010	0.01	0.01	10.0	250	NE	NE	NE	NE	NE	NE	NE	NE
NC 2B Surface Water Standard		0.087	0.050	1.0 [1]	0.002	0.050	0.007	1.0	0.025	0.200 [1]	0.000012	0.005	0.00006	0.05	10.0 [1]	250 [1]	500 [1]	NE	6.0 - 9.0	NE	NE	NE	NE	>5.0
SS-01 (RHSS-001) Surface Water - Upstream	4/29/88	<0.152	<0.010	0.118	**0.008**	<0.016	<0.019	0.086	<0.024	<0.014	<0.00020	<0.005	<0.014	0.015	0.22	64	220	2.81	6.8	--	--	--	--	--
	7/13/89	--	<0.010	0.100	<0.002	<0.020	--	--	<0.005	--	<0.00020	<0.010	<0.010	--	--	--	--	--	--	--	--	--	--	--
	9/6/90	--	<0.010	0.064	<0.001	--	--	--	<0.0025	--	<0.00020	<0.005	<0.005	--	--	--	--	--	7.9	--	--	--	--	--
	9/21/90	**0.14**	<0.010	<0.080	**0.0048**	<0.040	<0.020	0.2	<0.005	<0.020	<0.00020	<0.005	<0.010	<0.020	0.52	40	352	12	7.2	11.6	490	--	--	--
	10/23/91	**0.109**	<0.010	<0.080	<0.002	<0.020	<0.020	<0.100	<0.005	<0.020	<0.00020	<0.005	<0.010	<0.020	0.15	108	248	12	7.9	17.2	381	--	--	--
	3/25/92	**4.15**	<0.010	<0.080	**0.0034**	<0.020	<0.020	**5.0**	0.0158	0.064	<0.00020	<0.005	<0.010	<0.020	0.25	9.4	185	14	5.8	11.3	126	--	--	--
	9/29/92	<0.100	<0.010	<0.100	<0.002	<0.040	<0.020	0.16	<0.005	0.085	<0.00020	<0.005	<0.010	<0.020	0.19	84	241	2.0	5.7	13.8	356	--	--	--
	3/31/93	<0.200	<0.010	<0.100	<0.002	<0.020	<0.020	0.400	<0.005	0.077	<0.00020	<0.005	<0.010	0.029	1.34	70.4	127	2.0	5.9	13	207	--	--	--
	9/17/93	**0.24**	<0.010	<0.125	<0.002	<0.020	<0.020	0.598	<0.005	0.028	<0.00020	<0.005	<0.010	<0.020	0.45	77.4	251	3.0	7.1	20.9	360	--	--	--
	3/30/94	**0.220**	<0.010	<0.120	<0.002	<0.020	<0.020	0.873	<0.005	0.03	<0.00020	<0.005	<0.010	<0.020	0.25	30.6	108	5	5.9	14	380	--	--	--
	9/30/94	**1.300**	<0.010	<0.250	<0.002	<0.020	<0.020	**1.69**	0.006	0.084	<0.00020	<0.005	<0.010	<0.020	0.43	64.8	255	30.0	7.1	19.1	332	--	--	--
	3/31/95	**3.580**	<0.010	<0.250	<0.002	<0.020	<0.020	**2.44**	<0.005	0.106	<0.00020	<0.005	<0.010	**0.246**	0.19	48.9	211	<5.0	7.8	13.9	290	--	--	--
	9/29/95	**0.2**	<0.010	<0.250	<0.002	<0.020	<0.020	0.358	0.007	0.038	<0.00020	<0.005	<0.010	<0.020	0.5	70.0	264	3.74	5.2	13.9	458	--	--	--
	3/30/96	**0.279**	<0.010	<0.250	<0.002	<0.020	<0.020	0.547	<0.005	0.014	<0.00020	<0.005	<0.010	<0.020	0.185	31.3	129	1.79	6.7	11	193	--	--	--
	9/27/96	**0.125**	<0.010	<0.250	<0.002	<0.020	<0.020	0.3	0.005	0.021	<0.00020	<0.005	<0.010	**0.095**	0.29	56.1	225	2.36	7.7	19	336	--	--	--
	3/29/97	**0.307**	<0.010	<0.250	<0.002	<0.020	<0.020	0.552	<0.005	0.016	<0.00020	<0.005	<0.010	0.013	0.225	30.0	138	3.04	7.6	16	94	--	--	--
	9/17/97	**0.476**	<0.010	<0.250	<0.002	<0.020	<0.020	0.835	<0.005	0.040	<0.00020	<0.005	<0.010	**0.169**	0.625	47.4	224	1.67	7.9	19	319	--	--	--
	3/27/98	**0.190**	<0.010	<0.250	<0.002	<0.020	<0.020	0.685	<0.005	0.012	<0.00020	<0.010	<0.010	**0.061**	0.680	38.7	163	5.23	7.6	18.6	473	--	--	--
	9/30/98	**0.126**	<0.010	<0.250	<0.002	<0.020	<0.020	0.54	0.006	0.033	<0.00020	<0.010	<0.010	<0.020	0.300	28.0	177	4.09	7.2	18	322	--	--	--
	3/31/99	**0.239**	<0.010	<0.250	<0.002	<0.020	<0.020	0.332	<0.005	0.044	<0.00020	<0.010	<0.010	<0.020	0.12	63.2	191	2.49	7.1	16	247	--	--	--
	9/29/99	**1.53**	<0.010	<0.250	<0.002	<0.020	<0.020	**3.33**	0.005	0.088	<0.00020	<0.010	<0.010	<0.020	0.09	23.2	143	8.81	7.8	16	308	--	--	--
	9/15/00	**0.327**	<0.010	<0.250	<0.002	<0.020	<0.020	0.166	<0.005	0.038	<0.00020	<0.010	<0.010	<0.020	0.16	26.1	157	5.08	7.3	19	410	--	--	--
	3/16/00	**0.117**	<0.010	<0.250	<0.002	<0.020	<0.020	**1.94**	<0.005	**0.922**	<0.00020	<0.010	<0.010	<0.020	0.199	50.9	202	3.78				--	--	--
	3/23/01	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	0.158	<0.005	0.010	<0.00020	<0.010	<0.010	<0.020	<0.050	26.1	113	2.81	6.9	16	150	--	--	--
	10/4/01	**0.116**	<0.010	<0.250	<0.002	<0.020	<0.020	<0.100	<0.005	0.029	<0.00020	<0.010	<0.010	<0.020	0.3	99.0	343	5.30	7.4	19	440	--	--	--
	3/28/02	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	0.201	<0.005	0.010	--	<0.010	<0.010	0.027	0.32	41.9	177	3.18	7.0	11	400	--	--	--
	10/3/02	**0.317**	<0.010	<0.250	<0.002	<0.020	<0.020	0.767	<0.005	0.052	<0.00020	<0.010	<0.010	<0.020	0.75	73.3	300	3.07		19	330	--	--	--
	3/25/03	**0.673**	<0.010	<0.250	<0.002	<0.020	<0.020	0.607	<0.005	0.024	<0.00020	<0.010	<0.010	<0.020	0.115	31.6	119	2.08	6.9	18	440	--	--	--
	10/2/03	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	0.705	<0.005	0.072	<0.00020	<0.010	<0.010	<0.020	0.446	29.4	181	2.38	6.3	15	249	--	--	--
	4/28/04	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	0.179	<0.005	0.080	<0.00020	<0.010	<0.010	<0.020	0.374	70.4	176	2.06	--	11.7	281	--	--	--
	10/26/04	**0.145**	<0.010	<0.250	<0.002	<0.020	<0.020	0.132	<0.005	0.036	<0.00020	<0.010	<0.010	<0.020	0.209	58.8	217	2.62	--	--	397	--	--	--
	4/27/05	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	0.105	<0.005	0.011	<0.00020	<0.010	<0.010	<0.020	0.149	41.4	174	2.15	--	--	294	--	--	--
	10/20/05	**0.347**	<0.010	<0.250	<0.002	<0.020	**0.084**	0.453	<0.005	0.015	<0.00020	<0.010	<0.010	**0.055**	0.288	47.6	213	9.50	--	--	232	--	--	--
	10/19/06	**0.937**	<0.010	<0.250	<0.002	<0.020	<0.020	**1.63**	<0.005	0.130	<0.00020	<0.010	<0.010	0.022	0.226	59.2	168	2.97	--	--	423	--	--	--
	4/27/07	**0.446**	<0.010	<0.250	<0.002	<0.020	<0.020	**1.24**	<0.005	0.018	<0.00020	<0.010	<0.010	<0.020	0.188	27.4	128	3.60	--	--	209	--	--	--
	11/19/07	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	0.104	<0.005	0.011	<0.00020	<0.010	<0.010	<0.020	0.117	61.5	243	3.54	--	--	371	--	--	--
	4/30/08	**0.170**	<0.010	<0.250	<0.002	<0.020	<0.020	0.242	<0.005	0.021	<0.00020	<0.010	<0.010	<0.020	0.238	56.3	171	2.69	--	--	260	--	--	--
	10/29/08	<0.100	<0.010	0.0564	0.0003	<0.010	0.003	0.0206	<0.010	0.006	**0.00005**	<0.010	<0.010	**0.051**	0.229	76.3	254	2.87	--	--	392	--	--	--
	4/30/09	<0.100	<0.010	0.0648	<0.001	<0.010	<0.010	0.0778	0.0054	0.0083	<0.0002	**0.0099**	<0.010	0.0159	0.302	52.3	211	4.47	--	--	325	--	--	--
	8/26/09	--	--	0.072	<0.001	<0.005	--	0.16	<0.005	0.014	--	<0.020	--	--	--	45	--	--	8.1	22.0	1,490	10.0	94	9.1
	10/12/09	**0.089**	0.0027	0.063	<0.001	0.0008	0.0011	0.086	<0.005	0.0073	<0.0002	<0.020	<0.005	<0.30	0.37	49	240	8.6	7.8	13.1	2,380	8.9	160	12.7
	4/19/10	**0.19**	<0.010	0.064	<0.001	<0.005	<0.010	0.24	<0.005	0.012	<0.0002	<0.020	<0.005	<0.030	0.40	33	190	4.90	8.1	12.0	557	63.1	199	10.7
	10/11/10	0.052	0.0011	0.071	<0.001	0.0016	<0.025	0.16	<0.005	0.016	<0.0002	<0.005	<0.005	0.036	0.64	40	240	3.3	7.8	16.5	455	8.0	107	12.8
	4/20/11	0.062	<0.001	0.066	<0.0001	<0.005	<0.001	0.28	<0.001	0.013	<0.0001	<0.001	<0.001	<0.010	0.30	30	140	3.4	7.6	18.0	270	4.0	211	9.7
	10/18/11	**0.153**	<0.005	0.0767	<0.001	<0.005	<0.005	0.190	<0.005	0.0096	<0.00020	<0.010	<0.005	<0.010	0.25	39.2	210	5.7	7.5	16.9	289	8.3	236	9.6

TABLE A2
SURFACE WATER ANALYTICAL RESULTS SUMMARY
ASH LANDFILL - PERMIT 34-05
RURAL HALL, NORTH CAROLINA

Sample Location / ID	Date	Aluminum	Arsenic	Barium	Cadmium	Chromium (Total)	Copper	Iron	Lead	Manganese	Mercury	Selenium	Silver	Zinc	Nitrate-nitrogen	Sulfate	Dissolved Solids	Total Organic Carbon	pH	Temperature (degrees Celsius)	Conductivity (µmhos/cm)	Turbidity (NTUs)	Oxidation-Reduction Potential (mV)	Dissolved Oxygen
NC 2L Ground Water Standard		NE	0.010	0.700	0.002	0.010	1.0	0.300	0.015	0.050	0.001	0.020	0.020	1.00	10.0	250	500	NE	6.5 - 8.5	NE	NE	NE	NE	NE
Solid Waste Section Limit		NE	0.010	0.100	0.001	0.010	0.010	0.300	0.010	0.050	0.0002	0.010	0.01	0.01	10.0	250	NE	NE	NE	NE	NE	NE	NE	NE
NC 2B Surface Water Standard		0.087	0.050	1.0 [1]	0.002	0.050	0.007	1.0	0.025	0.200 [1]	0.000012	0.005	0.00006	0.05	10.0 [1]	250 [1]	500 [1]	NE	6.0 - 9.0	NE	NE	NE	NE	>5.0
SS-02	9/21/90	**0.130**	<0.010	0.094	**0.0046**	<0.020	<0.020	0.1	<0.005		<0.00020	<0.010	<0.010	<0.020	1.14	47	141	15.0	7.5	14.6	607	--	--	--
	10/23/91		<0.010	0.17	<0.002	<0.020	<0.020	0.82	<0.005	**0.711**	<0.00020	<0.010	<0.010	**0.08**	1.02	**490**	**806**	10.0	7.8	18	1,280	--	--	--
	3/26/92	**7.650**	<0.010	<0.250	**0.0021**	<0.020	<0.020	**8.07**	0.0129	0.130	<0.00020	<0.010	<0.010	<0.020	0.25	13	149	12.0	6.0	11.5	111	--	--	--
	9/30/92	**0.330**	<0.010	<0.250	<0.002	<0.020	<0.020		<0.005		<0.00020	**0.0073**	<0.010	<0.020	0.55	183	474	3.0	6.1	15.1	778	--	--	--
RHSS-002	3/31/93	**0.208**	<0.010	<0.250	<0.002	<0.020	<0.020	0.675	<0.005	**0.327**	<0.00020	<0.010	<0.010	<0.020	0.35	70	185	4.0	5.8	14.1	341	--	--	--
Surface Water - Downstream	9/17/93	**0.470**	<0.010	<0.250	<0.002	<0.020	<0.020	**1.27**	<0.005	**0.722**	<0.00020	<0.010	<0.010	<0.020	2.3	154	**523**	4.0	7.5	22.2	754	--	--	--
	3/30/94	**0.220**	<0.010	<0.250	<0.002	0.032	<0.020	**1.12**	<0.005	0.117	<0.00020	<0.010	<0.010	**0.165**	0.32	40	143		6.0	14.4	692	--	--	--
	9/30/94	**0.120**	<0.010	<0.250	<0.002	<0.020	**0.028**	0.47	<0.005	**0.356**	<0.00020	<0.010	<0.010	0.024	0.325	135	397	37.9	7.4	18.6	573	--	--	--
	3/31/95	**0.165**	<0.010	<0.250	<0.002	<0.020	<0.020	0.526	<0.005	**0.332**	<0.00020	<0.010	<0.010	0.041	0.75	102	342		7.9	14.5	496	--	--	--
	9/29/95	**0.406**	<0.010	<0.250	<0.002	<0.020	<0.020	**1.02**	0.006	**0.598**	<0.00020	<0.010	<0.010	<0.020	1.03	155	**505**	2.68	5.6	13.5	1,095	--	--	--
	3/30/96	**0.426**	<0.010	<0.250	<0.002	<0.020	<0.020	0.787	<0.005	**0.250**	<0.00020	<0.010	<0.010	<0.020	0.19	31	198	2.99	6.5	12	282	--	--	--
	9/27/96	0.061	<0.010	<0.250	<0.002	<0.020	<0.020	0.227	0.01	**0.262**	<0.00020	<0.010	<0.010	0.047	0.75	147	409	3.19	7.6	20	613	--	--	--
	3/29/97	**0.209**	<0.010	<0.250	<0.002	<0.020	<0.020	0.644	<0.005	**0.246**	<0.00020	<0.010	<0.010	0.01	0.45	73	255	2.47	7.8	16	224	--	--	--
	9/17/97	**0.165**	<0.010	<0.250	<0.002	<0.020	<0.020	0.428	0.006	**0.333**	<0.00020	<0.005	<0.010	**0.153**	2.21	160	**562**	2.43	7.8	18	826	--	--	--
	3/27/98	**0.220**	<0.010	<0.250	<0.002	<0.020	<0.020	0.960	<0.005	**0.363**	<0.00020	<0.010	<0.010	0.032	0.550	94	324	3.96	7.8	17.5	724	--	--	--
	9/30/98	**0.100**	<0.010	<0.250	<0.002	<0.020	<0.020	0.595	<0.005	**0.351**	<0.00020	<0.010	<0.010	<0.020	1.55	89	444	6.85	7.4	19	368	--	--	--
	3/31/99	**0.129**	<0.010	<0.250	<0.002	<0.020	<0.020	0.947	<0.005	**0.587**	<0.00020	<0.010	<0.010	<0.020	1.55	204	420	3.26	7.4	17	340	--	--	--
	9/29/99	**1.380**	<0.010	<0.250	<0.002	<0.020	<0.020	**3.03**	<0.005	0.147	<0.00020	<0.010	<0.010	0.021	0.16	46	173	8.10	7.6	17	623	--	--	--
	9/15/00	**0.283**	<0.010	<0.250	<0.002	<0.020	<0.020	0.225	<0.005	**0.416**	<0.00020	<0.010	<0.010	<0.020	1.24	170	439	6.58	7.4	20	640	--	--	--
	3/16/00	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	0.96	<0.005	**0.464**	<0.00020	<0.010	<0.010	<0.020	1.18	175	500	3.75				--	--	--
	3/23/01	**0.108**	<0.010	<0.250	<0.002	<0.020	<0.020	0.26	0.007	0.135	<0.00020	<0.010	<0.010	0.034	0.103	72	224	3.08	6.6	16	170	--	--	--
	10/4/01	**0.166**	<0.010	<0.250	<0.002	<0.020	<0.020	0.746	0.008	**0.91**	<0.00020	<0.010	<0.010	<0.020	6.32	**421**	**1,250**	27	7.2	19	680	--	--	--
	3/28/02	**0.121**	<0.010	<0.250	<0.002	<0.020	<0.020	0.502	<0.005	**0.206**	--	<0.010	<0.010	<0.020	0.32	127	405	2.97	7.4	11	510	--	--	--
	10/3/02	**0.220**	<0.010	<0.250	<0.002	<0.020	<0.020	0.494	<0.005	**0.549**	<0.00020	<0.010	<0.010	<0.020	1.11	**266**	**517**	4.28	5.8	18	130	--	--	--
	3/25/03	**1.57**	<0.010	<0.250	<0.002	<0.020	<0.020	**1.28**	0.006	**0.264**	<0.00020	<0.010	<0.010	0.024	0.162	90	234	1.91	6.0	18	1,260	--	--	--
duplicate	3/25/03	**1.75**	<0.010	<0.250	<0.002	<0.020	<0.020	**1.32**	<0.005	**0.265**	<0.00020	<0.010	<0.010	0.024	0.194	95	235	2.00	6.0	18	1,260	--	--	--
	10/2/03	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	**1.01**	<0.005	**0.546**	<0.00020	<0.010	<0.010	<0.020	0.61	115	395	2.50	6.5	14	556	--	--	--
	4/28/04	**0.109**	<0.010	<0.250	<0.002	<0.020	<0.020	0.40	<0.005	**0.417**	<0.00020	<0.010	<0.010	<0.020	0.608	220	394	2.26	--	12.7	623	--	--	--
	10/26/04	**0.216**	<0.010	<0.250	<0.002	<0.020	<0.020	0.839	<0.005	**0.582**	<0.00020	<0.010	<0.010	<0.020	2.00	**276**	**554**	3.06	--	--	807	--	--	--
	4/27/05	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	0.356	<0.005	**0.272**	<0.00020	<0.010	<0.010	<0.020	0.648	38	460	2.48	--	--	737	--	--	--
	10/20/05	<0.100	<0.010	<0.250	<0.002	<0.020	**0.072**	**1.12**	<0.005	**0.33**	<0.00020	<0.010	<0.010	0.048	0.546	240	**571**	3.4	--	--	419	--	--	--
	10/19/06	**0.530**	<0.010	<0.250	<0.002	<0.020	<0.020	**1.06**	<0.005	**0.534**	<0.00020	<0.010	<0.010	0.032	0.299	204	422	3.49	--	--	550	--	--	--
	4/27/07	**0.389**	<0.010	<0.250	<0.002	<0.020	<0.020	0.811	<0.005	**0.488**	<0.00020	<0.010	<0.010	<0.020	0.333	**439**	303	4.42	--	--	511	--	--	--
	11/19/07	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	0.136	<0.005	**0.308**	<0.00020	<0.010	<0.010	0.023	0.258	**300**	**647**	3.54	--	--	908	--	--	--
	4/30/08	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	0.278	<0.005	**0.254**	<0.00020	<0.010	<0.010	0.046	0.285	159	371	2.74	--	--	569	--	--	--
	10/29/08	<0.100	<0.010	0.0563	0.00024	<0.010	<0.010	0.128	<0.010	**0.318**	<0.00020	<0.010	<0.010	0.0142	0.407	**342**	**708**	3.43	--	--	1,070	--	--	--
	4/30/09	<0.100	<0.010	0.0608	<0.001	<0.010	<0.010	0.0894	<0.010	**0.222**	<0.0002	<0.010	<0.010	0.0192	0.499	201	**518**	3.39	--	--	821	--	--	--
	8/26/09	--	--	0.071	<0.001	<0.005	--	0.11	<0.005	**0.220**	--	<0.020	--	--	--	**310**	--	--	7.8	21.6	2,120	6.4	101	6.4
	10/12/09	0.043	0.0051	0.06	<0.001	0.0008	<0.010	0.045	<0.005	0.048	<0.0002	<0.020	<0.005	<0.30	0.32	210	**510**	10.3	7.8	13.3	3,360	8.7	123	13.0
	4/19/10	<0.10	<0.010	0.064	<0.001	<0.005	<0.010	0.26	<0.005	**0.26**	<0.0002	<0.020	<0.005	<0.030	0.42	150	390	6.3	7.6	10.6	632	60.1	181	10.2
	10/11/10	<0.250	0.0011	0.069	<0.001	0.0014	<0.025	0.27	<0.005	**0.310**	<0.0002	**0.0089**	<0.005	0.0064	1.2	250	**660**	4.7	7.6	15.2	999	0.0	113	8.3
	4/20/11	<0.040	<0.001	0.063	<0.0001	<0.005	<0.001	0.27	<0.001	0.150	<0.0001	0.004	<0.001	<0.010	0.63	120	360	3.0	7.6	18.6	602	4.2	241	9.7
	10/18/11	<0.100	<0.005	0.0749	<0.001	<0.005	<0.005	0.181	<0.005	**0.266**	<0.00020	<0.010	<0.005	<0.010	0.47	202	**582**	7.3	7.4	17.6	536	4.6	248	9.7

TABLE A2
SURFACE WATER ANALYTICAL RESULTS SUMMARY
ASH LANDFILL - PERMIT 34-05
RURAL HALL, NORTH CAROLINA

Sample Location / ID	Date	Aluminum	Arsenic	Barium	Cadmium	Chromium (Total)	Copper	Iron	Lead	Manganese	Mercury	Selenium	Silver	Zinc	Nitrate-nitrogen	Sulfate	Dissolved Solids	Total Organic Carbon	pH	Temperature (degrees Celsius)	Conductivity (µmhos/cm)	Turbidity (NTUs)	Oxidation-Reduction Potential (mV)	Dissolved Oxygen
NC 2L Ground Water Standard		NE	0.010	0.700	0.002	0.010	1.0	0.300	0.015	0.050	0.001	0.020	0.020	1.00	10.0	250	500	NE	6.5 - 8.5	NE	NE	NE	NE	NE
Solid Waste Section Limit		NE	0.010	0.100	0.001	0.010	0.010	0.300	0.010	0.050	0.0002	0.010	0.01	0.01	10.0	250	NE	NE	NE	NE	NE	NE	NE	NE
NC 2B Surface Water Standard		0.087	0.050	1.0 [1]	0.002	0.050	0.007	1.0	0.025	0.200 [1]	0.000012	0.005	0.00006	0.05	10.0 [1]	250 [1]	500 [1]	NE	6.0 - 9.0	NE	NE	NE	NE	>5.0
SS-10	8/11/09	--	--	0.065	<0.001	<0.005	--	**12**	<0.005	**0.40**	--	<0.020	--	--	--	11	--	--	7.1	20.6	1,890	42.9	-40	3.4
SS-15	8/11/09	--	--	0.052	<0.001	<0.005	--	0.90	<0.005	0.035	--	<0.020	--	--	--	7.5	--	--	7.8	20.7	1,840	52.5	114	9.7
SS-20	8/11/09	--	--	0.058	<0.001	<0.005	--	0.80	<0.005	0.046	--	<0.020	--	--	--	8.2	--	--	8.4	23.9	1,112	27.3	58	7.6
	4/21/11	**0.19**	<0.010	0.054	<0.0001	<0.005	<0.001	0.550	<0.001	0.017	<0.0001	<0.001	<0.001	<0.010	0.10	4.8	96	1.9	7.7	14.6	87	14.2	128	9.4
SS-25	8/11/09	--	--	0.060	<0.001	<0.005	--	0.59	<0.005	0.053	--	<0.020	--	--	--	28	--	--	8.4	22.1	1,830	32.1	75	7.6
	4/21/11	**0.15**	<0.010	0.050	<0.0001	<0.005	<0.001	0.047	<0.001	0.0082	<0.0001	<0.001	<0.001	<0.010	0.04	5.0	100	1.9	7.6	14.8	89	15.5	128	9.7
SS-30	8/11/09	--	--	0.072	<0.001	<0.005	--	0.15	<0.005	0.025	--	<0.020	--	--	--	95	--	--	8.5	22.8	5,250	21.7	57	8.1
	1/5/11	--	--	0.077	<0.0001	<0.005	--	0.33	<0.010	0.130	--	<0.010	--	--	--	63	370	--	8.6	3.9	388	6.9	132	10.4
	4/20/11	<0.040	<0.001	0.067	<0.0001	<0.005	<0.001	0.22	<0.001	0.089	<0.0001	<0.001	<0.001	<0.010	0.33	27	160	2.8	7.4	17.9	283	3.9	238	9.5
SS-40	8/26/09	--	--	0.091	<0.001	<0.005	--	0.08	<0.005	0.022	--	<0.020	--	--	--	**300**	--	--	7.8	21.3	2,050	7.1	89	7.9
	4/20/11	0.057	<0.001	0.059	<0.0001	<0.005	<0.001	0.33	<0.001	0.059	**0.00025**	0.0021	<0.001	<0.010	0.81	110	270	2.9	7.3	17.5	494	4.6	223	10.2
SS-50	8/11/09	--	--	0.029	<0.001	<0.005	--	**2.90**	<0.005	0.180	--	<0.020	--	--	--	5.6	--	--	7.8	25.4	1,180	32.0	-21	8.5
	4/21/11	**0.12**	<0.001	0.036	<0.0001	<0.005	<0.001	**1.10**	<0.001	0.085	<0.0001	<0.001	<0.001	<0.010	0.13	3.7	71	2.0	6.9	14.66	85	16.3	92	9.9
SS-60	8/26/09	--	--	0.14	<0.001	<0.005	--	0.28	<0.005	**0.980**	--	<0.020	--	--	--	**350**	--	--	7.1	20.3	4,040	65.9	10	6.7
	4/21/11	0.068	<0.001	0.061	<0.0001	<0.005	<0.001	0.24	<0.001	0.011	<0.0001	0.0041	<0.001	<0.010	0.12	130	270	2.7	7.2	15.9	446	14.3	177	8.9
SS-70	8/26/09	--	--	0.12	<0.001	<0.005	--	**1.10**	<0.005	**0.250**	--	<0.020	--	--	--	65	--	--	6.9	20.6	2,520	6.8	91	6.4
	4/21/11	**0.160**	<0.001	0.050	<0.0001	<0.005	<0.001	0.38	<0.001	0.0058	**0.00012**	<0.001	<0.001	<0.010	0.053	23	92	2.3	7.0	16.4	138	8.3	189	10.3
SS-80	8/26/09	--	--	0.12	<0.001	<0.005	--	0.25	<0.005	0.025	--	<0.020	--	--	--	82	--	--	7.1	20.6	5,190	5.8	100	8.3
	4/21/11	**0.11**	<0.001	0.056	<0.0001	<0.005	<0.001	0.31	<0.001	<0.005	<0.0001	<0.001	<0.001	<0.010	0.099	27	120	2.1	6.8	15.5	161	6.8	92	10.6
SS-90	1/4/11	--	--	0.044	<0.0001	<0.005	--	**1.20**	<0.010	0.016	--	<0.010	--	--	--	26	97	--	8.4	3.0	390	4.2	152	10.6
	4/20/11	0.083	<0.001	0.057	<0.0001	<0.005	<0.001	0.33	<0.001	0.021	<0.0001	0.0021	<0.001	<0.010	0.33	56	130	2.6	6.7	16.9	292	4.6	293	11.7

TABLE A2
SURFACE WATER ANALYTICAL RESULTS SUMMARY
ASH LANDFILL - PERMIT 34-05
RURAL HALL, NORTH CAROLINA

Sample Location / ID	Date	Aluminum	Arsenic	Barium	Cadmium	Chromium (Total)	Copper	Iron	Lead	Manganese	Mercury	Selenium	Silver	Zinc	Nitrate-nitrogen	Sulfate	Dissolved Solids	Total Organic Carbon	pH	Temperature (degrees Celsius)	Conductivity (µmhos/cm)	Turbidity (NTUs)	Oxidation-Reduction Potential (mV)	Dissolved Oxygen
NC 2L Ground Water Standard		NE	0.010	0.700	0.002	0.010	1.0	0.300	0.015	0.050	0.001	0.020	0.020	1.00	10.0	250	500	NE	6.5 - 8.5	NE	NE	NE	NE	NE
Solid Waste Section Limit		NE	0.010	0.100	0.001	0.010	0.010	0.300	0.010	0.050	0.0002	0.010	0.01	0.01	10.0	250	NE	NE	NE	NE	NE	NE	NE	NE
NC 2B Surface Water Standard		0.087	0.050	1.0 [1]	0.002	0.050	0.007	1.0	0.025	0.200 [1]	0.000012	0.005	0.00006	0.05	10.0 [1]	250 [1]	500 [1]	NE	6.0 - 9.0	NE	NE	NE	NE	>5.0
RETENTION POND MW-001	9/30/94	**2.58**	0.016	<0.250	<0.002	<0.020	**0.044**	**23.2**	<0.005	**6.49**	<0.00020	<0.010	<0.010	0.035	2.95	**787**	**2,230**	258.00	7.4	22.5	3,140	--	--	--
	3/31/95	**0.66**	<0.010	<0.250	<0.002	<0.020	<0.020	**5.15**	<0.005	**2.36**	<0.00020	<0.010	<0.010	**0.155**	8.88	**794**	**2,540**	459	7.8	17.5	3,680	--	--	--
	9/29/95	**0.156**	<0.010	<0.250	<0.002	<0.020	<0.020	**5.24**	0.008	**4.88**	<0.00020	<0.010	<0.010	<0.020	1.03	**801**	**2,660**	4.95	5.4	14.8	4,220	--	--	--
	3/30/96	**0.112**	<0.010	<0.250	0.002	<0.020	<0.020	**5.02**	<0.005	**5.4**	<0.00020	<0.010	<0.010	<0.020	2.08	--	**2,340**	6.65	7.2	15	3,050	--	--	--
	9/27/96	**0.167**	<0.010	<0.250	<0.002	<0.020	<0.020	--	0.009	**4.53**	<0.00020	<0.010	<0.010	**0.066**	1.70	**1,010**	**2,700**	4.04	7.3	23	1,510	--	--	--
Water from Sediment Basin at W-1	3/29/97	**0.097**	<0.010	<0.250	<0.002	<0.020	<0.020	**6.18**	<0.005	**5.46**	<0.00020	<0.010	<0.010	0.010	1.29	**1,050**	**2,460**	4.31	7.5	22	1,770	--	--	--
	3/17/97	**0.164**	<0.010	<0.250	<0.002	<0.020	<0.020	**3.66**	<0.005	**5.40**	<0.00020	<0.010	<0.010	**0.055**	0.608	**1,160**	**3,000**	6.43	7.2	22	3,660	--	--	--
duplicate	3/27/98	<0.100	0.010	<0.250	<0.002	<0.020	<0.020	**11.4**	<0.005	**5.90**	<0.00020	<0.010	<0.010	0.021	0.290	**942**	**2,780**	4.43	7.2	23.4	1,419	--	--	--
	9/30/98	**0.274**	<0.010	<0.250	<0.002	<0.020	<0.020		<0.005	**4.94**	<0.00020	<0.010	<0.010	<0.020		**666**	**2,700**	15.4	7.6	20	1,200	--	--	--
	3/31/99	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	**7.55**	0.006	**4.45**	<0.00020	<0.010	<0.010	<0.020	0.600	**1,560**	**2,930**	7.92	7.3	18	1,021	--	--	--
	9/29/99	**0.877**	<0.010	<0.250	<0.002	<0.020	<0.020	**6.77**	<0.005	**0.862**	<0.00020	<0.010	<0.010	**0.08**	3.36	**330**	**715**	13.30	7.1	18	2,930	--	--	--
	3/16/00	**0.41**	<0.010	<0.250	<0.002	<0.020	<0.020	**72**	<0.005	**4.54**	<0.00020	<0.010	<0.010	<0.020	1.09	**948**	**2,610**	10.60				--	--	--
	9/15/00	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	**2.02**	<0.005	**3.48**	<0.00020	<0.010	<0.010	<0.020	6.27	**894**	**2,470**	5.21	6.6	19	980	--	--	--
	3/23/01	**0.144**	<0.010	<0.250	**0.004**	<0.020	<0.020	**35.9**	0.012	**4.07**	<0.00020	<0.010	<0.010	<0.020	0.48	**926**	**2,630**	5.85	6.5	17	480	--	--	--
duplicate	3/23/01	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	**6.9**	0.007	**4.19**	<0.00020	<0.010	<0.010	<0.020	0.35	**939**	**2,640**	7.52	6.5	17	480	--	--	--
	10/4/01	**0.204**	<0.010	<0.250	<0.002	<0.020	<0.020	0.915	0.007	**0.229**	<0.00020	<0.010	<0.010	<0.020	<0.05	<5.00	186	7.8	6.3	20	300	--	--	--
	3/28/02	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	**5.1**	<0.005	**3.66**	--	<0.010	<0.010	<0.020	0.28	**1,000**	**3,010**	3.77	6.4	12	1,080	--	--	--
	10/3/02	<0.100	<0.010	<0.250	0.002	<0.020	**0.027**	**1.52**	<0.005	**3.34**	<0.00020	<0.010	<0.010	<0.020	1.82	**1,030**	**2,940**	4.94	6.7	18	370	--	--	--
duplicate	10/3/02	<0.100	<0.010	<0.250	0.002	<0.020	**0.024**	**1.58**	<0.005	**3.33**	<0.00020	<0.010	<0.010	<0.020	1.78	**1,040**	**2,860**	5.12	5.7	18	370	--	--	--
	3/25/03	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	**6.69**	0.006	**3.56**	<0.00020	<0.010	<0.010	0.025	0.406	**846**	**2,530**	3.72	6.6	17	330	--	--	--
	10/2/03	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	**11.3**	0.007	**3.88**	<0.00020	<0.010	<0.010	0.042	0.174	**916**	**2,710**	3.92	5.6	15	3,050	--	--	--
duplicate	10/2/03	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	**11.4**	0.006	**3.88**	<0.00020	<0.010	<0.010	<0.020	<0.050	**958**	**2,690**	3.9	5.6	15	3,170	--	--	--
	4/28/04	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	**11.1**	0.006	**6.08**	<0.00020	<0.010	<0.010	<0.020	<0.050	**1,460**	**2550**	5.36	--	17.3	2860	--	--	--
	10/26/04	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	**5.25**	<0.005	**4.55**	<0.00020	<0.010	<0.010	<0.020	0.287	**1,190**	**2,950**	3.64	--	--	3,480	--	--	--
	4/27/05	<0.100	<0.010	<0.250	0.002	<0.020	<0.020	**7.63**	0.007	**5.73**	<0.00020	<0.010	<0.010	<0.020	<0.050	**1,100**	**2,550**	4.71	--	--	2,870	--	--	--
	10/20/05	**1.63**	<0.010	<0.250	**0.004**	<0.020	**0.028**	**103**	0.006	**4.88**	<0.00020	<0.010	<0.010	**0.057**	0.428	**403**	**3,010**	89	--	--	529	--	--	--
	10/19/06	**0.172**	<0.010	<0.250	0.002	<0.020	**0.347**	**27.4**	<0.005	**3.60**	<0.00020	<0.010	<0.010	0.027	0.139	**1,320**	**2,850**	4.37	--	--	2,000	--	--	--
	4/27/07	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	**5.36**	<0.005	**2.38**	<0.00020	<0.010	<0.010	<0.020	0.287	**1,380**	**2,750**	4.01	--	--	4,830	--	--	--
	11/19/07	<0.100	0.042	<0.250	0.002	<0.020	<0.020	**48.2**	<0.005	**3.28**	<0.00020	<0.010	<0.010	0.025	<0.050	**1,560**	**3,060**	3.82	--	--	3,300	--	--	--
	4/30/08	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	**9.68**	<0.005	**2.99**	<0.00020	<0.010	<0.010	0.022	0.155	**1,100**	**2,910**	3.38	--	--	4,880	--	--	--
	10/29/08	<0.100	<0.010	0.0687	<0.001	<0.010	<0.010	**4.84**	0.0035	**2.88**	<0.00020	<0.010	<0.010	<0.010	<0.050	188	**3,060**	3.510	--	--	4,200	--	--	--
	4/30/09	<0.100	<0.010	0.0774	0.0018	<0.010	0.0036	**4.08**	0.0044	**3.10**	<0.0002	<0.010	<0.010	<0.010	0.264	37.7	**2,904**	3.940	--	--	4,070	--	--	--

TABLE A2
SURFACE WATER ANALYTICAL RESULTS SUMMARY
ASH LANDFILL - PERMIT 34-05
RURAL HALL, NORTH CAROLINA

Sample Location / ID	Date	Aluminum	Arsenic	Barium	Cadmium	Chromium (Total)	Copper	Iron	Lead	Manganese	Mercury	Selenium	Silver	Zinc	Nitrate-nitrogen	Sulfate	Dissolved Solids	Total Organic Carbon	pH	Temperature (degrees Celsius)	Conductivity (µmhos/cm)	Turbidity (NTUs)	Oxidation-Reduction Potential (mV)	Dissolved Oxygen
NC 2L Ground Water Standard		NE	0.010	0.700	0.002	0.010	1.0	0.300	0.015	0.050	0.001	0.020	0.020	1.00	10.0	250	500	NE	6.5 - 8.5	NE	NE	NE	NE	NE
Solid Waste Section Limit		NE	0.010	0.100	0.001	0.010	0.010	0.300	0.010	0.050	0.0002	0.010	0.01	0.01	10.0	250	NE	NE	NE	NE	NE	NE	NE	NE
NC 2B Surface Water Standard		0.087	0.050	1.0 [1]	0.002	0.050	0.007	1.0	0.025	0.200 [1]	0.000012	0.005	0.00006	0.05	10.0 [1]	250 [1]	500 [1]	NE	6.0 - 9.0	NE	NE	NE	NE	>5.0
RETENTION POND MW-003	9/30/94	**1.77**	<0.010	<0.250	<0.002	<0.020	**0.113**	**3.37**	<0.005	**2.2**	<0.00020	<0.010	<0.010	**0.096**	0.20	159	415	20.1	6.9	19.6	519	--	--	--
	3/31/95		<0.010	<0.250	<0.002	<0.020	<0.020	**4.86**	<0.005	**5.98**	<0.00020	<0.010	<0.010	0.032	0.10	**294**	**625**		7.6	13.6	896	--	--	--
	9/29/95	**1.64**	<0.010	<0.250	<0.002	<0.020	<0.020	**3.42**	0.007	**2.94**	<0.00020	<0.010	<0.010	**0.104**	0.463	**314**	**740**	3.74	4.9	14	1,040	--	--	--
	3/30/96	**11.4**	<0.010	<0.250	0.002	<0.020	<0.020	**23.3**	0.009	**3.16**	<0.00020	<0.010	<0.010	**0.126**	0.13	222	**552**	3.83	7.2	12	750	--	--	--
	9/27/96	**0.11**	<0.010	<0.250	<0.002	<0.020	<0.020	**1.01**	0.007	**2.36**	<0.00020	<0.010	<0.010	0.03	0.16	**283**	**737**	6.73	7.6	20	974	--	--	--
Water from Sediment Basin at W-3	3/29/97	**0.238**	<0.010	<0.250	<0.002	<0.020	<0.020	**1.93**	<0.005	**3.05**	<0.00020	**0.013**	<0.010	0.02	0.18	**809**	**807**	4.17	7.8	16	590	--	--	--
	9/17/97	**0.169**	<0.010	<0.250	<0.002	<0.020	<0.020	0.715	0.005	**3.06**	<0.00020	**0.006**	<0.010	**0.212**	0.330	**562**	**1,290**	5.29	7.7	19	1,650	--	--	--
	3/27/98	**0.270**	<0.010	<0.250	<0.002	<0.020	<0.020	**2.50**	<0.005	**3.37**	<0.00020	**0.013**	<0.010	0.041	0.250		**929**	6.98	7.2	20.0	1,214	--	--	--
	9/30/98	**0.353**	<0.010	<0.250	<0.002	<0.020	<0.020	**1.38**	<0.005		<0.00020	**0.017**	<0.010	<0.020	0.780	**367**	**1,280**	10.1	6.9	19	920	--	--	--
	3/31/99	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	**4.83**	<0.005	**5.55**	<0.00020	<0.010	<0.010	<0.020	0.19	**482**	**842**	7.58	7.1	16	592	--	--	--
	9/29/99	**0.677**	<0.010	<0.250	<0.002	<0.020	<0.020	**1.94**	<0.005	**0.894**	<0.00020	<0.010	<0.010	<0.020	0.10	**258**	413	8.14	7.7	19	741	--	--	--
	9/15/00	**0.224**	<0.010	<0.250	<0.002	<0.020	<0.020	**2.38**	<0.005	**2.8**	<0.00020	<0.010	<0.010	<0.020	0.16	**550**	**1,260**	8.58	7.1	21	680	--	--	--
	3/23/01	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	**3.69**	0.010	**2.25**	<0.00020	<0.010	<0.010	0.030	0.23	**530**	**1,230**	5.72	6.6	17	640	--	--	--
	10/4/01	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	**4.24**	0.006	**3.65**	<0.00020	<0.010	<0.010	<0.020	0.08	**592**	**1,440**	30	7.0	20	600	--	--	--
	3/28/02	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	**5.62**	<0.005	**2.18**	--	<0.010	<0.010	<0.020	0.11	**682**	**1,590**	5.36	6.4	13	680	--	--	--
	10/3/02	<0.100	<0.010	<0.250	0.002	<0.020	<0.020	**6.51**	<0.005	**5.29**	<0.00020	<0.010	<0.010	<0.020	<0.050	**932**	**1,900**	8.51	6.2	19	150	--	--	--
	3/25/03	**3.28**	<0.010	<0.250	<0.002	<0.020	<0.020	**6.17**	0.008	**4.29**	<0.00020	<0.010	<0.010	**0.078**	0.088	**784**	**1,520**	1.34	6.4	18	110	--	--	--
	10/2/03	**0.634**	<0.010	<0.250	<0.002	<0.020	<0.020	**5.95**	0.008	**6.75**	<0.00020	<0.010	<0.010	0.05	0.174	**765**	**1,420**	3.97	6.1	14	1,460	--	--	--
	4/28/04	**0.152**	<0.010	<0.250	<0.002	<0.020	<0.020	**8.37**	<0.005	**6.72**	<0.00020	<0.010	<0.010	<0.020	0.224	**1,040**	**1810**	3.89	--	12.1	2030	--	--	--
	10/26/04	**0.554**	<0.010	<0.250	**0.005**	<0.020	<0.020	**16.3**	<0.005	**4.22**	<0.00020	<0.010	<0.010	0.036	0.289	**1,070**	**2,140**	5.16	--	--	2,150	--	--	--
	4/27/05	<0.100	<0.010	<0.250	0.002	<0.020	<0.020	**4.47**	<0.005	**6.11**	<0.00020	<0.010	<0.010	<0.020	0.246	**1,075**	**2,090**	4.05	--	--	2,320	--	--	--
	10/20/05	<0.100	<0.010	<0.250	**0.005**	<0.020	**0.027**	**7.90**	<0.005	**5.87**	<0.00020	<0.010	<0.010	0.044	0.279	**1,300**	**2,090**	30	--	--	1,060	--	--	--
	10/19/06	<0.100	<0.010	**1.46**	<0.002	<0.020	<0.020	**6.04**	<0.005	**4.55**	<0.00020	<0.010	<0.010	0.021	0.281	**1,170**	**1,920**	4.2	--	--	1,370	--	--	--
	4/27/07	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	**8.33**	<0.005	**4.19**	<0.00020	<0.010	<0.010	<0.020	0.290	**1,130**	**2,130**	3.83	--	--	2,230	--	--	--
	11/19/07	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	**8.20**	<0.005	**6.00**	<0.00020	<0.010	<0.010	<0.020	0.064	**1,680**	**2,550**	4.59	--	--	2,710	--	--	--
	4/30/08	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	**3.36**	<0.005	**3.80**	<0.00020	<0.010	<0.010	0.037	0.297	**2,090**	**2,110**	3.56	--	--	2,290	--	--	--
	10/29/08	<0.100	<0.010	0.0593	<0.001	<0.010	<0.010	**2.88**	0.0023	**4.36**	<0.00020	<0.010	<0.010	<0.010	0.171	**988**	**2,360**	3.48	--	--	2,740	--	--	--
	4/30/09	<0.100	<0.010	0.0532	<0.001	<0.010	<0.010	**4.62**	0.0072	**4.96**	<0.00020	<0.010	<0.010	0.0146	0.337	**261**	**2,460**	4.11	--	--	2,930	--	--	--

All concentrations in milligrams per liter.
-- - Not sampled

NE - Not established
[1] - No freshwater aquatic life standard established. Water Supply criteria presented.

Gray background indicates exceedance of NC 2B Surface Water Standard

TABLE A3
QUALITY CONTROL ANALYTICAL RESULTS SUMMARY
ASH LANDFILL - PERMIT 34-05
RURAL HALL, NORTH CAROLINA

Sample Location / ID	Date	Aluminum	Arsenic	Barium	Cadmium	Chromium (Total)	Copper	Iron	Lead	Manganese	Mercury	Selenium	Silver	Zinc	Nitrate-nitrogen	Sulfate	Dissolved Solids	Total Organic Carbon	pH	Temperature (degrees Celsius)	Conductivity (µmhos/cm)
NC 2L Ground Water Standard		NE	0.010	0.700	0.002	0.010	1.0	0.300	0.015	0.050	0.001	0.020	0.020	1.00	10.0	250	500	NE	6.5 - 8.5	NE	NE
Solid Waste Section Limit		NE	0.010	0.100	0.001	0.010	0.010	0.300	0.010	0.050	0.0002	0.010	0.01	0.01	10.0	250	NE	NE	NE	NE	NE
Field Blank	9/30/98	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	<0.100	<0.005	<0.010	<0.00020	<0.010	<0.010	<0.020	<0.050	<5.00	<5.00	<1.0	NS	NS	NS
	3/31/99	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	<0.100	<0.005	<0.010	<0.00020	<0.010	<0.010	<0.020	0.19	<5.00	<5.00	2.18	NS	NS	NS
	9/15/00	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	<0.100	<0.005	<0.010	<0.00020	<0.010	<0.010	<0.020	<0.050	<5.00	<5.0	<1.0	NS	NS	NS
	3/23/01	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	<0.100	0.006	<0.010	<0.00020	<0.010	<0.010	<0.020	<0.050	<5.00	14	<1.0	NS	NS	NS
	10/4/01	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	<0.100	0.006	<0.010	<0.00020	<0.010	<0.010	<0.020	0.3	<5.00	15	<2.0	NS	NS	NS
	3/28/02	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	<0.100	<0.005	<0.010	NS	<0.010	<0.010	<0.020	<0.050	<5.00	14	<1.0	NS	NS	NS
	10/3/02	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	<0.100	<0.005	<0.010	<0.00020	<0.010	<0.010	<0.020	<0.050	<5.00	6	<1.0	NS	NS	NS
	3/25/03	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	<0.100	<0.005	<0.010	<0.00020	<0.010	<0.010	<0.020	0.198	<5.00	<5.00	<1.0	NS	NS	NS
	10/2/03	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	<0.100	<0.005	<0.010	<0.00020	<0.010	<0.010	<0.020	<0.050	<5.00	<5.00	<1.0	NS	NS	NS
	4/28/04	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	<0.100	<0.005	<0.010	<0.00020	<0.010	<0.010	<0.020	<0.050	<5.00	6	<1.0	NS	NS	NS
	10/26/04	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	<0.100	<0.005	<0.010	<0.00020	<0.010	<0.010	<0.020	0.151	<5.00	10	2.18	NS	NS	NS
	4/27/05	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	<0.100	<0.005	<0.010	<0.00020	<0.010	<0.010	<0.020	<0.050	<5.00	12	1.79	NS	NS	<30
	10/20/05	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	<0.100	<0.005	<0.010	<0.00020	<0.010	<0.010	<0.020	0.101	<5.00	<5.00	<0.50	NS	NS	<30
	10/19/06	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	<0.100	<0.005	<0.010	<0.00020	<0.010	<0.010	<0.020	<0.050	<5.00	<5.00	<0.50	NS	NS	<30
	4/27/07	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	<0.100	<0.005	<0.010	<0.00020	<0.010	<0.010	<0.020	<0.050	<5.00	<5.00	<0.50	NS	NS	<30
	11/19/07	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	<0.100	<0.005	<0.010	<0.00020	<0.010	<0.010	<0.020	<0.050	<5.00	<5.00	<0.50	NS	NS	<30
	4/30/08	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	<0.100	<0.005	<0.010	<0.00020	<0.010	<0.010	<0.020	0.336	<5.00	<5.00	<0.50	NS	NS	<30
	10/29/08	<0.100	<0.010	0.0031	<0.001	<0.010	<0.010	<0.050	<0.010	<0.010	0.00002	<0.010	0.0022	0.010	<0.050	<10	<5.00	<0.50	NS	NS	<30
	4/30/09	<0.100	<0.010	0.0077	<0.001	<0.010	<0.010	<0.050	0.0045	0.008	<0.0002	<0.010	<0.010	<0.010	<0.050	<10	90	<0.50	NS	NS	109
Travel Blank (Trip)	9/30/98	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	<0.100	<0.005	<0.010	<0.00020	<0.010	<0.010	<0.020	<0.050	<5.00	<5.00	<1.0	NS	NS	NS
	3/31/99	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	<0.100	<0.005	<0.010	<0.00020	<0.010	<0.010	<0.020	0.22	<5.00	15	<1.00	NS	NS	NS
	9/15/00	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	<0.100	<0.005	<0.010	<0.00020	<0.010	<0.010	<0.020	<0.050	<5.00	<5.0	<1.0	NS	NS	NS
	3/23/01	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	<0.100	<0.005	<0.010	<0.00020	<0.010	<0.010	<0.020	<0.050	<5.00	14	1.03	NS	NS	NS
	10/4/01	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	<0.100	0.005	<0.010	<0.00020	<0.010	<0.010	<0.020	0.4	<5.00	12	2.0	NS	NS	NS
	3/28/02	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	<0.100	<0.005	<0.010	NS	<0.010	<0.010	<0.020	<0.050	<5.00	14	1.03	NS	NS	NS
	10/3/02	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	<0.100	<0.005	<0.010	<0.00020	<0.010	<0.010	<0.020	<0.050	<5.00	<5.00	<0.50	NS	NS	NS
	3/25/03	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	<0.100	<0.005	<0.010	<0.00020	<0.010	<0.010	<0.020	0.197	<5.00	7	<1.0	NS	NS	NS
	10/2/03	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	<0.100	<0.005	<0.010	<0.00020	<0.010	<0.010	<0.020	<0.050	<5.00	7	<1.0	NS	NS	NS
	4/28/04	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	<0.100	<0.005	<0.010	<0.00020	<0.010	<0.010	<0.020	<0.050	<5.00	16	<1.0	NS	NS	NS
	10/26/04	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	<0.100	<0.005	<0.010	<0.00020	<0.010	<0.010	<0.020	<0.050	<5.00	8	1.29	NS	NS	NS
	4/27/05	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	<0.100	<0.005	<0.010	<0.00020	<0.010	<0.010	<0.020	<0.050	<5.00	14	1.76	NS	NS	<30
	10/20/05	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	<0.100	<0.005	<0.010	<0.00020	<0.010	<0.010	<0.020	<0.050	<5.00	6	<0.50	NS	NS	<30
	10/19/06	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	<0.100	<0.005	<0.010	<0.00020	<0.010	<0.010	<0.020	<0.050	<5.00	<5.00	<0.50	NS	NS	<30
	4/27/07	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	<0.100	<0.005	<0.010	<0.00020	<0.010	<0.010	<0.020	<0.050	<5.00	<5.00	<0.50	NS	NS	<30
	11/19/07	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	<0.100	<0.005	<0.010	<0.00020	<0.010	<0.010	<0.020	<0.050	<5.00	<5.00	<0.50	NS	NS	<30
	4/30/08	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	<0.100	<0.005	<0.010	<0.00020	<0.010	<0.010	<0.020	<0.050	<5.00	<5.00	<0.50	NS	NS	<30
	10/29/08	<0.100	<0.010	0.0046	<0.001	<0.010	<0.010	<0.050	<0.010	<0.010	0.00001	<0.010	<0.010	<0.010	<0.050	<10	<5.00	<0.50	NS	NS	<30
	4/30/09	<0.100	<0.010	0.0086	0.0003	<0.010	<0.010	<0.050	<0.010	0.0071	<0.0002	<0.010	<0.010	<0.010	<0.050	<10	85	<0.50	NS	NS	115

All concentrations in milligrams per liter. NE - Not established NS - Not sampled