Corrective Action Plan

Prepared for

Alexander County Landfill - Permit #02-01
Taylorsville, Alexander County, North Carolina

MESCO Project Number: G07060.0

Completed on 9/19/2008
Revised on 2/6/2009

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1 INTRODUCTION

1.1 Site Background

The Alexander County Construction and Demolition (C&D) landfill is located at 2500 Payne Dairy Road, Taylorsville, Alexander County, North Carolina. Alexander County C&D landfill operates under permit #02-01. The C&D landfill is operated within the area covered under the transition plan. Prior to operating as a C&D landfill, the site operated as a Municipal Solid Waste (MSW) unlined sanitary landfill that consisted of two units. The western unit was closed prior to October 9, 1991 with a 24-inch final soil cover. The second, eastern unit was closed by mid-1999, with an 18-inch cohesive soil cap with permeability of 1 x 10^{-5} cm/sec, and 18 inches of erosive layer.[9] The C&D landfill was constructed and is operating on top of the western MSW unit. The site is monitored under 15A NCAC 13B.1630. A topographic map showing the location of the site is included as **Plate 1**.

1.2 Aquifer Characteristics

The site lies within the Inner Piedmont physiographic province which is characterized by gently rolling hills with moderately sloped valleys. Total relief across the facility is approximately 180 feet. Multiple drainage features control surfacewater flow off the site. The northern and western portions of the site have three drainage features, the primary feature being a tributary of the Little River. The Little River drains into the Catawba River southwest of the facility. The southern portion of the site has five drainage features that also empty into the Catawba River, one of which is located immediately off the property line. A site map showing the layout of the permitted facility is included as **Plate 2**.

The lithology below the site consists of regolith and bedrock. The regolith ranges in thickness from 10 to 31 feet, and consists of tan to orange clayey silt and coarse to fine-grained sand (saprolite) produced by in-situ weathering of the interlayered schist and gneiss bedrock.[4][6] The schist is composed of muscovite, biotite, and sillimanite with minor garnet and pyrite. Gneiss layers are gradational, thin to thick, with biotite, feldspar, and quartz. Pronounced ridges that are more resistant to weathering contain relatively greater amounts of sillimanite and quartz than the surrounding rock. The area has many overturned antiformal and synformal rock units that tend to generally strike to the northeast, with fold axes generally plunging at angles from 25° to 45°. [4]

Regionally, Alexander County is located in the Piedmont groundwater region of the United States.[4] The aquifer consists of three layers- the uppermost unconsolidated regolith, the partially weathered rock (PWR) transition, and the upper 15 feet of highly fractured rock. Groundwater typically occurs at depths of 20-40 feet below ground surface (bgs), with the shallowest depths occurring in draws and near drainage features. Groundwater depths in the monitoring wells have been generally consistent over time, and occur in the following depth ranges:

- ≤ 20 ft. bgs: *MW-4R, MW-8, MW-9, MW-17, MW-22, MW-23*
- 20 to 30 ft. bgs: *MW-2, MW-3, MW-6, MW-15 MW-21, MW-26, MW-27*
- 30 to 40 ft. bgs: *MW-1, MW-5, MW-7, MW-10, MW-13, MW-14 MW-16, MW-24, MW-25*
- > 40 ft. bgs: *MW-1A, MW-1B, MW-11, MW-12, MW-12D, MW-18, MW-19, MW-20*

Historical groundwater elevations are provided in **Table 2**. Groundwater exhibits flow dynamics that are primarily controlled by the topographical high and local drainage features. Groundwater flow at the site is in a general westerly direction, with southwesterly and northwesterly flow away from the waste limits. A single-day potentiometric map depicting groundwater flow conditions on June 20, 2008 is provided as **Plate 3**.

Hydraulic conductivities, hydraulic gradients, and average linear groundwater velocities are summarized in **Table 3**. Hydraulic conductivity values, as determined from slug testing, ranged from 1.60 x 10^{-6} cm/sec (MW-7) to 1.33 x 10^{-2} cm/sec (MW-24), with a geometric mean of 7.72 x 10^{-5} cm/sec. The geometric mean hydraulic conductivity for the silty sand unit was calculated as 3.73 x 10^{-4} cm/sec while the geometric mean hydraulic conductivity for the gneiss unit was calculated as 2.65 x 10^{-5} cm/sec. Hydraulic gradient at the site was found to range from 0.01 to 0.87 ft/ft, with an average value of 0.17 ft/ft.[10] Average linear velocities (v_x) were calculated using the following equation:

$$v_x = \frac{K * i}{n_e}$$

where

v_x is the average linear velocity [length/time]

K is the hydraulic conductivity [length/time]

n_e is the effective porosity [unitless]

i is the horizontal hydraulic gradient in the direction of groundwater flow, taken as the difference in head elevation between two points divided by the distance between those points [unitless, or length/length]

The calculated average linear velocities were found to have a median value of 69.1 ft/yr.

1.3 Contaminant Distribution

Groundwater contamination at the site consists of dissolved-phase volatile organic compounds (VOCs) in concentrations exceeding established 15A NCAC 2L groundwater standards. Groundwater contaminants are distributed in several finger plumes that extend toward the drainage areas. Groundwater contaminants found to exceed 2L standards are: 1,1-dichloroethane, 1,2-dichloropropane, benzene, *cis*-1,2-dichloroethene, methylene chloride (dichloromethane- DCM), *p*-dichlorobenzene, tetrachloroethene (tetrachloroethylene, perchloroethene- PCE), trichloroethene (trichloroethylene- TCE), and total xylenes. *p*-Dichlorobenzene is a halogenated aromatic hydrocarbon. 1,1-Dichloroethane, *cis*-1,2-dichloroethene, 1,2-dichloropropane, methylene chloride, tetrachloroethene, and trichloroethene are halogenated aliphatic hydrocarbons. Benzene and xylenes are aromatic hydrocarbons.[13] Historic organic results of detected constituents are shown in **Table 4**.

The four (4) contaminant plumes identified in the *Assessment of Corrective Measures* are:

- **MW-24 Area:** The plume associated with monitoring well MW-24 consists of benzene, *p*-dichlorobenzene and *cis*-1,2-dichloroethene. Extended plume movement in this area is believed to be associated with high hydraulic conductivity ($K = 1.33 \times 10^{-2}$ cm/s). Groundwater contaminants are in the unconfined surficial aquifer. [10]
- **MW-26 Area:** The plume associated with the drainage area near monitoring well MW-26 consists of benzene, *p*-dichlorobenzene, and *cis*-1,2-dichloroethene. A decreasing trend in benzene and *p*-dichlorobenzene concentrations with increasing distance from the landfill has been observed in wells MW-3, MW-11, and MW-26, respectively. Groundwater contaminants are in the upper bedrock aquifer.
- **MW-16 Area:** The plume associated with the drainage area near monitoring wells MW-16, MW-5, and MW-10 consists of 1,1-dichloroethane, 1,2-dichloropropane, benzene, *cis*-1,2-dichloroethene, methylene chloride, *p*-dichlorobenzene, tetrachloroethene, and trichloroethene. MW-16 is located off-site on an adjacent property that is not owned or controlled by Alexander County. Groundwater contaminants are in the unconfined surficial aquifer.
- **MW-1B Area:** The upgradient plume associated with monitoring wells MW-1 and MW-1B consists benzene and *p*-dichlorobenzene, and is believed to be influenced by volatiles transport via landfill gas (methane). Groundwater contaminants are in the upper bedrock aquifer.

1.4 Site Conceptual Models

Site conceptual and analytical models were developed in the *ACM*. The models consisted of conceptual cross sections and analytical modeling using MODFLOW with MT3D[96]. The conceptual cross sections from the *ACM* are provided as **Plates 4A**, **4B**, and **4C**.

Physical Process

The primary mechanism of physical plume movement is through advection. Advective flow with applied sorption (retardation) typically slows plume migration. The retardation coefficient (R) used to calculate the expected migration rates for the constituents can be calculated from the following equation:

$$R = 1 + \frac{\rho_d}{n} K_d$$

where

R is the retardation coefficient
ρ_d is the dry bulk density of the soil (g/cm^3)
n is the porosity (unitless)
K_d is the distribution coefficient (mL/g)

The dry bulk density utilized in the *ACM* Report was taken from published literature at a value of 1.44 g/cm^3. The distribution coefficient (K_d) can be estimated as the constituent-specific soil–water partitioning coefficient (K_{oc}) times the fraction of organic carbon in the soil.[3] Based on boring logs and field observations there is little evidence to suggest any significant soil organic carbon. A conservative value for soil organic carbon was estimated to be 1%. "Soils vary in the amount of soil organic carbon they contain, ranging from less than 1 percent in many sandy soils to greater than 20 percent in soils found in wetlands and bogs."[8]

Coefficients of Retardation	
Constituent	**R**
1,1-Dichloroethane	1.03
1,2-Dichloropropane	1.04
Benzene	1.07
cis-1,2-Dichloroethene	-
Methylene chloride	1.02
p-Dichlorobenzene	1.43
Tetrachloroethene	1.22
Trichloroethene	1.11
Xylenes	1.36

The above table suggests that there is limited retardation. Contamination has the potential to travel at or near the seepage velocities as identified in the *ACM*.

The groundwater plumes near areas MW-24, MW-26 and MW-16 are mixing with stream water as evidenced by low levels of VOC concentrations below groundwater standards. Groundwater mixing results in stream dilution and volatilization. In the case of MW-24 and MW-26 the distance from the point of mixing to where the stream exits the facility is approximately 0.5 miles. In addition to the length of stream prior to exiting the facility, surfacewater in the stream is further diluted by water received from tributary streams. Since MW-16 is located off Alexander County property, these dilutions occur off the property as well. Stream dilutions were calculated in the *ACM*. Summaries of the corrective action screening results as presented in the *ACM* are included as **Tables 8A-8G** (attached).

Chemical/Biochemical Process

Chemical degradation processes, primarily that of half-life decay, are typically expressed based on surfacewater measurements. The identified contamination consists of constituents dissolved in groundwater. 1,1-Dichloroethane, 1,2-dichloropropane, benzene, *cis*-1,2-dichloroethene, methylene chloride, and tetrachloroethene all undergo volatilization from soil when released near the surface and volatilization when released to surfacewaters. *p*-Dichlorobenzene, trichloroethene, and xylenes have an environmental fate of rapid volatilization when released from surfacewater and low to moderate adsorption when released into soils.[1] Half-life reactions in groundwater vary greatly. A summary of published half life reactions in groundwater is included below.

Half-Life in Groundwater[7]		
Constituent	**Half-Life (high)**	**Half-Life (low)**
1,1-Dichloroethane	22 weeks	32 days
1,2-Dichloropropane	7.1 years	334 days
Benzene	24 months	10 days
cis-1,2-Dichloroethene	95 months	8 weeks
Methylene Chloride	8 weeks	14 days
p-Dichlorobenzene	12 months	8 weeks
Tetrachloroethene	2 years	12 months
Trichloroethene	4.5 years	10.7 months
Xylenes	12 months	2 weeks

Biotransformation of most chlorinated solvents, including halogenated aliphatic hydrocarbons, occurs through reductive dechlorination.[2] The reductive dechlorination process utilizes the chlorinated solvents as the

electron acceptor. Through reductive dechlorination, carbon is utilized as the electron donor for microbial growth, with the aromatic hydrocarbons acting as the potential carbon source.

1.5 Regulatory Status

The Alexander County Landfill operates as a C&D landfill over a MSWLF landfill under permit #02-01. Assessment monitoring is currently performed on a semi-annual basis at the site.

2 CONTAMINANT CHARACTERIZATION

2.1 Contaminants of Concern

The following chemical compounds were identified in the *ACM* as being contaminants of concern (COCs):

- benzene, xylenes, *p*-Dichlorobenzene – *aromatic hydrocarbons*
- cis-1,2 dichloroethene; tetrachloroethene; trichloroethene; methylene chloride; 1,1-dichloroethane, 1,2-dichloropropane – *chlorinated aliphatic hydrocarbons*
- mercury – *toxic metal*

2.2 Contaminant Source Confirmation

The groundwater contaminant source is the former MSW landfill cell. The mechanism for the presence of this contamination is precipitation that has percolated through the landfill waste, allowing VOCs to partition from solid/liquid phases into a dissolved phase, and that has subsequently migrated downwards to mix with groundwater. To limit water percolation, the MSW unit was closed with a cohesive cap of 18 inches of soil with a permeability of 1 x 10^{-5} cm/sec, and 18 inches of erosive layer. Landfill drainage flows westwards towards Little River. No private water supply wells were identified within 2,000 feet of the facility during a receptor survey performed as part of the *Transition Plan*.[9] However, one (1) non-potable water supply well, used for equipment washing and general maintenance, is located near the scale house (see **Plate 2**).

2.3 Source Control Measures

The western unit of the MSW was closed prior to October 9, 1991. This unit was closed with a 24 inch final soil cover. The second, eastern unit was closed by mid-1999, with a cohesive cap of 18 inches of soil liner with permeability of 1 x 10^{-5} cm/sec, and 18 inches of erosive layer.[9]

A passive gas venting system for methane extraction/collection was installed as part of the transition plan. The venting system was installed on the eastern unit. The methane gas collection trenches and methane vents are

limited to the upper portions of the eastern unit. Currently there is no collection system on the northern portion of the landfill, between the landfill and the scale house.

2.4 Risk Assessment

Risk assessment was performed as part of the *ACM*, and assumed direct contact with the identified contamination. Exposure pathways are limited to on-site contact with groundwater. Monitoring wells are cased and secured with locking well caps. Access to the site is limited during operational hours. Both adult and child hazard index values for contaminants of concern were less than 1 from inhalation, dermal and oral ingestion exposure with two exceptions. In MW-7 for adult, carcinogenic, inhalation the maximum observed detection of methylene chloride initiated a response slightly over 1. Also in MW-3 for non-carcinogenic, inhalation the maximum observed detection of 1,2–dichloropropane initiated a response slightly exceeding 1.

2.5 Contaminant Concentrations

2.5.1 Background Concentrations

Groundwater sampling and monitoring has been conducted at the site since 1994. Background water quality data has historically been collected from monitoring well MW-1. However, since both monitoring wells MW-1 and MW-1B are impacted by groundwater contaminants in excess of groundwater quality standards, information regarding background analyte concentrations must be collected from non-impacted wells (i.e. analyte concentrations not due to a known contaminant source, VOC concentrations historically below detection limits). Monitoring wells which have not exhibited analyte concentrations above established groundwater standards are: MW-6, MW-10, MW-13, MW-15, MW-17 through MW-23, and MW-25. Historical background results are shown in **Table 5**. Current groundwater results (June 2008) are summarized in **Table 6**.

2.5.2 Exceedances of Groundwater Quality Standards

Groundwater contaminants that currently (June 2008) exceed 2L standards are: benzene (MW-2, MW-16, MW-24, MW-26); *p*-dichlorobenzene (MW-8, MW-16, MW-24, MW-26); 1,2-dichloropropane (MW-16); tetrachloroethene (MW-16); and trichloroethene (MW-16). Manganese and lead concentrations in some samples were also found to exceed 2L standards. However, these compounds were identified in the *ACM* as occurring naturally and are, therefore, not of concern in this study.

2.5.3 Exceedances of Surfacewater Quality Standards

Laboratory analysis of surfacewater samples have not detected contaminant concentrations in excess of established NCAC 2B water quality standards. Current surfacewater results for SW-3, SW-4R, and SW-5 are shown in **Table 7**.

2.6 Media of Concern

Groundwater is the primary media of concern at the site since it acts as the primary mechanism of transport for environmental contaminants emanating from the landfill. Dissolved-phase contaminants can potentially be transported via groundwater and discharged to surfacewater.

Landfill gas is a secondary media of concern since it can transport VOCs that have partitioned into the vapor phase, allowing them to re-partition into the dissolved phase into groundwater. A passive horizontal gas venting system for methane extraction/collection was installed as part of the *Transition Plan*.

3 SELECTED AND APPROVED REMEDY / TECHNICAL APPROACH

A number of factors influenced selection of remediation alternatives.

- Groundwater contamination exists in both the surficial (unconfined) and upper bedrock aquifers.
- Groundwater contamination exists at relatively low levels (ppb range).
- Groundwater contamination is below risk exposure levels.
- Groundwater contamination has migrated past the compliance boundary in some locations.
- Groundwater contamination is likely being controlled and influenced by landfill gas at some locations.

Remediation of relatively low level contamination in the 100 ppb range can be difficult, expensive and may not be achievable. A multi-phase remedial approach is, therefore, necessary to address contamination across the site.

3.1 Technical Approach

3.1.1 MW-24 Area (Monitored Natural Attenuation w/ Phytoremediation)

Groundwater contaminants exist within the unconfined, shallow aquifer. Natural attenuation mechanisms are actively controlling groundwater contaminant movement in this area. Bioscreen was initially run for MW-24 to assess the potential effectiveness of MNA. Bioscreen focused on benzene, due to its high half life of 2 years. Results of the Bioscreen modeling are provided in **Appendix A**. Bioscreen results showed a 53%

decrease in contamination in 5 years through 1st order decay and a 100% decrease in contamination through the instantaneous reaction model.

Phytoremediation procedures will be implemented to enhance remediation by monitored natural attenuation of low level contaminants. To accelerate the natural evapotranspiration process and to allow for hydraulic containment (plume control), the area will be thinned of juvenile trees (those trees with a diameter of less than 3 inches) and pines, and planted with hybrid willows of the genus *Salix*. Hybrid willows have been recognized as being phreatophytic (water-loving) trees with root systems that can extend up to 40 feet bgs[11]. Phytoremediation is expected to occur through several processes: the release of enzymes from the root system that break down hydrocarbons (phytodegradation), limitation of infiltration by increasing evapotranspiration, and eventual uptake of hydrocarbons (phytoextraction). Available literature (e.g. Schnoor, 1997 [11]) indicates an initial planting density of 1,000-2,000 trees/acre (~43 ft^2/tree). As the trees become established over time (1-2 years) competition between plants will reduce this density to ~600-800 trees/acre. The proposed phytoremediation area comprises approximately 4 acres. At the aforementioned planting density a minimum of 4,000 hybrid willow seedlings will need to be planted at the onset of corrective action. Planting of seedlings will likely be performed by mechanical methods to reduce installation costs, and is tentatively scheduled to occur during May-June 2009. Protective fencing to prevent damage to the seedlings by wildlife (e.g. deer) shall be constructed around the area of planting. The proposed phytoremediation area is depicted in **Plate 5**.

In order to more fully delineate the contaminant plume in this area two (2) additional monitoring wells, MW-28 and MW-29, are proposed for installation. Both wells will be constructed of 2”-I.D. Sch. 40 PVC casing with a 0.010”-slotted screen interval. Based upon the boring log for MW-24 the estimated depth for the two new wells is 35-40 ft. bgs, with a 15-foot screened interval. The proposed well locations are depicted in **Plate 5**.

Groundwater sampling will be performed semi-annually on monitoring wells MW-6, MW-7, MW-12, MW-12D, MW-13, MW-24, MW-25, MW-28, and MW-29. Baseline sampling for the suite of MNA performance parameters listed in **Section 4** and **Appendix B** shall be performed for two years following planting of hybrid willow trees. Monitoring of stream quality in the adjacent unnamed tributary of the Little River will be achieved through surface water sampling at sampling point SW-4R (see **Plate 2**). Surfacewater sampling parameters will include Appendix I VOCs and metals. Soil sampling may also be conducted to monitor potential salt accumulation in the root zone. Phytoremediation sampling and monitoring results, in addition to information on tree growth and health, shall be included as a separate section within the semi-annual monitoring reports.

Water levels in MW-12 and MW-24 will be monitored on a daily basis with pressure transducer data loggers that will be installed in the wells prior to planting of the hybrid willow trees. Water level readings will be recorded twice daily, and the water level data downloaded from the data loggers on a monthly basis by MESCO field personnel. Once the trees are semi-established (1-2 years) water levels in these wells are expected to decrease, particularly in conjunction with the spring growing season.

3.1.2 MW-26 Area (Monitored Natural Attenuation w/ HRC Injection)

Groundwater contaminants exist within the upper bedrock aquifer, requiring a remedial technology to supplement MNA. Bioscreen was initially run for MW-26 to assess the potential effectiveness of MNA. Bioscreen focused on benzene, due to its high half life of 2 years. Bioscreen results showed a 46% decrease in contamination in 5 years through 1st order decay and a 100% decrease in contamination through the instantaneous reaction model. Results of Bioscreen are provided in **Appendix A**.

Natural attenuation of VOCs can be enhanced through the introduction of hydrogen release compound (HRC) into the subsurface. HRC enhances processes such as the reductive dechlorination of chlorinated hydrocarbons including the COCs identified in **Section 2** (e.g. PCE, *cis*-1,2-DCE). One such brand of commercially-available HRC is 3DMe^{TM} which is manufactured by Regenesis (San Clemente, CA). According to Regenesis, HRC 3DMe^{TM} "is composed of free lactic acid, controlled-release lactic acid (polylactate) and certain fatty acid components which are esterified to a carbon backbone molecule of glycerin. HRC 3DMe^{TM} produces a sequential, staged release of its electron donor components. The immediately available, free lactic acid is fermented rapidly while the controlled release lactic acid is metabolized at a more controlled rate. The fatty acids are converted to hydrogen over a mid to long-range timeline giving HRC 3DMe an exceptionally long electron donor release profile. This staged fermentation provides an immediate, mid-range and very long-term, controlled-release supply of hydrogen (electron donor) to fuel the reductive dechlorination process." Prior to injection HRC 3DMe^{TM} is mixed with water in a 1:10 ratio. Regenesis recommends a minimum quantity of 22 gals. of HRC per injection point (~242 gals. total liquid). HRC can remain resident in the subsurface for over one year. A material safety data sheet for HRC 3DMe^{TM} is included in **Appendix C**.

HRC will be injected into monitoring wells MW-3 and MW-11, which are upgradient of MW-26 and exhibit the highest COC concentrations. Since groundwater flow in bedrock occurs within interconnected discontinuities such as fractures, joints, and faults within the rock mass (secondary porosity), the HRC mixture will necessarily permeate only those areas impacted by groundwater contaminants. The HRC will, therefore,

travel downgradient through the contaminant plume. Typical injection rates are on the order of 4 gallons per minute (gpm) at a pressure of 10 pounds per square inch (psi). Actual injection rates are contingent upon the permeability of the formation material at the injection points, and care should be taken during injection so as not to compromise monitoring well integrity. Since HRC can remain resident in the subsurface for over one year after introduction, a single injection only will be needed to implement this form of corrective action. An injection permit will be required from the NCDENR Underground Injection Control Section prior to implementation.

In order to more fully delineate the contaminant plume in this area, two (2) additional monitoring wells, MW-30 and MW-31, are proposed for installation. Both wells will be constructed of 2”-I.D. Sch. 40 PVC casing with a 0.010”-slotted screen interval. Based upon the boring log for MW-26 the estimated depth for the two new wells is ~50 ft. bgs, with a 15-foot screened interval. Both wells are expected to be completed within bedrock. MW-30 will be installed near the transfer station driveway and will provide groundwater quality information for the area between the MW-24 and MW-26 plume areas. MW-31 will be installed downgradient of MW-26. The proposed well locations are depicted in **Plate 5**.

Baseline sampling will be instated as a part of the monitoring protocol. Monitoring will incorporate the select MNA parameters. Sampling will be performed semi-annually on monitoring wells MW-26, MW-27, MW-11 and MW-3. Baseline sampling for the suite of MNA performance parameters listed in **Section 4** and **Appendix B** shall be performed for two years following implementation of corrective action. *It must be noted that due to the persistence of HRC in the subsurface after initial injection, groundwater in the injection wells may not be of adequate quality to sample for 30-60 days after injection.*

3.1.3 MW-16 Area (Monitored Natural Attenuation w/ HRC Injection)

Groundwater contaminants in the MW-16 area have reached the property line of the facility, requiring an additional remedial approach to supplement MNA. Modeling results indicate that MNA has the potential to reduce groundwater contamination. Bioscreen was initially run for MW-16 to assess the potential effectiveness of MNA. Bioscreen focused on benzene, due to its high half life of 2 years. Bioscreen results showed a 44% decrease in contamination in 5 years through 1st order decay and a 100% decrease in contamination through the instantaneous reaction model. Surfacewater analytical results from sampling point SW-5 do not indicate the presence of COC concentrations above either NCAC 2B or 2L standards, indicating that natural attenuation is reducing contaminant levels in the shallow aquifer to below water quality standards prior to groundwater discharge to surface water. Bioscreen results are provided in **Appendix A**.

Since chlorinated hydrocarbons make up the majority of COCs in the plume, HRC can be used to enhance reductive dechlorination at this location. It is proposed that HRC be injected into the shallow, unconfined aquifer using truck or rig-mounted direct-push technology. Injection points will be spaced at approximate 10-ft intervals in a line transverse to groundwater flow, and located at the upgradient end of the plume near the waste limit. The injection point line will extend for a distance of 100 ft. north and south from MW-5, along the east side of the roadway between MW-5 and the waste limit (see **Plate 5**), for a total distance of 200 lineal feet (20 injection points total). The injection depth at this location will be approximately 30-40 ft. bgs. This application of HRC is intended to create a reactive barrier that will breakdown COCs near the source area before they can be transported further downgradient. The existing plume will then be subject to natural biodegradation processes as it will be cut off from the contaminant source. As the HRC diffuses throughout the aquifer reductive dechlorination processes will be enhanced throughout the plume. Multiple injection events may be needed at roughly 18-month intervals in order to effectively implement this form of corrective action.

Since HRC can remain resident in the subsurface for over one year after introduction, a single injection only will be needed to implement this form of corrective action. Monitoring wells MW-5 and MW-16 may also be used for HRC injection; however, these wells will be more effectively utilized as performance wells. An injection permit will be required from the NCDENR Underground Injection Control Section prior to implementation.

HRC can also be injected directly into well MW-10 in order to reduce benzene concentrations located in the upper bedrock water-bearing zone in that location. However, this may render groundwater in the well unsuitable for sampling for as much as 6 months following injection, and will limit its use as part of semi-annual sampling and monitoring.

In order to more fully delineate the contaminant plume in this area, three (3) additional monitoring wells, MW-32 through MW-34, are proposed for installation. All wells will be constructed of 2”-I.D. Sch. 40 PVC casing with a 0.010”-slotted screen interval. Based upon existing boring logs the estimated depth for the new wells is ~50 ft. bgs, with 15-foot screened intervals. MW-32 will be installed downgradient of MW-10. MW-33 and MW-34 will be installed downgradient of MW-5 and MW-16, and will act as sentinel wells between those existing wells and the adjacent stream. Since MW-33 and MW-34 will be located on property not owned or controlled by Alexander County, an access agreement between Alexander County and the relevant property owner will be needed prior to well installation. The proposed well locations are depicted in **Plate 5**.

Baseline sampling of monitoring wells MW-5, MW-16, MW-32, MW-33, and MW-34 will be performed semi-annually for a two-year period, and will incorporate the MNA performance parameters listed in **Section 4** and **Appendix B**. *It must be noted that due to the persistence of HRC in the subsurface after initial injection, groundwater in the injection wells may not be of adequate quality to sample for 30-60 days after injection.* Monitoring of stream quality will consist of sampling existing downstream surfacewater sampling point SW-5, located along the unnamed tributary of the Catawba River (see **Plate 2**).

3.1.4 MW-1B Area (Active Methane Extraction)

Contamination has reached the adjacent property line. Landfill gas is believed to be affecting migration of the contaminant plume in this area. Alexander County is in the process of purchasing the adjacent property in order to increase the compliance boundary at this location. Based on *ACM* observations, the most efficient and cost effective method of remediation is to install an active methane gas system. Although a passive system presently exists at the MSW, installation of an active system would provide more efficient and cost effective contaminant reduction.

Ten (10) active methane wells will be installed along the periphery and outside of the current waste limits. Wells will be ordered sequentially starting near MW-16 inside the current property line and following the edge of waste counterclockwise through MW-5, crossing the access road then running parallel to the waste limit and the scale house. The last well will be installed adjacent to the maintenance buildings. Each well will have an individual release valve to ensure optimum gas pressure. Methane will travel from the wells through pipes to the flares. Care will be taken to not exceed the EPA Clean Air Act standards in addition to complying with gas control standards set in the 15A NCAC 13B rules. Proposed methane wells and flare locations are shown in **Plate 6**.

Monitoring of the active methane system will be implemented through the quarterly monitoring of existing methane probes already in effect. Groundwater sampling parameters will include Appendix I VOCs and metals. Additionally, groundwater samples may be analyzed for dissolved methane to aid in determining the influence of landfill gas on plume migration.

4 GROUNDWATER AND SURFACEWATER MONITORING PLAN

4.1 Groundwater Sampling and Monitoring

Data with which to monitor and evaluate the performance of remediation shall be obtained through a groundwater sampling and monitoring program. All groundwater samples collected from the monitoring wells will be analyzed for Appendix I VOC concentrations by EPA method 8260, and for Appendix I metals concentrations by EPA method 6010. Additionally, groundwater samples collected from monitoring wells in the areas subject to MNA, phytoremediation, and HRC injection will be analyzed for the following MNA performance parameters:

MNA Performance Parameters		
Parameter	**Analysis Type**	**Analytical Method**
Dissolved Oxygen (DO)	Field Reading	Multi-parameter Field Instrument w/ flow-through cell
pH	Field Reading	
Oxidation-Reduction Potential (ORP)	Field Reading	
Turbidity	Field Reading	
Conductivity	Field Reading	
Temperature	Field Reading	
Dissolved CO_2	Field Reading	Field Instrument / Hach Kit
Alkalinity (Total as $CaCO_3$)*	Laboratory/Field*	EPA 310.2
Chloride*	Laboratory/Field*	SM 4500-CLB
Iron	Laboratory	SM3111B
Nitrate*	Laboratory/Field*	EPA 353.2 / SM 2320B
Sulfate*	Laboratory/Field*	EPA 375.4 / SM 4500-SO4E
Sulfide*	Laboratory/Field*	EPA 376.1 or SM 4500SE
TOC/BOD/COD	Laboratory	EPA 415.1 / EPA 405.1 / EPA 410.1
Methane	Laboratory	RSK 175
Ethane, Ethene	Laboratory	RSK 175
Hydrogen	Laboratory	AM19GA
Volatile Fatty Acids	Laboratory	AM23G
*For budgetary considerations these analyses may be performed in the field using Hach® brand color wheel test kits. Historical iron concentrations have exceeded Hach kit quantitation limits.		

4.2 Surfacewater Sampling and Monitoring

Surfacewater sampling will be conducted to monitor COC concentrations in the adjacent stream areas. To date (January 2009) COC concentrations have been below respective NCAC 2B and 2L standards. Surfacewater sampling point locations are depicted in **Plate 2**. Surfacewater sampling point SW-4R is located downstream of the landfill on the tributary of Little River where it flows past the western side of the landfill. Surfacewater sampling points SW-3 and SW-5 are located downstream of the landfill on another tributary of the Catawba River. All surfacewater samples will be analyzed for Appendix I VOC and metals concentrations by EPA methods 8260 and 6010, respectively. The complete *Groundwater and Surfacewater Sampling and Analysis Plan* is presented as **Appendix B**.

5 EVALUATION OF EFFECTIVENESS AND REPORT SUBMITTALS

5.1 Evaluation of Effectiveness

As remediation progresses at the site certain changes in the physical and chemical characteristics of the contaminant plumes should occur. In all areas contaminant concentrations are expected to decrease over the period of remediation, thus resulting in a decrease in the physical extent of the plume. The various methods for evaluating the effectiveness of remediation are discussed in the sections below.

5.1.1 Qualitative and Quantitative Evaluation

Qualitative Evaluation

Qualitative methods include graphical analysis of groundwater analytical data over time in order to visualize changing trends in groundwater chemistry that are expected to occur over time as a result of the various remedial mechanisms/processes that are occurring at the site (e.g. biodegradation, phytoremediation, HRC injection). Examples of graphical analyses that will be used include, but are not be limited to, time-series graphs of contaminant concentrations and groundwater levels, distance-concentration graphs of analytical data, and mapping of the contaminant plumes over time. For the plume near MW-24, tree growth (height and girth) will be monitored monthly to bi-monthly for the first two years following planting. Correlation of contaminant plume size and migration with hybrid willow growth may be used to further evaluate the progress of phytoremediation.

Quantitative Evaluation

Quantitative evaluation will be conducted through annual revision of Bioscreen models, and through analysis of groundwater analytical data using statistical tests for significance. Statistical significance tests can be grouped into two types, *inter-well* and *intra-well*. *Inter-well* methods determine statistical significance by

examining trends in contaminant concentrations from performance wells with respect to those from background wells, which are used as a control group. As remediation progresses, the performance well data is expected to exhibit decreases in contaminant concentrations, while contaminant concentrations in the background wells are expected to remain relatively stable. Background wells are selected on the basis of location (typically upgradient) and analytical history (non-impacted wells are best). *Intra-well* methods determine statistical significance within individual performance wells by examining historical analytical results (time series) for a given well, thus indicating if changing contaminant concentrations at a given well location result from either remedial activity or natural fluctuation. Comparisons of background well data with sentinel and compliance well data will also be performed to monitor groundwater contaminant movement over time.

Various types of significance tests have been developed to analyze differing types of data populations based upon characteristics such as distribution type (normal vs. non-normal), trend type (changing vs. non-changing), percentage of "non-detect" results for a given population, and the sample population size. This allows for the selection of particular methods that are appropriate for a given situation. For the remedial activity at the subject facility the following statistical tests are proposed for use, although others may be used as the course of remediation progresses:

- Wilcoxon Rank-Sum (Inter-well) - *normal or non-normal data, invariant trends, < 90% non-detects, >3 samples/per well.*
- Parametric Prediction Limit (Inter-well) – *normal data, varying trends,< 15% non-detects.*
- Parametric Prediction Limit (Intra-well) – *normal data, varying trends,≥ 4 samples/well, < 15% non-detects.*
- Non-Parametric Prediction Limit (Inter-Well & Intra-Well) – *normal or non-normal data, can tolerate high percentage of non-detects, compares recent to historical data.*

As indicated by the list above, it is important to note that prior to conducting any test of statistical significance a baseline of analytical data must first be established. For the MNA parameters listed in **Section 4.0** this baseline will consist of the four (4) semi-annual sampling events mentioned previously. *Since some plume areas do not have upgradient wells that are suitable for use as background wells, non-impacted compliance wells may be used if necessary for inter-well statistical analyses.*

5.1.2 Evaluation of Plume Areas

Plume Area MW-24

Since monitoring well MW-25 is located upgradient of MW-24 and has previously been unimpacted, MW-25 will be used as a background well for inter-well statistical analysis of MNA data from this area. Monitoring wells MW-24, MW-12, and MW-12D will be used as performance wells. The proposed new wells MW-28

and MW-29 will be used as either compliance or sentinel wells, depending upon the results of initial groundwater sample analyses. Qualitative evaluation of phytoremediation will include the methods discussed in **Section 5.1.1.** Significant changes in groundwater chemistry and contaminant concentrations are not expected to occur until 3-5 years after initiation of corrective action in this area.

Plume Area MW-26

Since monitoring wells MW-3 and MW-11 are proposed for HRC injection, and are both impacted by groundwater contaminants in excess of 2L standards, no suitable background wells exist at this location for use in inter-well statistical analyses. Intra-well analyses will, therefore, be used to quantitatively evaluate the effectiveness of remediation. Monitoring wells MW-3, MW-11, and MW-26 will be used as performance wells. The proposed new well MW-31 will be used as a sentinel well.

Within 1-3 months of HRC injection, decreases in groundwater contaminant concentrations on the order of a few ppb are expected to occur at wells MW-3 and MW-11. Increases in acetone, total organic carbon, and VFAs are expected to occur as the process of reductive dechlorination breaks down chlorinated hydrocarbons. Consequently, end products such as ethane, ethene, and chloride are also expected to increase as COC concentrations decrease. Follow-up sampling at 30-day, 60-day, and 90-day intervals will be required by the NCDENR Underground Injection Control Section as part of their injection permit requirements. Reduction in contaminant concentrations should be observed in the monitoring wells within 6 to 12 months after HRC injection.

Plume Area MW-16

Since monitoring wells MW-5 and MW-16 are both impacted by groundwater contaminants, no suitable background wells exist at this location for use in inter-well statistical analyses. Intra-well analyses will, therefore, be used to quantitatively evaluate the effectiveness of remediation. Monitoring wells MW-5 and MW-16 will be used as performance wells. The proposed new wells MW-32 through MW-34 will be used as sentinel wells.

Within 1-3 months of HRC injection decreases in groundwater contaminant concentrations on the order of a few ppb are to be expected to occur. Increases in acetone, total organic carbon, and VFAs are expected to occur as the process of reductive dechlorination breaks down chlorinated hydrocarbons. Consequently, end products such as methane, ethane, ethene, and chloride are also expected to increase as COC concentrations decrease. However, since time will be necessary for the HRC to permeate through the formation material, the effects of HRC injection may not be immediately recognizable in laboratory analyses of groundwater samples collected from the performance wells. Direct-push groundwater sampling may be necessary to collect samples

with which to evaluate HRC performance, although the quantity of groundwater that can be collected at a given point may be limited.

Plume Area MW-1B

Evaluation of effectiveness for the plume area associated with MW-1B will be determined through semi-annual sampling events to monitor potential decreases in contaminant levels. Since this area is located at the topographic high at the site, no un-impacted wells exist for use as background wells for inter-well statistical analysis. Intra-well analyses will, therefore, be used to quantitatively evaluate the effectiveness of remediation. Monitoring wells MW-1 and MW-1B will be used as performance wells.

5.2 Refining the Site Conceptual Model

Over the course of corrective action the site conceptual model will be refined in order to determine the appropriate course of remediation. Additional information on groundwater chemistry, site lithology, plume characteristics, etc. will be used to further improve understanding of contaminant fate and transport at the site, and to determine any changes to the approved remedial measures if necessary.

5.3 Report Submittals

Corrective action sampling and monitoring reports will be submitted on a semi-annual basis, within 30 days of receiving all complete laboratory analytical reports. All reports submitted regarding evaluation of effectiveness will establish trends of the indicator parameters and contain tables, maps and figures relating to field and laboratory data. Laboratory reports, groundwater maps, contamination concentration maps and cross sections will be included. Specific parameters for individual plume areas will also be ascertained. A separate section detailing the status of phytoremediation (tree health, growth, appearance, rainfall, etc.) will be included with each report.

Injection reports for the areas where HRC injection is proposed will be submitted in accordance with the injection permits to be issued for the site by the NCDENR Underground Injection Control Section. These reports typically consist of an *Injection Event Record* report detailing the actual event, and subsequent monitoring reports submitted at semi-annual intervals.

6 CONTINGENCY PLAN

6.1 Contingency Plan

Should the selected remedial approaches not perform as expected and/or the constituent concentrations do not decrease, contingency plans will be needed for each respective plume. These are discussed in detail in the sections below.

Plume Area MW-24

Should phytoremediation fail to significantly reduce contaminant concentrations within five years of implementation, or should the hybrid willows fail to thrive as expected, a more aggressive remedial approach may be necessary. HRC injection as discussed previously for other plume areas is one option, and would require either the installation of injection wells or injection via direct push to depths of up to 40 ft. bgs. The cost estimate of HRC application over the subject 4-acre area is beyond the scope of this report. An injection permit would be required from the NCDENR Underground Injection Control Section should this contingency plan be implemented. This approach could, therefore, not be applied until at least 60 days after initiation of this option.

Plume Area MW-26

Should the introduction of HRC fail to significantly reduce contaminant concentrations within two years of implementation, substrates other than HRC may need to be injected. One such substrate that has also been shown to effectively reduce contaminant concentrations is oxygen-release compound (ORC). ORC as manufactured by Regenesis, Ltd. consists of a dry mixture of calcium hydroxides with potassium phosphates that is injected with water as a slurry. Issues to consider prior to its use are its high pH (11-13), and its insolubility which may lead to settlement during mixing and handling. Air sparging with vapor extraction is also an option but would require the design, construction, operation, and maintenance of a remediation system, the scope of which is beyond this CAP report.

Plume Area MW-16

Alexander County is currently in the process of purchasing the property associated with migration potential in order to expand the existing compliance boundary. Although this contingency plan would not decrease contaminant concentrations, it would keep the contaminant plume on the facility property and within the compliance boundary, thereby allowing MNA as the sole remedial approach. Should COC concentrations remain stable and not decrease by two years after HRC injection, additional transverse lines of injection points will be used during a second injection event. HRC may also be applied over a wider area of the plume using a

gridded injection point scheme. Phytoremediation could also be implemented should this approach prove effective in controlling the plume near MW-24.

Plume Area MW-1B

If the plume corresponding to MW-1B does not respond to methane extraction within five years, a contingency plan consisting of HRC injection will be implemented. An injection permit would be required from the NCDENR Underground Injection Control Section should this contingency plan be implemented. This approach could therefore not be applied until at least 60 days after initiation of this option. Methane extraction will also need to be continued to reduce the potential for vapor accumulation in this area. Air sparging with vapor extraction is also an option but would require the design, construction, operation, and maintenance of a remediation system, the scope of which is beyond this CAP report.

6.2 Safeguard Measures and Site Security

Exposure pathways are limited to onsite contact with groundwater. Monitoring wells are cased and secured with locking well caps. Access to the site is limited during operational hours. Heavy vegetation limits access from other areas. Alexander County owns the majority of the property surrounding the facility. Public water is available to the surrounding area. A passive horizontal gas venting system for methane extraction/collection was installed as part of the *Transition Plan*. [9]

Prior to the facility becoming a C&D landfill, the western unit of the sanitary landfill was closed with a 24 inch soil cap and vegetative cover. The vegetative cover acts as an erosion control measure and also aides in the evapotranspiration process to reduce infiltration. "(T)he natural evapotranspiration process of vegetation has been recognized and harnessed as an alternative cover method to reduce landfill infiltration."[11][page 392] As with the western unit, side slopes of the eastern unit were closed with a 24 inch soil cap and vegetative cover. The top of the eastern unit was closed with a cohesive cap of 18 inches of soil with a permeability of 1 x 10^{-5} cm/sec, and 18 inches of erosive layer. Surfacewater is diverted from the landfill and is not impounded on the landfill property.

6.3 Revisions

Requests for modification of the approved corrective action and implementation schedule will be submitted in writing to the Solid Waste Section. No actions regarding modification will be implemented until written approval is received from the Division of Waste Management. Approval of changes to HRC injection will be required by the NCDENR Underground Injection Control Section prior to implementation.

7 SCHEDULE AND MAINTENANCE

7.1 Operations & Maintenance

Alexander County will oversee day-to-day operation and upkeep of the remediation technology. Any equipment required for remediation will be the responsibility of Alexander County. If problems with the remediation system arise, the Solid Waste Section will be notified and a written report will be issued. The Alexander Department of Solid Waste can be contacted at (828) 632-9467 regarding daily activities.

7.2 Timeline

Implementation of corrective action will begin within 30 days of CAP approval. Initial activities will consist primarily of administrative tasks including scheduling of drilling and remediation subcontractors, permit preparation/submittal, and materials purchasing. HRC injection will be performed after the June 2009 semi-annual sampling and monitoring, during which the MNA performance parameter baseline will be established. A timeline estimate for sampling events and performance evaluation is presented in **Table 9**.

8 FINANCIAL ASSURANCE REQUIREMENTS

In general accordance with 15A NCAC 13B .0546, demonstration of financial assurance was achieved through the local government financial test. Due to uncertainty of the acquisition of the property through private cost negotiation, costs associated with corrective action were estimated. The estimated cost includes acquisition of additional property, installation of an active methane system, purchase and planting of hybrid willow trees, one HRC injection event, additional monitoring of water levels, additional sampling parameters, and methane monitoring. A breakdown of estimated costs for initiation of proposed corrective action, as well as operation and maintenance costs over a 5-year period, is as follows:

Purchase of Adjacent Property - $500,000
Phytoremediation (seedlings) - $25,000
Phytoremediation + HRC Injection (planting & maintenance; one injection event) - $35,000
MNA Sampling & Monitoring - $55,000
Methane Extraction System + Well Installation - $300,000
Estimated Total Costs – $915,000 (based upon ACM)

9 COMPLETENESS OF CORRECTIVE ACTION

Results indicate that reduction of the low level contamination can be achieved through natural attenuation, HRC injection, active methane extraction, and phytoremediation. The purchase of the property associated with the plume fingers near MW-16 and MW-1B will allow for the expansion of the relevant point of compliance. As per 15A NCAC 13B .1631(a)(2)(A) the new compliance boundary would be established no more than 250 feet from the waste limit, and be at least 50 feet within the facility property boundary. Prior to establishing the new compliance boundary a petition would have to be submitted to the SWS Permitting Branch. For Alexander County to control all property associated with the plume migration patterns would also eliminate the need for off-site access permits. There is no indication that the contamination would reach the new relative point of compliance within a reasonable time period. Institutional controls limit access to the site. The source area has been capped to limit infiltration. The on-site, non-potable water supply well located near the scale house should be abandoned to eliminate a potential contaminant migration pathway.

Respectfully submitted,
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TABLES

Table 1: Well Construction Details

Monitoring Well	Date Installed	Ground Elevation	Top-of-Casing Elevation	Northing	Easting	Well Diameter	Boring Diameter	Screen Interval (BGS)	TOR	Status
MW-1	09/14/1990	1077.98	1080.68	767134.0364	1363442.6050	2	6	25-40	31.00	Performance Well
MW-1A	09/30/1994	1083.28	1085.32	767200.3163	1363503.3553	2	-	32.5-47.5	41.00	Monitoring Well
MW-1B	05/21/2003	1079.56	1082.56	767195.2993	1363465.9606	2	6	46-61	-	Performance Well
MW-2	09/06/1990	1002.28	1004.48	766674.3685	1362089.6189	2	10	15-30	-	Monitoring Well
MW-3	09/19/1990	1024.23	1024.73	766250.3839	1362679.0876	2	6	13-33	23.10	Performance Well
MW-4R	09/30/1994	1008.54	1012.64	766301.7951	1363401.6259	2	-	5.5-20.5	18.00	Monitoring Well
MW-5	09/16/1994	1049.01	1051.26	766547.9303	1363808.9110	2	-	33.8-48.8	42.00	Performance Well
MW-6	09/29/1994	1008.29	1010.79	766433.2733	1361867.3868	2	-	26-41	24.00	Monitoring Well
MW-7	09/29/1994	1005.84	1009.24	766240.2892	1362135.0386	2	-	38-53	12.00	Monitoring Well
MW-8	09/29/1994	1019.01	1022.01	767017.6867	1362679.5452	2	-	12.5-27.5	14.00	Background Well
MW-9	10/24/2000	993.76	996.27	766114.0184	1363340.8075	2	6	16.5-31.5	7.00	Monitoring Well
MW-10	10/25/2000	1037.83	1040.80	766278.6433	1363705.7044	2	6.5	76-91	36.00	Monitoring Well
MW-11	10/24/2000	1008.98	1011.96	766061.8888	1362636.9409	2	6.5	41-56	36.00	Performance Well
MW-12	10/23/2000	1004.46	1007.35	766005.5659	1362030.9237	2	6	51.5-66.5	66.00	Performance Well
MW-12D	06/09/2000	1006.03	1008.46	766005.1529	1362038.5108	2	3.88	90-100	-	Performance Well
MW-13	10/25/2000	1001.63	1004.56	766375.4660	1361820.1834	2	6.5	45.5-60.5	30.00	Monitoring Well
MW-14	10/26/2000	994.06	997.44	766663.1022	1362045.4545	2	6	25.0-40.5	37.50	Monitoring Well
MW-15	10/25/2000	1020.81	1023.44	766979.9418	1362543.9150	2	6	19-35	26.00	Monitoring Well
MW-16	12/20/2007	1034.94	1037.56	766458.4917	1363828.4046	2	7.75	25.25-40.25	-	Performance Well
MW-17	06/10/2003	988.36	991.16	767043.7701	1362461.2129	2	6	7.3-22.3	-	Monitoring Well
MW-18	12/19/2007	1081.52	1084.33	767212.2504	1363776.4901	2	6	41.7-56.7	20.50	Background Well
MW-19	12/20/2007	1068.67	1071.48	767200.6858	1363194.7175	2	6	48.92-63.92	43.00	Monitoring Well
MW-20	12/20/2007	1044.19	1046.92	767200.0703	1362748.8204	2	6	48.55-63.55	38.00	Monitoring Well
MW-21	12/19/2007	987.08	990.00	767046.2058	1362368.8492	2	6	26.05-41.05	-	Monitoring Well
MW-22	12/19/2007	956.21	958.97	766871.4240	1362092.4590	2	6	8.12-18.12	-	Monitoring Well
MW-23	12/19/2007	947.83	950.48	766686.4251	1361922.3394	2	6	6.54-21.54	21.54	Monitoring Well
MW-24	12/20/2007	971.29	974.04	765972.4283	1361780.7942	2	6	20.35-35.35	35.35	Monitoring Well
MW-25	12/19/2007	979.93	981.93	765849.7417	1361936.5943	2	6	29.48-44.48	22.80	Background Well
MW-26	12/20/2007	988.08	990.69	765876.1807	1362646.1678	2	6	34.8-49.8	31.85	Monitoring Well
MW-27	12/20/2007	989.19	992.19	765934.3152	1362968.1353	2	6	34.82-49.82	23.70	Monitoring Well
*MW-28**	*May-June 2009*	*~972*	-	*766218.15*	*1361636.24*	*2*	*6*	*25-40*	*40.00*	*Sentinel/Compliance Well*
*MW-29**	*May-June 2009*	*~962*	-	*765882.93*	*1361711.49*	*2*	*6*	*25-40*	*40.00*	*Sentinel/Compliance Well*
*MW-30**	*May-June 2009*	*~1014*	-	*765889.70*	*1362218.80*	*2*	*6*	*35-50*	*50.00*	*Monitoring Well*
*MW-31**	*May-June 2009*	*~984*	-	*765750.80*	*1362602.97*	*2*	*6*	*35-50*	*50.00*	*Sentinel Well*
*MW-32**	*May-June 2009*	*~1025*	-	*766086.13*	*1363697.83*	*2*	*6*	*35-50*	*50.00*	*Sentinel Well*
*MW-33**	*May-June 2009*	*~1033*	-	*766326.70*	*1363793.79*	*2*	*6*	*35-50*	*50.00*	*Sentinel Well*
*MW-34**	*May-June 2009*	*~1025*	-	*766422.12*	*1363885.82*	*2*	*6*	*35-50*	*50.00*	*Sentinel Well*

NOTE:
1. Ground, datum and TOR elevation are in units of feet, well and boring diameter are in units of inches.
2. TOR = Top of rock below ground surface (bgs)

* Proposed monitoring wells to be installed May - June 2009, all elevations, coordinates, & depths are estimated.

Table 2: Historical Groundwater Elevation Data

Name	01/31/1995	02/15/1995	03/08/1995	12/06/1995	05/06/1996	11/11/1996	06/24/1997	12/03/1997	03/23/1998	04/30/1998	06/04/1998
MW-1	1047.54	1047.89	1048.09	1045.20	1045.84	1044.96	1046.93	1044.93	1047.68	1047.09	1046.94
MW-1A	1039.92	1039.19	1040.47	1037.47	1038.47	1037.53	1042.22	1038.97	1041.36	1042.38	1042.76
MW-1B	-	-	-	-	-	-	-	-	-	-	-
MW-2	984.48	981.98	985.88	982.05	983.48	-	-	-	-	-	-
MW-3	1000.23	999.13	1000.08	999.05	999.33	998.97	999.38	999.10	988.11	999.37	999.44
MW-4R	1000.64	1001.44	1001.39	996.41	997.16	996.48	997.95	996.85	998.24	998.24	997.74
MW-5	1014.14	1013.73	1015.16	1011.38	1012.76	1011.10	1012.90	1011.83	1025.82	1014.49	1013.54
MW-6	986.29	984.02	989.74	980.97	982.44	979.79	981.97	977.87	987.31	986.26	982.91
MW-7	971.54	967.86	973.74	969.86	973.24	969.34	974.72	969.32	974.68	974.94	974.89
MW-8	1011.96	1011.91	1014.21	1008.52	1010.14	1009.56	1012.42	1009.16	1012.56	1011.56	1010.54
MW-9	-	-	-	-	-	-	-	-	-	-	-
MW-10	-	-	-	-	-	-	-	-	-	-	-
MW-11	-	-	-	-	-	-	-	-	-	-	-
MW-12	-	-	-	-	-	-	-	-	-	-	-
MW-12D	-	-	-	-	-	-	-	-	-	-	-
MW-13	-	-	-	-	-	-	-	-	-	-	-
MW-14	-	-	-	-	-	-	-	-	-	-	-
MW-15	-	-	-	-	-	-	-	-	-	-	-
MW-17	-	-	-	-	-	-	-	-	-	-	-

Name	11/18/1998	05/13/1999	12/06/1999	05/17/2000	12/11/2000	06/11/2001	12/27/2001	06/12/2002	01/02/2003	06/24/2003	12/11/2003
MW-1	1044.77	1044.98	1044.51	1044.82	1044.36	1044.66	1044.58	1044.73	1044.97	1047.76	1044.77
MW-1A	1037.78	-	-	-	1036.72	1036.30	1036.26	1036.14	1036.79	1042.56	1038.90
MW-1B	-	-	-	-	-	-	-	-	-	1046.21	1040.92
MW-2	-	-	977.04	-	-	-	-	-	-	-	-
MW-3	999.08	999.31	998.62	999.10	998.50	998.12	998.18	998.77	999.21	999.45	999.11
MW-4R	996.24	996.45	995.71	995.95	995.37	995.48	995.32	995.37	996.50	997.82	996.59
MW-5	1010.76	1011.36	1008.92	1010.91	1007.84	1008.53	1007.50	1008.10	1011.16	1014.07	1010.19
MW-6	975.71	983.04	975.47	980.85	973.63	975.74	973.83	976.93	982.55	987.07	976.69
MW-7	968.46	969.54	967.92	968.97	967.92	967.98	967.86	967.90	968.40	977.75	968.29
MW-8	1006.75	1009.37	1007.56	1009.30	1005.47	1007.66	1007.73	1007.16	1011.16	1012.26	1012.06
MW-9	-	-	-	-	982.86	983.04	983.48	982.96	984.94	984.71	984.26
MW-10	-	-	-	-	1001.75	1001.90	1001.30	1001.57	1002.78	1004.80	1003.05
MW-11	-	-	-	-	968.75	969.66	969.78	969.39	976.35	958.76	970.34
MW-12	-	-	-	-	951.83	952.72	951.62	952.85	957.04	966.65	954.07
MW-12D	-	-	-	-	-	-	-	-	-	963.97	958.06
MW-13	-	-	-	-	958.33	958.41	957.51	960.03	964.43	975.00	963.61
MW-14	-	-	-	-	956.03	956.94	956.23	957.47	959.44	961.32	957.99
MW-15	-	-	-	-	996.60	997.74	997.38	997.83	1001.52	1002.37	999.19
MW-17	-	-	-	-	-	-	-	-	-	979.50	977.96

Table 2: Historical Groundwater Elevation Data

Name	06/15/2004	12/29/2004	06/22/2005	01/12/2006	07/06/2006	12/14/2006	06/27/2007	12/19/07
MW-1	1044.65	1044.69	1044.62	1044.60	1044.25	1044.62	1044.47	1044.13
MW-1A	1036.72	-	-	-	-	-	-	-
MW-1B	1038.18	1038.16	1038.67	1038.00	1037.14	1037.52	1037.75	1036.10
MW-2	-	-	-	-	-	979.17	977.28	975.12
MW-3	999.13	999.31	999.23	999.29	999.10	999.31	999.24	998.82
MW-4R	996.25	996.77	996.39	996.96	996.77	996.19	995.93	995.56
MW-5	1009.61	1011.18	1009.85	1010.43	1009.02	1009.69	1009.14	1007.51
MW-6	979.11	983.49	979.72	984.52	979.52	983.07	977.36	975.63
MW-7	967.83	968.52	969.83	968.01	967.77	967.94	967.42	976.18
MW-8	1008.40	1011.21	1010.54	1013.56	1013.63	1009.86	1007.57	-
MW-9	984.03	984.92	983.86	985.68	985.57	984.32	983.42	983.54
MW-10	1002.86	1003.33	1003.25	1003.21	1002.89	1002.99	1003.00	1002.03
MW-11	969.97	973.56	970.52	973.57	971.14	971.46	969.55	969.05
MW-12	954.60	955.95	957.26	954.29	953.70	954.67	954.81	951.15
MW-12D	952.82	952.78	949.27	948.26	947.66	948.10	947.29	943.50
MW-13	966.55	970.00	967.41	968.67	965.14	968.76	965.10	958.99
MW-14	958.05	960.16	958.25	960.08	955.93	958.32	957.89	956.58
MW-15	998.61	1000.90	999.22	1001.79	1000.78	999.56	995.44	994.91
MW-17	974.55	976.48	975.91	978.55	979.39	975.49	981.03	973.31

Name	Observed High	Observed Low	Difference	Average
MW-1	1048.09	1044.13	3.96	1045.47
MW-1A	1042.76	1036.14	6.62	1038.95
MW-1B	1046.21	1036.10	10.11	1038.87
MW-2	985.88	975.12	10.76	980.72
MW-3	1000.23	988.11	12.12	998.77
MW-4R	1001.44	995.32	6.12	997.01
MW-5	1025.82	1007.50	18.32	1011.42
MW-6	989.74	973.63	16.11	980.78
MW-7	977.75	967.42	10.33	970.29
MW-8	1014.21	1005.47	8.74	1010.13
MW-9	985.68	982.86	2.82	984.11
MW-10	1004.80	1001.30	3.50	1002.71
MW-11	976.35	958.76	17.59	970.12
MW-12	966.65	951.15	15.50	954.88
MW-12D	963.97	943.50	20.47	951.17
MW-13	975.00	957.51	17.49	964.53
MW-14	961.32	955.93	5.39	958.05
MW-15	1002.37	994.91	7.46	998.92
MW-17	981.03	973.31	7.72	977.22

Name	01/07/2008
MW-16	1005.58
MW-18	1029.33
MW-19	1015.00
MW-20	1005.91
MW-21	959.49
MW-22	943.66
MW-23	932.88
MW-24	940.34
MW-25	948.88
MW-26	960.78
MW-27	971.81

Table 3: Summary of Slug Test Results

Well	Screen Interval (BGS)	Initial DTW (BTOC)	Initial Head Change	K (cm/sec)	Lithology
MW-1A	32.5-47.5	46.50	31.50	5.60E-05	Gneiss
MW-2	15-30	22.80	3.20	3.70E-06	Silty Sand
MW-3	13-33	25.50	25.50	3.90E-06	PWR/Gneiss
MW-4R	5.5-20.5	14.80	4.80	4.90E-04	Silty Clay/Gneiss
MW-5	33.8-48.8	39.90	39.90	6.40E-05	Saprolite
MW-6	26-41	33.20	33.20	2.40E-05	Gneiss
MW-7	38-53	40.60	40.60	1.60E-06	Gneiss
MW-8	12.5-27.5	14.20	14.20	1.30E-05	Gneiss
MW-16	25.25-40.25	31.97	3.82	8.72E-04	Silty Sand
MW-18	41.7-56.7	55.00	2.48	1.19E-04	Gneiss
MW-19	48.92-63.92	56.48	1.56	1.92E-06	Gneiss
MW-20	48.55-63.55	40.80	5.72	5.49E-05	Gneiss
MW-21	26.05-41.05	30.51	3.98	3.77E-03	Silty Sand
MW-22	8.12-18.12	15.31	4.16	6.04E-04	Silty Sand
MW-23	6.54-21.51	17.60	4.97	9.83E-04	Silty Sand
MW-24	20.35-35.35	33.71	1.39	1.33E-02	PWR
MW-25	29.48-44.48	33.05	5.13	5.41E-05	Gneiss
MW-26	34.8-49.8	29.91	9.02	1.16E-04	Gneiss
MW-27	34.82-49.82	20.38	4.97	2.83E-05	Gneiss

Summary Statistics			
Geometric Mean (GM)	7.72E-05	Maximum	1.33E-02
Geo. Std. Deviation (σ_{GSD})	12.5	Minimum	1.60E-06
GM / GSD (-1σ_{GSD})	6.18E-06	Median	5.60E-05
GM * GSD (+1σ_{GSD})	9.64E-04	Count	19

Silty Sand			
Geometric Mean (GM)	3.73E-04	Maximum	3.77E-03
Geo. Std. Deviation (σ_{GSD})	14.4	Minimum	3.70E-06
GM / GSD (-1σ_{GSD})	2.58E-05	Median	8.72E-04
GM * GSD (+1σ_{GSD})	5.39E-03		

Gneiss			
Geometric Mean (GM)	2.65E-05	Maximum	4.90E-04
Geo. Std. Deviation (σ_{GSD})	5.73	Minimum	1.60E-06
GM / GSD (-1σ_{GSD})	4.62E-06	Median	4.12E-05
GM * GSD (+1σ_{GSD})	1.52E-04		

Notes: BGS = Below Ground Surface
BTOC = Below Top-of-Casing

Table 4: Summary of Historical Organic Results

Well ID	Parameter Name [1]	Sample Date	Result	Unit	Qual Code	PQL [2]	NCGW2L [3]	Exceedance
EB	Carbon disulfide	05/17/2000	6.2	ug/l		5	700	
EB	Chloroform	12/28/2007	28	ug/l		0.16	70	
FB	Chloroform	12/28/2007	31	ug/l		0.16	70	
MW-1	1,1-Dichloroethane	12/06/1999	18	ug/l		5	70	
MW-1	1,1-Dichloroethane	12/28/2001	13	ug/l		5	70	
MW-1	1,1-Dichloroethane	06/13/2002	17	ug/l		5	70	
MW-1	1,1-Dichloroethane	11/11/1996	15	ug/l		5	70	
MW-1	1,1-Dichloroethane	05/17/2000	17	ug/l		5	70	
MW-1	1,1-Dichloroethane	12/12/2000	17	ug/l		5	70	
MW-1	1,1-Dichloroethane	12/11/2003	6.2	ug/l		5	70	
MW-1	1,1-Dichloroethane	06/16/2004	5.4	ug/l		5	70	
MW-1	1,1-Dichloroethane	06/24/2003	8.3	ug/l		5	70	
MW-1	1,1-Dichloroethane	01/03/2003	8	ug/l		5	70	
MW-1	1,1-Dichloroethane	06/24/1997	22	ug/l		5	70	
MW-1	1,1-Dichloroethane	06/13/2001	15	ug/l		5	70	
MW-1	1,1-Dichloroethane	12/03/1997	19	ug/l		2	70	
MW-1	1,1-Dichloroethane	05/13/1999	20	ug/l		5	70	
MW-1	1,1-Dichloroethane	02/15/1995	17	ug/l		5	70	
MW-1	1,1-Dichloroethane	10/01/1994	19	ug/l		5	70	
MW-1	1,1-Dichloroethane	01/31/1995	17	ug/l		5	70	
MW-1	1,1-Dichloroethane	03/07/1995	15	ug/l		5	70	
MW-1	1,1-Dichloroethane	11/18/1998	15.1	ug/l		2	70	
MW-1	1,1-Dichloroethane	12/06/1995	13	ug/l		5	70	
MW-1	1,1-Dichloroethane	05/07/1996	16	ug/l		5	70	
MW-1	1,1-Dichloroethane	06/04/1998	19	ug/l		5	70	
MW-1	**1,4-Dichlorobenzene**	**12/27/2007**	**3.8**	**ug/l**		**0.15**	**1.4**	**2.4**
MW-1	**1,4-Dichlorobenzene**	**06/28/2007**	**2**	**ug/l**		**0.15**	**1.4**	**0.6**
MW-1	**Benzene**	**11/18/1998**	**3**	**ug/l**		**2**	**1**	**2**
MW-1	**Benzene**	**12/15/2006**	**4.2**	**ug/l**		**3**	**1**	**3.2**
MW-1	**Benzene**	**06/13/2002**	**7.2**	**ug/l**		**5**	**1**	**6.2**
MW-1	**Benzene**	**01/13/2006**	**6**	**ug/l**		**5**	**1**	**5**
MW-1	**Benzene**	**06/23/2005**	**5**	**ug/l**		**5**	**1**	**4**
MW-1	**Benzene**	**05/13/1999**	**5.7**	**ug/l**		**5**	**1**	**4.7**
MW-1	**Benzene**	**12/30/2004**	**5.7**	**ug/l**		**5**	**1**	**4.7**
MW-1	**Benzene**	**06/28/2007**	**5**	**ug/l**		**0.12**	**1**	**4**
MW-1	**Benzene**	**12/06/1999**	**5.7**	**ug/l**		**5**	**1**	**4.7**
MW-1	**Benzene**	**06/13/2001**	**5.9**	**ug/l**		**5**	**1**	**4.9**
MW-1	**Benzene**	**12/27/2007**	**5.6**	**ug/l**		**0.12**	**1**	**4.6**
MW-1	Carbon disulfide	05/13/1999	7.5	ug/l		5	700	
MW-1	Carbon disulfide	05/17/2000	18	ug/l		5	700	
MW-1	Carbon disulfide	06/13/2001	18	ug/l		5	700	
MW-1	Carbon disulfide	12/11/2003	170	ug/l		100	700	
MW-1	Carbon disulfide	06/24/1997	33	ug/l		5	700	
MW-1	Chloride	06/28/2007	2.8	mg/l		0.05	250	
MW-1	Chloride	02/11/2008	47000	ug/l		5000	250000	
MW-1	Chloroethane	11/18/1998	5.7	ug/l		2	2800	
MW-1	Chloroethane	12/03/1997	2	ug/l		2	2800	
MW-1	cis-1,2-Dichloroethene	12/27/2007	13	ug/l		0.14	70	
MW-1	cis-1,2-Dichloroethene	12/15/2006	6.6	ug/l		5	70	
MW-1	cis-1,2-Dichloroethene	05/17/2000	7.8	ug/l		5	70	
MW-1	cis-1,2-Dichloroethene	06/23/2005	10	ug/l		5	70	

Table 4: Summary of Historical Organic Results

Well ID	Parameter Name [1]	Sample Date	Result	Unit	Qual Code	PQL [2]	NCGW2L [3]	Exceedance
MW-1	cis-1,2-Dichloroethene	07/06/2006	8.1	ug/l		5	70	
MW-1	cis-1,2-Dichloroethene	11/18/1998	4.9	ug/l		2	70	
MW-1	cis-1,2-Dichloroethene	06/24/2003	14	ug/l		5	70	
MW-1	cis-1,2-Dichloroethene	06/13/2001	9.5	ug/l		5	70	
MW-1	cis-1,2-Dichloroethene	12/28/2001	7.4	ug/l		5	70	
MW-1	cis-1,2-Dichloroethene	01/03/2003	6.7	ug/l		5	70	
MW-1	cis-1,2-Dichloroethene	05/13/1999	8.3	ug/l		5	70	
MW-1	cis-1,2-Dichloroethene	12/30/2004	11	ug/l		5	70	
MW-1	cis-1,2-Dichloroethene	01/13/2006	11.4	ug/l		5	70	
MW-1	cis-1,2-Dichloroethene	06/28/2007	10	ug/l		0.14	70	
MW-1	cis-1,2-Dichloroethene	12/11/2003	8.8	ug/l		5	70	
MW-1	cis-1,2-Dichloroethene	06/16/2004	7.8	ug/l		5	70	
MW-1	cis-1,2-Dichloroethene	06/13/2002	12	ug/l		5	70	
MW-1	cis-1,2-Dichloroethene	12/06/1999	8.7	ug/l		5	70	
MW-1	cis-1,2-Dichloroethene	12/12/2000	9.7	ug/l		5	70	
MW-1	DEHP	12/03/1997	13	ug/l		10		
MW-1	Lindane	11/18/1998	0.055	ug/l		0.05	0.2	
MW-10	**Benzene**	**06/27/2007**	**2.1**	**ug/l**		**0.12**	**1**	**1.1**
MW-10	Carbon disulfide	06/12/2001	71	ug/l		5	700	
MW-10	Carbon disulfide	06/24/2003	13	ug/l		10	700	
MW-11	1,1-Dichloroethane	12/11/2000	11	ug/l		5	70	
MW-11	1,1-Dichloroethane	06/12/2001	10	ug/l		5	70	
MW-11	1,1-Dichloroethane	12/27/2001	9.8	ug/l		5	70	
MW-11	1,1-Dichloroethane	06/13/2002	7	ug/l		5	70	
MW-11	**1,4-Dichlorobenzene**	**06/12/2001**	**6.9**	**ug/l**		**5**	**1.4**	**5.5**
MW-11	**1,4-Dichlorobenzene**	**07/07/2006**	**11.6**	**ug/l**		**5**	**1.4**	**10.2**
MW-11	**1,4-Dichlorobenzene**	**06/15/2004**	**9**	**ug/l**		**5**	**1.4**	**7.6**
MW-11	**1,4-Dichlorobenzene**	**12/11/2003**	**8.3**	**ug/l**		**5**	**1.4**	**6.9**
MW-11	**1,4-Dichlorobenzene**	**06/22/2005**	**11**	**ug/l**		**5**	**1.4**	**9.6**
MW-11	**1,4-Dichlorobenzene**	**12/29/2004**	**8.4**	**ug/l**		**5**	**1.4**	**7**
MW-11	**1,4-Dichlorobenzene**	**12/14/2006**	**7.5**	**ug/l**		**3**	**1.4**	**6.1**
MW-11	**1,4-Dichlorobenzene**	**12/27/2007**	**5.9**	**ug/l**		**0.15**	**1.4**	**4.5**
MW-11	**1,4-Dichlorobenzene**	**06/24/2003**	**7.7**	**ug/l**		**5**	**1.4**	**6.3**
MW-11	**1,4-Dichlorobenzene**	**12/27/2001**	**7.8**	**ug/l**		**5**	**1.4**	**6.4**
MW-11	**Benzene**	**12/11/2000**	**5.2**	**ug/l**		**5**	**1**	**4.2**
MW-11	**Benzene**	**12/27/2001**	**6.9**	**ug/l**		**5**	**1**	**5.9**
MW-11	**Benzene**	**06/13/2002**	**7.7**	**ug/l**		**5**	**1**	**6.7**
MW-11	**Benzene**	**06/15/2004**	**5.3**	**ug/l**		**5**	**1**	**4.3**
MW-11	**Benzene**	**12/29/2004**	**5.6**	**ug/l**		**5**	**1**	**4.6**
MW-11	**Benzene**	**01/03/2003**	**6.4**	**ug/l**		**5**	**1**	**5.4**
MW-11	**Benzene**	**12/11/2003**	**6.4**	**ug/l**		**5**	**1**	**5.4**
MW-11	**Benzene**	**12/27/2007**	**4.2**	**ug/l**		**0.12**	**1**	**3.2**
MW-11	**Benzene**	**06/22/2005**	**6**	**ug/l**		**5**	**1**	**5**
MW-11	**Benzene**	**06/24/2003**	**6.3**	**ug/l**		**5**	**1**	**5.3**
MW-11	**Benzene**	**06/27/2007**	**6**	**ug/l**		**0.12**	**1**	**5**
MW-11	**Benzene**	**06/12/2001**	**7.8**	**ug/l**		**5**	**1**	**6.8**
MW-11	**Benzene**	**12/14/2006**	**4.6**	**ug/l**		**3**	**1**	**3.6**
MW-11	**Benzene**	**07/07/2006**	**5.1**	**ug/l**		**5**	**1**	**4.1**
MW-11	BHC, alpha	06/13/2002	0.0547	ug/l		0.05		
MW-11	BHC, alpha	01/03/2003	0.18	ug/l		0.05		
MW-11	Carbon disulfide	06/24/2003	47	ug/l		10	700	

Table 4: Summary of Historical Organic Results

Well ID	Parameter Name [1]	Sample Date	Result	Unit	Qual Code	PQL [2]	NCGW2L [3]	Exceedance
MW-11	Carbon disulfide	06/12/2001	15	ug/l		5	700	
MW-11	Chloride	06/27/2007	7.7	mg/l		0.05	250	
MW-11	cis-1,2-Dichloroethene	12/14/2006	26	ug/l		5	70	
MW-11	cis-1,2-Dichloroethene	01/12/2006	25.4	ug/l		5	70	
MW-11	cis-1,2-Dichloroethene	06/12/2001	50	ug/l		5	70	
MW-11	cis-1,2-Dichloroethene	12/29/2004	38	ug/l		5	70	
MW-11	cis-1,2-Dichloroethene	06/22/2005	40	ug/l		5	70	
MW-11	cis-1,2-Dichloroethene	07/07/2006	48.6	ug/l		5	70	
MW-11	cis-1,2-Dichloroethene	06/27/2007	30	ug/l		0.14	70	
MW-11	cis-1,2-Dichloroethene	12/11/2003	42	ug/l		5	70	
MW-11	cis-1,2-Dichloroethene	06/13/2002	51	ug/l		5	70	
MW-11	cis-1,2-Dichloroethene	12/27/2001	51	ug/l		5	70	
MW-11	cis-1,2-Dichloroethene	12/11/2000	28	ug/l		5	70	
MW-11	cis-1,2-Dichloroethene	06/24/2003	41	ug/l		5	70	
MW-11	cis-1,2-Dichloroethene	01/03/2003	42	ug/l		5	70	
MW-11	cis-1,2-Dichloroethene	12/27/2007	42	ug/l		0.14	70	
MW-11	cis-1,2-Dichloroethene	06/15/2004	35	ug/l		5	70	
MW-11	Trichloroethylene	06/27/2007	1.1	ug/l		0.23	2.8	
MW-12	1,1-Dichloroethane	06/12/2002	11	ug/l		5	70	
MW-12	1,1-Dichloroethane	01/02/2003	7.5	ug/l		5	70	
MW-12	1,1-Dichloroethane	06/24/2003	8.7	ug/l		5	70	
MW-12	1,1-Dichloroethane	01/12/2006	5.9	ug/l		5	70	
MW-12	1,1-Dichloroethane	12/27/2001	17	ug/l		5	70	
MW-12	1,1-Dichloroethane	12/28/2007	5	ug/l		0.09	70	
MW-12	1,1-Dichloroethane	06/13/2001	17	ug/l		5	70	
MW-12	1,1-Dichloroethane	12/11/2000	17	ug/l		5	70	
MW-12	1,1-Dichloroethane	12/11/2003	5.4	ug/l		5	70	
MW-12	**1,4-Dichlorobenzene**	**06/15/2004**	**6.4**	**ug/l**		**5**	**1.4**	**5**
MW-12	**1,4-Dichlorobenzene**	**06/12/2002**	**5.6**	**ug/l**		**5**	**1.4**	**4.2**
MW-12	**1,4-Dichlorobenzene**	**06/24/2003**	**6.8**	**ug/l**		**5**	**1.4**	**5.4**
MW-12	**1,4-Dichlorobenzene**	**06/13/2001**	**5.6**	**ug/l**		**5**	**1.4**	**4.2**
MW-12	**1,4-Dichlorobenzene**	**06/28/2007**	**7.5**	**ug/l**		**0.15**	**1.4**	**6.1**
MW-12	**1,4-Dichlorobenzene**	**07/07/2006**	**10.9**	**ug/l**		**5**	**1.4**	**9.5**
MW-12	**1,4-Dichlorobenzene**	**12/11/2003**	**5.7**	**ug/l**		**5**	**1.4**	**4.3**
MW-12	**1,4-Dichlorobenzene**	**01/12/2006**	**8.1**	**ug/l**		**5**	**1.4**	**6.7**
MW-12	**1,4-Dichlorobenzene**	**06/23/2005**	**8**	**ug/l**		**5**	**1.4**	**6.6**
MW-12	**1,4-Dichlorobenzene**	**12/30/2004**	**6.2**	**ug/l**		**5**	**1.4**	**4.8**
MW-12	**1,4-Dichlorobenzene**	**12/27/2001**	**6.4**	**ug/l**		**5**	**1.4**	**5**
MW-12	**1,4-Dichlorobenzene**	**12/11/2000**	**6.3**	**ug/l**		**5**	**1.4**	**4.9**
MW-12	**1,4-Dichlorobenzene**	**12/14/2006**	**6.9**	**ug/l**		**3**	**1.4**	**5.5**
MW-12	**1,4-Dichlorobenzene**	**12/28/2007**	**7.4**	**ug/l**		**0.15**	**1.4**	**6**
MW-12	**Benzene**	**12/11/2000**	**7**	**ug/l**		**5**	**1**	**6**
MW-12	**Benzene**	**06/13/2001**	**8.2**	**ug/l**		**5**	**1**	**7.2**
MW-12	**Benzene**	**12/28/2007**	**7.1**	**ug/l**		**0.12**	**1**	**6.1**
MW-12	**Benzene**	**12/27/2001**	**7.6**	**ug/l**		**5**	**1**	**6.6**
MW-12	**Benzene**	**01/12/2006**	**7.1**	**ug/l**		**5**	**1**	**6.1**
MW-12	**Benzene**	**07/07/2006**	**8.1**	**ug/l**		**5**	**1**	**7.1**
MW-12	**Benzene**	**06/23/2005**	**6**	**ug/l**		**5**	**1**	**5**
MW-12	**Benzene**	**12/30/2004**	**5.8**	**ug/l**		**5**	**1**	**4.8**
MW-12	**Benzene**	**06/28/2007**	**7.2**	**ug/l**		**0.12**	**1**	**6.2**
MW-12	**Benzene**	**06/15/2004**	**5**	**ug/l**		**5**	**1**	**4**

Table 4: Summary of Historical Organic Results

Well ID	Parameter Name [1]	Sample Date	Result	Unit	Qual Code	PQL [2]	NCGW2L [3]	Exceedance
MW-12	**Benzene**	**12/14/2006**	**6.3**	**ug/l**		**3**	**1**	**5.3**
MW-12	**Benzene**	**06/12/2002**	**5.6**	**ug/l**		**5**	**1**	**4.6**
MW-12	**Benzene**	**06/24/2003**	**6.5**	**ug/l**		**5**	**1**	**5.5**
MW-12	Chloride	06/28/2007	4.3	mg/l		0.05	250	
MW-12	Chloroethane	06/24/2003	15	ug/l		10	2800	
MW-12	Chloroethane	06/13/2001	11	ug/l		10	2800	
MW-12	cis-1,2-Dichloroethene	06/13/2001	10	ug/l		5	70	
MW-12	cis-1,2-Dichloroethene	12/11/2003	11	ug/l		5	70	
MW-12	cis-1,2-Dichloroethene	01/12/2006	11.8	ug/l		5	70	
MW-12	cis-1,2-Dichloroethene	12/28/2007	14	ug/l		0.14	70	
MW-12	cis-1,2-Dichloroethene	06/12/2002	7.1	ug/l		5	70	
MW-12	cis-1,2-Dichloroethene	12/27/2001	12	ug/l		5	70	
MW-12	cis-1,2-Dichloroethene	06/28/2007	11	ug/l		0.14	70	
MW-12	cis-1,2-Dichloroethene	06/15/2004	9.6	ug/l		5	70	
MW-12	cis-1,2-Dichloroethene	06/23/2005	9	ug/l		5	70	
MW-12	cis-1,2-Dichloroethene	01/02/2003	5.5	ug/l		5	70	
MW-12	cis-1,2-Dichloroethene	12/30/2004	12	ug/l		5	70	
MW-12	cis-1,2-Dichloroethene	07/07/2006	10.2	ug/l		5	70	
MW-12	cis-1,2-Dichloroethene	12/14/2006	9.1	ug/l		5	70	
MW-12	cis-1,2-Dichloroethene	06/24/2003	14	ug/l		5	70	
MW-12	cis-1,2-Dichloroethene	12/11/2000	10	ug/l		5	70	
MW-12	**Methylene chloride**	**06/13/2001**	**10**	**ug/l**		**5**	**4.6**	**5.4**
MW-12	**Methylene chloride**	**12/11/2000**	**13**	**ug/l**		**5**	**4.6**	**8.4**
MW-12	**Methylene chloride**	**12/27/2001**	**12**	**ug/l**		**5**	**4.6**	**7.4**
MW-12	**Methylene chloride**	**06/12/2002**	**7.4**	**ug/l**		**5**	**4.6**	**2.8**
MW-12	**Tetrachloroethylene**	**12/28/2007**	**1**	**ug/l**		**0.25**	**0.7**	**0.3**
MW-12	**Tetrachloroethylene**	**06/28/2007**	**1.3**	**ug/l**		**0.25**	**0.7**	**0.6**
MW-12	Trichloroethylene	12/28/2007	2.2	ug/l		0.23	2.8	
MW-12	Trichloroethylene	06/28/2007	2.4	ug/l		0.23	2.8	
MW-12D	Carbon disulfide	06/24/2003	70	ug/l		10	700	
MW-12D	Chloride	06/28/2007	32	mg/l		0.05	250	
MW-12D	Chloroform	06/24/2003	5.8	ug/l		5	70	
MW-13	Carbon disulfide	06/24/2003	91	ug/l		10	700	
MW-13	Carbon disulfide	12/11/2003	130	ug/l		100	700	
MW-13	Carbon disulfide	06/12/2001	15	ug/l		5	700	
MW-13	Chloride	06/28/2007	2.1	mg/l		0.05	250	
MW-14	1,1-Dichloroethane	12/12/2000	9.4	ug/l		5	70	
MW-14	1,1-Dichloroethane	06/13/2001	9.5	ug/l		5	70	
MW-14	1,1-Dichloroethane	06/13/2002	11	ug/l		5	70	
MW-14	1,1-Dichloroethane	12/28/2001	9	ug/l		5	70	
MW-14	**1,4-Dichlorobenzene**	**06/13/2002**	**7.5**	**ug/l**		**5**	**1.4**	**6.1**
MW-14	**1,4-Dichlorobenzene**	**07/07/2006**	**6.4**	**ug/l**		**5**	**1.4**	**5**
MW-14	**1,4-Dichlorobenzene**	**06/28/2007**	**3.9**	**ug/l**		**0.15**	**1.4**	**2.5**
MW-14	**1,4-Dichlorobenzene**	**12/15/2006**	**4**	**ug/l**		**3**	**1.4**	**2.6**
MW-14	**1,4-Dichlorobenzene**	**12/11/2003**	**5.5**	**ug/l**		**5**	**1.4**	**4.1**
MW-14	**1,4-Dichlorobenzene**	**12/28/2007**	**4.6**	**ug/l**		**0.15**	**1.4**	**3.2**
MW-14	**Benzene**	**12/28/2007**	**1.2**	**ug/l**		**0.12**	**1**	**0.2**
MW-14	**Benzene**	**06/28/2007**	**2**	**ug/l**		**0.12**	**1**	**1**
MW-14	cis-1,2-Dichloroethene	01/03/2003	6.3	ug/l		5	70	
MW-14	cis-1,2-Dichloroethene	12/15/2006	9.3	ug/l		5	70	
MW-14	cis-1,2-Dichloroethene	01/12/2006	7.9	ug/l		5	70	

Table 4: Summary of Historical Organic Results

Well ID	Parameter Name [1]	Sample Date	Result	Unit	Qual Code	PQL [2]	NCGW2L [3]	Exceedance
MW-14	cis-1,2-Dichloroethene	12/28/2001	12	ug/l		5	70	
MW-14	cis-1,2-Dichloroethene	12/29/2004	7.5	ug/l		5	70	
MW-14	cis-1,2-Dichloroethene	06/16/2004	11	ug/l		5	70	
MW-14	cis-1,2-Dichloroethene	12/11/2003	14	ug/l		5	70	
MW-14	cis-1,2-Dichloroethene	06/13/2002	17	ug/l		5	70	
MW-14	cis-1,2-Dichloroethene	12/12/2000	11	ug/l		5	70	
MW-14	cis-1,2-Dichloroethene	12/28/2007	19	ug/l		0.14	70	
MW-14	cis-1,2-Dichloroethene	07/07/2006	13.5	ug/l		5	70	
MW-14	cis-1,2-Dichloroethene	06/13/2001	12	ug/l		5	70	
MW-14	cis-1,2-Dichloroethene	06/23/2005	9	ug/l		5	70	
MW-14	cis-1,2-Dichloroethene	06/28/2007	14	ug/l		0.14	70	
MW-15	1,1-Dichloroethane	06/12/2001	41	ug/l		5	70	
MW-15	1,1-Dichloroethane	01/03/2003	24	ug/l		5	70	
MW-15	1,1-Dichloroethane	06/25/2003	53	ug/l		5	70	
MW-15	1,1-Dichloroethane	06/23/2005	6	ug/l		5	70	
MW-15	1,1-Dichloroethane	01/12/2006	9.1	ug/l		5	70	
MW-15	1,1-Dichloroethane	12/12/2003	13	ug/l		5	70	
MW-15	1,1-Dichloroethane	07/07/2006	5.8	ug/l		5	70	
MW-15	1,1-Dichloroethane	12/30/2004	26	ug/l		5	70	
MW-15	1,1-Dichloroethane	12/28/2001	17	ug/l		5	70	
MW-15	1,1-Dichloroethane	12/11/2000	27	ug/l		5	70	
MW-15	1,1-Dichloroethane	06/12/2002	28	ug/l		5	70	
MW-15	1,1-Dichloroethane	06/15/2004	9.2	ug/l		5	70	
MW-15	**Benzene**	**06/12/2001**	**5.3**	**ug/l**		**5**	**1**	**4.3**
MW-15	**Benzene**	**06/28/2007**	**2.6**	**ug/l**		**0.12**	**1**	**1.6**
MW-15	Carbon disulfide	06/12/2001	21	ug/l		5	700	
MW-15	Chloroethane	06/25/2003	13	ug/l		10	2800	
MW-15	cis-1,2-Dichloroethene	06/28/2007	6.6	ug/l		0.14	70	
MW-15	**Methylene chloride**	**12/30/2004**	**13**	**ug/l**		**10**	**4.6**	**8.4**
MW-15	**Methylene chloride**	**06/25/2003**	**16**	**ug/l**		**5**	**4.6**	**11.4**
MW-16	1,1-Dichloroethane	04/17/2008	15	ug/l		0.09	70	
MW-16	1,1-Dichloroethane	01/08/2008	21	ug/l		0.09	70	
MW-16	**1,2-Dichloropropane**	**01/08/2008**	**1**	**ug/l**		**0.18**	**0.51**	**0.49**
MW-16	**1,2-Dichloropropane**	**04/17/2008**	**1**	**ug/l**		**0.18**	**0.51**	**0.49**
MW-16	**1,4-Dichlorobenzene**	**04/17/2008**	**1.6**	**ug/l**		**0.15**	**1.4**	**0.2**
MW-16	**1,4-Dichlorobenzene**	**01/08/2008**	**1.8**	**ug/l**		**0.15**	**1.4**	**0.4**
MW-16	**Benzene**	**01/08/2008**	**3.3**	**ug/l**		**0.12**	**1**	**2.3**
MW-16	**Benzene**	**04/17/2008**	**3.6**	**ug/l**		**0.12**	**1**	**2.6**
MW-16	cis-1,2-Dichloroethene	04/17/2008	12	ug/l		0.14	70	
MW-16	cis-1,2-Dichloroethene	01/08/2008	16	ug/l		0.14	70	
MW-16	Methylene chloride	04/17/2008	3.8	ug/l		0.088	4.6	
MW-16	Methylene chloride	01/08/2008	4.1	ug/l		0.088	4.6	
MW-16	**Tetrachloroethylene**	**01/08/2008**	**2.5**	**ug/l**		**0.25**	**0.7**	**1.8**
MW-16	**Tetrachloroethylene**	**04/17/2008**	**3.3**	**ug/l**		**0.25**	**0.7**	**2.6**
MW-16	**Trichloroethylene**	**04/17/2008**	**3.6**	**ug/l**		**0.23**	**2.8**	**0.8**
MW-16	**Trichloroethylene**	**01/08/2008**	**3.7**	**ug/l**		**0.23**	**2.8**	**0.9**
MW-17	1,1-Dichloroethane	12/12/2003	12	ug/l		5	70	
MW-17	1,1-Dichloroethane	06/25/2003	17	ug/l		5	70	
MW-17	1,1-Dichloroethane	06/15/2004	9.1	ug/l		5	70	
MW-17	1,1-Dichloroethane	12/30/2004	6.3	ug/l		5	70	
MW-17	1,1-Dichloroethane	06/23/2005	7	ug/l		5	70	

Table 4: Summary of Historical Organic Results

Well ID	Parameter Name [1]	Sample Date	Result	Unit	Qual Code	PQL [2]	NCGW2L [3]	Exceedance
MW-17	**Benzene**	**12/27/2007**	**1.1**	**ug/l**		**0.12**	**1**	**0.1**
MW-17	**Benzene**	**06/28/2007**	**1.4**	**ug/l**		**0.12**	**1**	**0.4**
MW-17	**Methylene chloride**	**06/25/2003**	**9.7**	**ug/l**		**5**	**4.6**	**5.1**
MW-1A	1,1-Dichloroethane	12/03/1997	2	ug/l		1	70	
MW-1A	1,1-Dichloroethane	06/25/2003	6.2	ug/l		5	70	
MW-1A	1,1-Dichloroethane	12/28/2001	6.5	ug/l		5	70	
MW-1A	Acetone	06/25/2003	270	ug/l		20	700	
MW-1A	Acetone	12/11/2003	200	ug/l		200	700	
MW-1A	Carbon disulfide	06/25/2003	21	ug/l		10	700	
MW-1A	Xylene	12/03/1997	3	ug/l		1	530	
MW-1A	Xylene	06/16/2004	5.9	ug/l		5	530	
MW-1A	Xylene	11/18/1998	7.4	ug/l		2	530	
MW-1B	**1,4-Dichlorobenzene**	**12/28/2007**	**2.4**	**ug/l**		**0.15**	**1.4**	**1**
MW-1B	**Benzene**	**06/28/2007**	**1.7**	**ug/l**		**0.12**	**1**	**0.7**
MW-1B	Chloride	06/28/2007	2	mg/l		0.05	250	
MW-1B	Chloroform	12/11/2003	8.4	ug/l		5	70	
MW-1B	cis-1,2-Dichloroethene	12/28/2007	6.6	ug/l		0.14	70	
MW-1B	cis-1,2-Dichloroethene	01/13/2006	5.4	ug/l		5	70	
MW-1B	cis-1,2-Dichloroethene	12/30/2004	5.3	ug/l		5	70	
MW-1B	Methylene chloride	12/28/2007	2.8	ug/l		0.088	4.6	
MW-1B	Xylene	12/28/2007	8.8	ug/l		0.21	530	
MW-1B	Xylene	07/06/2006	7.3	ug/l		5	530	
MW-1B	Xylene	06/16/2004	5.2	ug/l		5	530	
MW-1B	Xylene	12/30/2004	5	ug/l		5	530	
MW-1B	Xylene	12/15/2006	5.5	ug/l		4	530	
MW-2	1,1-Dichloroethane	12/06/1995	19	ug/l		5	70	
MW-2	1,1-Dichloroethane	12/06/1999	12	ug/l		5	70	
MW-2	1,1-Dichloroethane	02/15/1995	26	ug/l		5	70	
MW-2	1,1-Dichloroethane	01/31/1995	26	ug/l		5	70	
MW-2	1,1-Dichloroethane	05/06/1996	11	ug/l		5	70	
MW-2	1,1-Dichloroethane	03/07/1995	26	ug/l		5	70	
MW-2	1,1-Dichloroethane	10/01/1994	33	ug/l		5	70	
MW-2	**1,4-Dichlorobenzene**	**12/15/2006**	**5**	**ug/l**		**3**	**1.4**	**3.6**
MW-2	**1,4-Dichlorobenzene**	**06/28/2007**	**5.2**	**ug/l**		**0.15**	**1.4**	**3.8**
MW-2	**1,4-Dichlorobenzene**	**02/11/2008**	**3.4**	**ug/l**		**0.21**	**1.4**	**2**
MW-2	**1,4-Dichlorobenzene**	**12/28/2007**	**4.4**	**ug/l**		**0.15**	**1.4**	**3**
MW-2	**1,4-Dichlorobenzene**	**12/06/1999**	**5.1**	**ug/l**		**5**	**1.4**	**3.7**
MW-2	**Benzene**	**03/07/1995**	**5**	**ug/l**		**5**	**1**	**4**
MW-2	**Benzene**	**06/28/2007**	**2.8**	**ug/l**		**0.12**	**1**	**1.8**
MW-2	**Benzene**	**12/28/2007**	**1.8**	**ug/l**		**0.12**	**1**	**0.8**
MW-2	**Benzene**	**02/15/1995**	**5**	**ug/l**		**5**	**1**	**4**
MW-2	**Benzene**	**12/15/2006**	**3**	**ug/l**		**3**	**1**	**2**
MW-2	**Benzene**	**02/11/2008**	**2.6**	**ug/l**		**0.16**	**1**	**1.6**
MW-2	**Benzene**	**12/06/1995**	**5**	**ug/l**		**5**	**1**	**4**
MW-2	Chloride	06/28/2007	45	mg/l		0.05	250	
MW-2	Chloride	02/11/2008	79000	ug/l		5000	250000	
MW-2	Chlorobenzene	02/11/2008	13.7	ug/l		0.13	50	
MW-2	Chloroethane	03/07/1995	22	ug/l		10	2800	
MW-2	Chloroethane	12/06/1995	14	ug/l		10	2800	
MW-2	Chloroethane	01/31/1995	20	ug/l		10	2800	
MW-2	Chloroethane	10/01/1994	22	ug/l		10	2800	

Table 4: Summary of Historical Organic Results

Well ID	Parameter Name [1]	Sample Date	Result	Unit	Qual Code	PQL [2]	NCGW2L [3]	Exceedance
MW-2	Chloroethane	02/15/1995	20	ug/l		10	2800	
MW-2	cis-1,2-Dichloroethene	05/06/1996	5	ug/l		5	70	
MW-2	cis-1,2-Dichloroethene	03/07/1995	6	ug/l		5	70	
MW-2	cis-1,2-Dichloroethene	02/15/1995	6	ug/l		5	70	
MW-2	cis-1,2-Dichloroethene	12/28/2007	18	ug/l		0.14	70	
MW-2	cis-1,2-Dichloroethene	12/15/2006	13	ug/l		5	70	
MW-2	cis-1,2-Dichloroethene	06/28/2007	17	ug/l		0.14	70	
MW-2	cis-1,2-Dichloroethene	01/31/1995	5	ug/l		5	70	
MW-2	cis-1,2-Dichloroethene	12/06/1995	6	ug/l		5	70	
MW-2	cis-1,2-Dichloroethene	12/06/1999	13	ug/l		5	70	
MW-2	Trichloroethylene	06/28/2007	1.4	ug/l		0.23	2.8	
MW-2	**Trichloroethylene**	**01/31/1995**	**6**	**ug/l**		**5**	**2.8**	**3.2**
MW-2	**Trichloroethylene**	**02/15/1995**	**6**	**ug/l**		**5**	**2.8**	**3.2**
MW-2	**Trichloroethylene**	**10/01/1994**	**5**	**ug/l**		**5**	**2.8**	**2.2**
MW-2	**Trichloroethylene**	**12/06/1995**	**6**	**ug/l**		**5**	**2.8**	**3.2**
MW-2	**Trichloroethylene**	**03/07/1995**	**6**	**ug/l**		**5**	**2.8**	**3.2**
MW-23	1,4-Dichlorobenzene	01/07/2008	1.1	ug/l		0.15	1.4	
MW-23	cis-1,2-Dichloroethene	01/07/2008	7.8	ug/l		0.14	70	
MW-24	**1,4-Dichlorobenzene**	**01/08/2008**	**2.7**	**ug/l**		**0.15**	**1.4**	**1.3**
MW-24	**1,4-Dichlorobenzene**	**04/17/2008**	**2.5**	**ug/l**		**0.15**	**1.4**	**1.1**
MW-24	**Benzene**	**04/17/2008**	**1.3**	**ug/l**		**0.12**	**1**	**0.3**
MW-24	**Benzene**	**01/08/2008**	**1.6**	**ug/l**		**0.12**	**1**	**0.6**
MW-24	cis-1,2-Dichloroethene	04/17/2008	7.2	ug/l		0.14	70	
MW-24	cis-1,2-Dichloroethene	01/08/2008	8.2	ug/l		0.14	70	
MW-26	**1,4-Dichlorobenzene**	**04/17/2008**	**3.2**	**ug/l**		**0.15**	**1.4**	**1.8**
MW-26	**1,4-Dichlorobenzene**	**01/09/2008**	**3.1**	**ug/l**		**0.15**	**1.4**	**1.7**
MW-26	**Benzene**	**04/17/2008**	**1.6**	**ug/l**		**0.12**	**1**	**0.6**
MW-26	**Benzene**	**01/09/2008**	**1.9**	**ug/l**		**0.12**	**1**	**0.9**
MW-26	cis-1,2-Dichloroethene	01/09/2008	32	ug/l		0.14	70	
MW-26	cis-1,2-Dichloroethene	04/17/2008	26	ug/l		0.14	70	
MW-27	cis-1,2-Dichloroethene	01/09/2008	21	ug/l		0.14	70	
MW-3	1,1-Dichloroethane	05/06/1996	9	ug/l		5	70	
MW-3	1,1-Dichloroethane	02/15/1995	18	ug/l		5	70	
MW-3	1,1-Dichloroethane	01/31/1995	13	ug/l		5	70	
MW-3	1,1-Dichloroethane	10/01/1994	22	ug/l		5	70	
MW-3	1,1-Dichloroethane	03/07/1995	13	ug/l		5	70	
MW-3	1,1-Dichloroethane	12/07/1995	9	ug/l		5	70	
MW-3	1,1-Dichloroethane	06/24/1997	5.2	ug/l		5	70	
MW-3	1,1-Dichloroethane	11/11/1996	8.8	ug/l		5	70	
MW-3	1,1-Dichloroethane	12/03/1997	6	ug/l		1	70	
MW-3	**1,2-Dichloropropane**	**03/07/1995**	**7**	**ug/l**		**5**	**0.51**	**6.49**
MW-3	**1,2-Dichloropropane**	**02/15/1995**	**9**	**ug/l**		**5**	**0.51**	**8.49**
MW-3	**1,2-Dichloropropane**	**01/31/1995**	**6**	**ug/l**		**5**	**0.51**	**5.49**
MW-3	**1,2-Dichloropropane**	**10/01/1994**	**11**	**ug/l**		**5**	**0.51**	**10.49**
MW-3	**1,2-Dichloropropane**	**12/03/1997**	**2**	**ug/l**		**1**	**0.51**	**1.49**
MW-3	1,2,4-Trimethylbenzene	12/03/1997	5	ug/l		1		
MW-3	1,2,4-Trimethylbenzene	05/13/1999	5.8	ug/l		5		
MW-3	1,3,5-Trimethylbenzene	12/03/1997	2	ug/l		1		
MW-3	**1,4-Dichlorobenzene**	**12/03/1997**	**8**	**ug/l**		**1**	**1.4**	**6.6**
MW-3	**1,4-Dichlorobenzene**	**11/11/1996**	**5.2**	**ug/l**		**5**	**1.4**	**3.8**
MW-3	**1,4-Dichlorobenzene**	**12/11/2000**	**7.4**	**ug/l**		**5**	**1.4**	**6**

Table 4: Summary of Historical Organic Results

Well ID	Parameter Name [1]	Sample Date	Result	Unit	Qual Code	PQL [2]	NCGW2L [3]	Exceedance
MW-3	**1,4-Dichlorobenzene**	**12/28/2007**	**9.8**	**ug/l**		**0.15**	**1.4**	**8.4**
MW-3	**1,4-Dichlorobenzene**	**11/18/1998**	**4.6**	**ug/l**		**2**	**1.4**	**3.2**
MW-3	**1,4-Dichlorobenzene**	**05/17/2000**	**7.6**	**ug/l**		**5**	**1.4**	**6.2**
MW-3	**1,4-Dichlorobenzene**	**06/27/2007**	**5.8**	**ug/l**		**0.15**	**1.4**	**4.4**
MW-3	**1,4-Dichlorobenzene**	**12/14/2006**	**3.8**	**ug/l**		**3**	**1.4**	**2.4**
MW-3	**1,4-Dichlorobenzene**	**06/24/2003**	**9.5**	**ug/l**		**5**	**1.4**	**8.1**
MW-3	**1,4-Dichlorobenzene**	**06/13/2002**	**8.4**	**ug/l**		**5**	**1.4**	**7**
MW-3	**1,4-Dichlorobenzene**	**06/22/2005**	**11**	**ug/l**		**5**	**1.4**	**9.6**
MW-3	**1,4-Dichlorobenzene**	**12/07/1995**	**6**	**ug/l**		**5**	**1.4**	**4.6**
MW-3	**1,4-Dichlorobenzene**	**06/04/1998**	**7.6**	**ug/l**		**5**	**1.4**	**6.2**
MW-3	**1,4-Dichlorobenzene**	**12/27/2001**	**7.5**	**ug/l**		**5**	**1.4**	**6.1**
MW-3	**1,4-Dichlorobenzene**	**06/12/2001**	**6.6**	**ug/l**		**5**	**1.4**	**5.2**
MW-3	**1,4-Dichlorobenzene**	**12/11/2003**	**7.5**	**ug/l**		**5**	**1.4**	**6.1**
MW-3	**1,4-Dichlorobenzene**	**06/15/2004**	**5.6**	**ug/l**		**5**	**1.4**	**4.2**
MW-3	**1,4-Dichlorobenzene**	**12/06/1999**	**7.7**	**ug/l**		**5**	**1.4**	**6.3**
MW-3	**1,4-Dichlorobenzene**	**12/29/2004**	**8.9**	**ug/l**		**5**	**1.4**	**7.5**
MW-3	**1,4-Dichlorobenzene**	**05/13/1999**	**7.4**	**ug/l**		**5**	**1.4**	**6**
MW-3	2,4,5-TP	06/13/2002	11	ug/l		2	50	
MW-3	**Benzene**	**12/06/1999**	**11**	**ug/l**		**5**	**1**	**10**
MW-3	**Benzene**	**11/18/1998**	**5.7**	**ug/l**		**2**	**1**	**4.7**
MW-3	**Benzene**	**06/04/1998**	**8.8**	**ug/l**		**5**	**1**	**7.8**
MW-3	**Benzene**	**06/24/1997**	**8.3**	**ug/l**		**5**	**1**	**7.3**
MW-3	**Benzene**	**12/28/2007**	**8**	**ug/l**		**0.12**	**1**	**7**
MW-3	**Benzene**	**05/13/1999**	**7.9**	**ug/l**		**5**	**1**	**6.9**
MW-3	**Benzene**	**06/24/2003**	**11**	**ug/l**		**5**	**1**	**10**
MW-3	**Benzene**	**02/15/1995**	**9**	**ug/l**		**5**	**1**	**8**
MW-3	**Benzene**	**06/27/2007**	**8**	**ug/l**		**0.12**	**1**	**7**
MW-3	**Benzene**	**06/13/2002**	**10**	**ug/l**		**5**	**1**	**9**
MW-3	**Benzene**	**05/17/2000**	**9.5**	**ug/l**		**5**	**1**	**8.5**
MW-3	**Benzene**	**12/11/2000**	**10**	**ug/l**		**5**	**1**	**9**
MW-3	**Benzene**	**12/27/2001**	**11**	**ug/l**		**5**	**1**	**10**
MW-3	**Benzene**	**03/07/1995**	**6**	**ug/l**		**5**	**1**	**5**
MW-3	**Benzene**	**05/06/1996**	**9**	**ug/l**		**5**	**1**	**8**
MW-3	**Benzene**	**11/11/1996**	**11**	**ug/l**		**5**	**1**	**10**
MW-3	**Benzene**	**12/03/1997**	**10**	**ug/l**		**1**	**1**	**9**
MW-3	**Benzene**	**06/15/2004**	**6.9**	**ug/l**		**5**	**1**	**5.9**
MW-3	**Benzene**	**01/31/1995**	**8**	**ug/l**		**5**	**1**	**7**
MW-3	**Benzene**	**12/29/2004**	**8.5**	**ug/l**		**5**	**1**	**7.5**
MW-3	**Benzene**	**12/14/2006**	**4.8**	**ug/l**		**3**	**1**	**3.8**
MW-3	**Benzene**	**01/03/2003**	**7.5**	**ug/l**		**5**	**1**	**6.5**
MW-3	**Benzene**	**12/11/2003**	**7.9**	**ug/l**		**5**	**1**	**6.9**
MW-3	**Benzene**	**06/22/2005**	**7**	**ug/l**		**5**	**1**	**6**
MW-3	**Benzene**	**10/01/1994**	**9**	**ug/l**		**5**	**1**	**8**
MW-3	**Benzene**	**06/12/2001**	**13**	**ug/l**		**5**	**1**	**12**
MW-3	BHC, alpha	12/03/1997	0.12	ug/l		0.05		
MW-3	Carbon disulfide	06/24/2003	31	ug/l		10	700	
MW-3	Carbon disulfide	01/03/2003	11	ug/l		10	700	
MW-3	Carbon disulfide	06/12/2001	26	ug/l		5	700	
MW-3	Carbon disulfide	05/17/2000	22	ug/l		5	700	
MW-3	Carbon disulfide	11/18/1998	6.7	ug/l		2	700	
MW-3	Carbon disulfide	06/24/1997	6.6	ug/l		5	700	

Table 4: Summary of Historical Organic Results

Well ID	Parameter Name [1]	Sample Date	Result	Unit	Qual Code	PQL [2]	NCGW2L [3]	Exceedance
MW-3	Carbon disulfide	12/11/2000	29	ug/l		10	700	
MW-3	Chloride	02/11/2008	11000	ug/l		5000	250000	
MW-3	Chloride	06/27/2007	7.7	mg/l		0.05	250	
MW-3	Chloroethane	11/18/1998	9.7	ug/l		2	2800	
MW-3	Chloroethane	02/15/1995	12	ug/l		10	2800	
MW-3	Chloroethane	11/11/1996	10	ug/l		10	2800	
MW-3	Chloroethane	12/03/1997	12	ug/l		1	2800	
MW-3	Chloroethane	06/24/2003	10	ug/l		10	2800	
MW-3	Chloroethane	01/31/1995	10	ug/l		10	2800	
MW-3	Chloroethane	10/01/1994	12	ug/l		10	2800	
MW-3	cis-1,2-Dichloroethene	01/03/2003	22	ug/l		5	70	
MW-3	cis-1,2-Dichloroethene	12/27/2001	28	ug/l		5	70	
MW-3	cis-1,2-Dichloroethene	05/17/2000	20	ug/l		5	70	
MW-3	cis-1,2-Dichloroethene	12/03/1997	17	ug/l		1	70	
MW-3	cis-1,2-Dichloroethene	06/24/1997	14	ug/l		5	70	
MW-3	cis-1,2-Dichloroethene	06/15/2004	16	ug/l		5	70	
MW-3	cis-1,2-Dichloroethene	02/15/1995	13	ug/l		5	70	
MW-3	cis-1,2-Dichloroethene	05/06/1996	13	ug/l		5	70	
MW-3	cis-1,2-Dichloroethene	11/11/1996	12	ug/l		5	70	
MW-3	cis-1,2-Dichloroethene	12/07/1995	10	ug/l		5	70	
MW-3	cis-1,2-Dichloroethene	12/14/2006	7.6	ug/l		5	70	
MW-3	cis-1,2-Dichloroethene	12/29/2004	18	ug/l		5	70	
MW-3	cis-1,2-Dichloroethene	12/28/2007	13	ug/l		0.14	70	
MW-3	cis-1,2-Dichloroethene	12/11/2000	26	ug/l		5	70	
MW-3	cis-1,2-Dichloroethene	03/07/1995	10	ug/l		5	70	
MW-3	cis-1,2-Dichloroethene	06/22/2005	12	ug/l		5	70	
MW-3	cis-1,2-Dichloroethene	01/12/2006	10.6	ug/l		5	70	
MW-3	cis-1,2-Dichloroethene	06/27/2007	8.3	ug/l		0.14	70	
MW-3	cis-1,2-Dichloroethene	06/24/2003	30	ug/l		5	70	
MW-3	cis-1,2-Dichloroethene	10/01/1994	12	ug/l		5	70	
MW-3	cis-1,2-Dichloroethene	06/04/1998	17	ug/l		5	70	
MW-3	cis-1,2-Dichloroethene	01/31/1995	7	ug/l		5	70	
MW-3	cis-1,2-Dichloroethene	06/13/2002	24	ug/l		5	70	
MW-3	cis-1,2-Dichloroethene	12/11/2003	20	ug/l		5	70	
MW-3	cis-1,2-Dichloroethene	11/18/1998	15.8	ug/l		2	70	
MW-3	cis-1,2-Dichloroethene	12/06/1999	21	ug/l		5	70	
MW-3	cis-1,2-Dichloroethene	05/13/1999	20	ug/l		5	70	
MW-3	cis-1,2-Dichloroethene	06/12/2001	25	ug/l		5	70	
MW-3	Cumene	12/03/1997	2	ug/l		1		
MW-3	Ethylbenzene	12/28/2007	3.9	ug/l		0.17	550	
MW-3	Ethylbenzene	12/03/1997	3	ug/l		1	550	
MW-3	Ethylbenzene	11/18/1998	2	ug/l		2	550	
MW-3	Ethylbenzene	06/27/2007	2.3	ug/l		0.17	550	
MW-3	**Heptachlor**	**12/03/1997**	**0.1**	**ug/l**		**0.05**	**0.008**	**0.092**
MW-3	Methyl methacrylate	12/03/1997	35	ug/l		1		
MW-3	Methyl tert-butyl ether	12/03/1997	14	ug/l		1		
MW-3	**Methylene chloride**	**10/01/1994**	**24**	**ug/l**		**10**	**4.6**	**19.4**
MW-3	**Methylene chloride**	**02/15/1995**	**14**	**ug/l**		**10**	**4.6**	**9.4**
MW-3	Naphthalene	12/03/1997	7	ug/l		1	21	
MW-3	Naphthalene	04/30/1998	4.6	ug/l		2	21	
MW-3	**Tetrachloroethylene**	**12/03/1997**	**1**	**ug/l**		**1**	**0.7**	**0.3**

Table 4: Summary of Historical Organic Results

Well ID	Parameter Name [1]	Sample Date	Result	Unit	Qual Code	PQL [2]	NCGW2L [3]	Exceedance
MW-3	Toluene	06/27/2007	3.2	ug/l		0.15	1000	
MW-3	Toluene	12/03/1997	2	ug/l		1	1000	
MW-3	Toluene	05/06/1996	8	ug/l		5	1000	
MW-3	Toluene	12/28/2007	2.1	ug/l		0.15	1000	
MW-3	Toluene	06/24/2003	5.1	ug/l		5	1000	
MW-3	Toluene	06/24/1997	7.6	ug/l		5	1000	
MW-3	**Trichloroethylene**	**12/03/1997**	**4**	**ug/l**		**1**	**2.8**	**1.2**
MW-3	Trichloroethylene	06/27/2007	1.1	ug/l		0.23	2.8	
MW-3	Trichloroethylene	12/28/2007	2	ug/l		0.23	2.8	
MW-3	**Trichloroethylene**	**02/15/1995**	**5**	**ug/l**		**5**	**2.8**	**2.2**
MW-3	**Vinyl chloride**	**12/03/1997**	**2**	**ug/l**		**1**	**0.015**	**1.985**
MW-3	Xylene	06/04/1998	23	ug/l		5	530	
MW-3	Xylene	02/15/1995	24	ug/l		5	530	
MW-3	Xylene	12/03/1997	11	ug/l		1	530	
MW-3	Xylene	12/14/2006	8.8	ug/l		4	530	
MW-3	Xylene	06/27/2007	12	ug/l		0.21	530	
MW-3	Xylene	11/18/1998	12.8	ug/l		2	530	
MW-3	Xylene	05/13/1999	11	ug/l		5	530	
MW-3	Xylene	12/11/2003	10	ug/l		5	530	
MW-3	Xylene	06/22/2005	16	ug/l		5	530	
MW-3	Xylene	01/31/1995	20	ug/l		5	530	
MW-3	Xylene	12/29/2004	13	ug/l		5	530	
MW-3	Xylene	06/15/2004	9.3	ug/l		5	530	
MW-3	Xylene	12/28/2007	15	ug/l		0.21	530	
MW-3	Xylene	03/07/1995	22	ug/l		5	530	
MW-3	Xylene	12/07/1995	19	ug/l		5	530	
MW-3	Xylene	10/01/1994	34	ug/l		5	530	
MW-3	Xylene	05/06/1996	34	ug/l		5	530	
MW-3	Xylene	06/24/1997	23	ug/l		5	530	
MW-3	Xylene	06/24/2003	17	ug/l		10	530	
MW-4	1,1-Dichloroethane	10/01/1994	14	ug/l		5	70	
MW-4	1,1-Dichloroethane	12/03/1997	16	ug/l		1	70	
MW-4	**1,4-Dichlorobenzene**	**12/03/1997**	**3**	**ug/l**		**1**	**1.4**	**1.6**
MW-4	**Benzene**	**12/03/1997**	**4**	**ug/l**		**1**	**1**	**3**
MW-4	Chloroethane	12/03/1997	7	ug/l		1	2800	
MW-4	cis-1,2-Dichloroethene	12/03/1997	20	ug/l		1	70	
MW-4	cis-1,2-Dichloroethene	10/01/1994	8	ug/l		5	70	
MW-4	**Trichloroethylene**	**12/03/1997**	**3**	**ug/l**		**1**	**2.8**	**0.2**
MW-4R	1,1-Dichloroethane	06/15/2004	7.4	ug/l		5	70	
MW-4R	1,1-Dichloroethane	10/01/1994	14	ug/l		5	70	
MW-4R	1,1-Dichloroethane	12/27/2007	7.6	ug/l		0.09	70	
MW-4R	1,1-Dichloroethane	06/13/2002	7.4	ug/l		5	70	
MW-4R	1,1-Dichloroethane	06/13/2001	13	ug/l		5	70	
MW-4R	1,1-Dichloroethane	11/18/1998	10.1	ug/l		2	70	
MW-4R	1,1-Dichloroethane	06/25/2003	7	ug/l		5	70	
MW-4R	1,1-Dichloroethane	12/28/2001	16	ug/l		5	70	
MW-4R	1,1-Dichloroethane	12/06/1999	18	ug/l		5	70	
MW-4R	1,1-Dichloroethane	05/13/1999	15	ug/l		5	70	
MW-4R	1,1-Dichloroethane	12/11/2000	15	ug/l		5	70	
MW-4R	1,1-Dichloroethane	06/04/1998	10	ug/l		5	70	
MW-4R	1,1-Dichloroethane	12/29/2004	7.5	ug/l		5	70	

Table 4: Summary of Historical Organic Results

Well ID	Parameter Name [1]	Sample Date	Result	Unit	Qual Code	PQL [2]	NCGW2L [3]	Exceedance
MW-4R	1,1-Dichloroethane	07/07/2006	6	ug/l		5	70	
MW-4R	1,1-Dichloroethane	06/27/2007	6.2	ug/l		0.09	70	
MW-4R	1,1-Dichloroethane	12/06/1995	11	ug/l		5	70	
MW-4R	1,1-Dichloroethane	06/22/2005	7	ug/l		5	70	
MW-4R	1,1-Dichloroethane	12/12/2003	7.4	ug/l		5	70	
MW-4R	1,1-Dichloroethane	06/24/1997	13	ug/l		5	70	
MW-4R	1,1-Dichloroethane	01/12/2006	14.6	ug/l		5	70	
MW-4R	1,1-Dichloroethane	03/07/1995	14	ug/l		5	70	
MW-4R	1,1-Dichloroethane	05/06/1996	13	ug/l		5	70	
MW-4R	1,1-Dichloroethane	05/17/2000	12	ug/l		5	70	
MW-4R	1,1-Dichloroethane	11/11/1996	16	ug/l		5	70	
MW-4R	1,1-Dichloroethane	02/15/1995	17	ug/l		5	70	
MW-4R	1,1-Dichloroethane	01/31/1995	17	ug/l		5	70	
MW-4R	**1,4-Dichlorobenzene**	**12/27/2007**	**3.6**	**ug/l**		**0.15**	**1.4**	**2.2**
MW-4R	**1,4-Dichlorobenzene**	**12/14/2006**	**3.3**	**ug/l**		**3**	**1.4**	**1.9**
MW-4R	**1,4-Dichlorobenzene**	**06/27/2007**	**3.6**	**ug/l**		**0.15**	**1.4**	**2.2**
MW-4R	**Benzene**	**06/13/2001**	**5.6**	**ug/l**		**5**	**1**	**4.6**
MW-4R	**Benzene**	**06/27/2007**	**2.8**	**ug/l**		**0.12**	**1**	**1.8**
MW-4R	**Benzene**	**11/18/1998**	**2.3**	**ug/l**		**2**	**1**	**1.3**
MW-4R	**Benzene**	**06/25/2003**	**5.1**	**ug/l**		**5**	**1**	**4.1**
MW-4R	BHC, alpha	04/30/1998	0.066	ug/l		0.05		
MW-4R	BHC, alpha	12/03/1997	0.1	ug/l		0.05		
MW-4R	BHC, alpha	11/18/1998	0.39	ug/l		0.05		
MW-4R	Carbon disulfide	06/13/2001	11	ug/l		5	700	
MW-4R	Carbon disulfide	05/17/2000	30	ug/l		5	700	
MW-4R	Carbon disulfide	06/24/1997	5.5	ug/l		5	700	
MW-4R	Carbon disulfide	06/25/2003	20	ug/l		10	700	
MW-4R	Carbon disulfide	05/13/1999	5.9	ug/l		5	700	
MW-4R	Carbon disulfide	12/28/2001	5.4	ug/l		5	700	
MW-4R	Chloroethane	11/18/1998	7.6	ug/l		2	2800	
MW-4R	Chloroethane	05/06/1996	13	ug/l		10	2800	
MW-4R	cis-1,2-Dichloroethene	03/07/1995	10	ug/l		5	70	
MW-4R	cis-1,2-Dichloroethene	06/25/2003	36	ug/l		5	70	
MW-4R	cis-1,2-Dichloroethene	12/28/2001	24	ug/l		5	70	
MW-4R	cis-1,2-Dichloroethene	07/07/2006	12.8	ug/l		5	70	
MW-4R	cis-1,2-Dichloroethene	12/11/2000	15	ug/l		5	70	
MW-4R	cis-1,2-Dichloroethene	06/22/2005	16	ug/l		5	70	
MW-4R	cis-1,2-Dichloroethene	06/15/2004	15	ug/l		5	70	
MW-4R	cis-1,2-Dichloroethene	01/12/2006	14	ug/l		5	70	
MW-4R	cis-1,2-Dichloroethene	06/13/2001	19	ug/l		5	70	
MW-4R	cis-1,2-Dichloroethene	10/01/1994	10	ug/l		5	70	
MW-4R	cis-1,2-Dichloroethene	01/31/1995	12	ug/l		5	70	
MW-4R	cis-1,2-Dichloroethene	02/15/1995	12	ug/l		5	70	
MW-4R	cis-1,2-Dichloroethene	06/13/2002	14	ug/l		5	70	
MW-4R	cis-1,2-Dichloroethene	01/02/2003	22	ug/l		5	70	
MW-4R	cis-1,2-Dichloroethene	12/14/2006	11	ug/l		5	70	
MW-4R	cis-1,2-Dichloroethene	12/29/2004	20	ug/l		5	70	
MW-4R	cis-1,2-Dichloroethene	12/06/1999	16	ug/l		5	70	
MW-4R	cis-1,2-Dichloroethene	05/17/2000	14	ug/l		5	70	
MW-4R	cis-1,2-Dichloroethene	12/06/1995	7	ug/l		5	70	
MW-4R	cis-1,2-Dichloroethene	05/06/1996	10	ug/l		5	70	

Table 4: Summary of Historical Organic Results

Well ID	Parameter Name [1]	Sample Date	Result	Unit	Qual Code	PQL [2]	NCGW2L [3]	Exceedance
MW-4R	cis-1,2-Dichloroethene	06/04/1998	18	ug/l		5	70	
MW-4R	cis-1,2-Dichloroethene	06/24/1997	18	ug/l		5	70	
MW-4R	cis-1,2-Dichloroethene	06/27/2007	15	ug/l		0.14	70	
MW-4R	cis-1,2-Dichloroethene	12/12/2003	17	ug/l		5	70	
MW-4R	cis-1,2-Dichloroethene	11/11/1996	16	ug/l		5	70	
MW-4R	cis-1,2-Dichloroethene	05/13/1999	16	ug/l		5	70	
MW-4R	cis-1,2-Dichloroethene	12/27/2007	18	ug/l		0.14	70	
MW-4R	Lindane	11/18/1998	0.11	ug/l		0.05	0.2	
MW-5	1,1-Dichloroethane	05/13/1999	15	ug/l		5	70	
MW-5	1,1-Dichloroethane	01/12/2006	7.5	ug/l		5	70	
MW-5	1,1-Dichloroethane	06/13/2002	5.9	ug/l		5	70	
MW-5	1,1-Dichloroethane	12/06/1999	13	ug/l		5	70	
MW-5	1,1-Dichloroethane	01/02/2003	6.1	ug/l		5	70	
MW-5	1,1-Dichloroethane	05/17/2000	10	ug/l		5	70	
MW-5	1,1-Dichloroethane	02/15/1995	8	ug/l		5	70	
MW-5	1,1-Dichloroethane	12/07/1995	14	ug/l		5	70	
MW-5	1,1-Dichloroethane	06/24/2003	6.4	ug/l		5	70	
MW-5	1,1-Dichloroethane	06/24/1997	15	ug/l		5	70	
MW-5	1,1-Dichloroethane	05/06/1996	16	ug/l		5	70	
MW-5	1,1-Dichloroethane	12/19/2007	5.7	ug/l		0.09	70	
MW-5	1,1-Dichloroethane	11/18/1998	11.2	ug/l		2	70	
MW-5	1,1-Dichloroethane	01/31/1995	12	ug/l		5	70	
MW-5	1,1-Dichloroethane	06/13/2001	12	ug/l		5	70	
MW-5	1,1-Dichloroethane	12/11/2000	11	ug/l		5	70	
MW-5	1,1-Dichloroethane	12/03/1997	19	ug/l		1	70	
MW-5	1,1-Dichloroethane	10/01/1994	11	ug/l		5	70	
MW-5	1,1-Dichloroethane	06/04/1998	22	ug/l		5	70	
MW-5	1,1-Dichloroethane	11/11/1996	16	ug/l		5	70	
MW-5	1,1-Dichloroethane	03/07/1995	7	ug/l		5	70	
MW-5	1,1-Dichloroethane	12/27/2001	6.2	ug/l		5	70	
MW-5	**Benzene**	**06/13/2001**	**6.1**	**ug/l**		**5**	**1**	**5.1**
MW-5	**Benzene**	**11/18/1998**	**2.5**	**ug/l**		**2**	**1**	**1.5**
MW-5	**Benzene**	**06/27/2007**	**3.2**	**ug/l**		**0.12**	**1**	**2.2**
MW-5	**Benzene**	**12/19/2007**	**3.2**	**ug/l**		**0.12**	**1**	**2.2**
MW-5	**Benzene**	**12/03/1997**	**4**	**ug/l**		**1**	**1**	**3**
MW-5	**Benzene**	**06/04/1998**	**5.6**	**ug/l**		**5**	**1**	**4.6**
MW-5	Carbon disulfide	06/13/2001	54	ug/l		5	700	
MW-5	Carbon disulfide	06/24/1997	36	ug/l		5	700	
MW-5	Carbon disulfide	05/17/2000	17	ug/l		5	700	
MW-5	Chloride	02/11/2008	23000	ug/l		5000	250000	
MW-5	Chloroethane	12/03/1997	2	ug/l		1	2800	
MW-5	cis-1,2-Dichloroethene	12/14/2006	6	ug/l		5	70	
MW-5	cis-1,2-Dichloroethene	06/13/2002	11	ug/l		5	70	
MW-5	cis-1,2-Dichloroethene	05/13/1999	7.4	ug/l		5	70	
MW-5	cis-1,2-Dichloroethene	12/19/2007	10	ug/l		0.14	70	
MW-5	cis-1,2-Dichloroethene	12/11/2000	7.2	ug/l		5	70	
MW-5	cis-1,2-Dichloroethene	12/27/2001	7.2	ug/l		5	70	
MW-5	cis-1,2-Dichloroethene	06/15/2004	11	ug/l		5	70	
MW-5	cis-1,2-Dichloroethene	12/03/1997	4	ug/l		1	70	
MW-5	cis-1,2-Dichloroethene	06/13/2001	13	ug/l		5	70	
MW-5	cis-1,2-Dichloroethene	06/04/1998	8.3	ug/l		5	70	

Table 4: Summary of Historical Organic Results

Well ID	Parameter Name [1]	Sample Date	Result	Unit	Qual Code	PQL [2]	NCGW2L [3]	Exceedance
MW-5	cis-1,2-Dichloroethene	12/29/2004	10	ug/l		5	70	
MW-5	cis-1,2-Dichloroethene	12/12/2003	13	ug/l		5	70	
MW-5	cis-1,2-Dichloroethene	06/24/2003	17	ug/l		5	70	
MW-5	cis-1,2-Dichloroethene	06/27/2007	8.2	ug/l		0.14	70	
MW-5	cis-1,2-Dichloroethene	07/07/2006	8.5	ug/l		5	70	
MW-5	cis-1,2-Dichloroethene	06/22/2005	9	ug/l		5	70	
MW-5	cis-1,2-Dichloroethene	01/02/2003	19	ug/l		5	70	
MW-5	Naphthalene	03/23/1998	4.6	ug/l		2	21	
MW-5	**Tetrachloroethylene**	**12/03/1997**	**1**	**ug/l**		**1**	**0.7**	**0.3**
MW-5	**Trichloroethylene**	**12/03/1997**	**4**	**ug/l**		**1**	**2.8**	**1.2**
MW-6	**Benzene**	**12/19/2007**	**1.1**	**ug/l**		**0.12**	**1**	**0.1**
MW-6	beta-BHC	12/03/1997	0.06	ug/l		0.05		
MW-6	Carbon disulfide	05/17/2000	18	ug/l		5	700	
MW-6	Carbon disulfide	12/03/1997	6	ug/l		1	700	
MW-6	Carbon disulfide	06/24/2003	11	ug/l		10	700	
MW-6	Carbon disulfide	06/24/1997	61	ug/l		5	700	
MW-6	Carbon disulfide	06/12/2001	41	ug/l		5	700	
MW-6	Chloride	06/28/2007	4	mg/l		0.05	250	
MW-6	Chloroethane	12/03/1997	1	ug/l		1	2800	
MW-6	cis-1,2-Dichloroethene	12/06/1999	11	ug/l		5	70	
MW-6	cis-1,2-Dichloroethene	11/18/1998	6.5	ug/l		2	70	
MW-6	cis-1,2-Dichloroethene	06/12/2001	13	ug/l		5	70	
MW-6	cis-1,2-Dichloroethene	12/11/2000	7.6	ug/l		5	70	
MW-6	cis-1,2-Dichloroethene	12/28/2001	8	ug/l		5	70	
MW-7	1,1-Dichloroethane	06/13/2001	15	ug/l		5	70	
MW-7	1,1-Dichloroethane	06/04/1998	14	ug/l		5	70	
MW-7	1,1-Dichloroethane	06/24/1997	19	ug/l		5	70	
MW-7	1,1-Dichloroethane	01/12/2006	5.9	ug/l		5	70	
MW-7	1,1-Dichloroethane	12/06/1999	17	ug/l		5	70	
MW-7	1,1-Dichloroethane	10/01/1994	16	ug/l		5	70	
MW-7	1,1-Dichloroethane	05/13/1999	13	ug/l		5	70	
MW-7	1,1-Dichloroethane	12/03/1997	17	ug/l		1	70	
MW-7	1,1-Dichloroethane	12/11/2003	8.2	ug/l		5	70	
MW-7	1,1-Dichloroethane	12/30/2004	6.3	ug/l		5	70	
MW-7	1,1-Dichloroethane	12/28/2001	15	ug/l		5	70	
MW-7	1,1-Dichloroethane	05/17/2000	15	ug/l		5	70	
MW-7	1,1-Dichloroethane	11/18/1998	8.8	ug/l		2	70	
MW-7	1,1-Dichloroethane	12/12/2000	15	ug/l		5	70	
MW-7	1,1-Dichloroethane	12/06/1995	25	ug/l		5	70	
MW-7	1,1-Dichloroethane	01/02/2003	8.7	ug/l		5	70	
MW-7	1,1-Dichloroethane	06/12/2002	10	ug/l		5	70	
MW-7	1,1-Dichloroethane	03/07/1995	25	ug/l		5	70	
MW-7	1,1-Dichloroethane	01/31/1995	26	ug/l		5	70	
MW-7	1,1-Dichloroethane	02/15/1995	29	ug/l		5	70	
MW-7	1,1-Dichloroethane	06/23/2005	5	ug/l		5	70	
MW-7	1,1-Dichloroethane	06/16/2004	6.2	ug/l		5	70	
MW-7	1,1-Dichloroethane	05/06/1996	26	ug/l		5	70	
MW-7	1,1-Dichloroethane	11/11/1996	16	ug/l		5	70	
MW-7	1,1-Dichloroethane	06/25/2003	14	ug/l		5	70	
MW-7	**1,4-Dichlorobenzene**	**12/27/2007**	**2.1**	**ug/l**		**0.15**	**1.4**	**0.7**
MW-7	1,4-Dichlorobenzene	06/27/2007	1.3	ug/l		0.15	1.4	

Table 4: Summary of Historical Organic Results

Well ID	Parameter Name [1]	Sample Date	Result	Unit	Qual Code	PQL [2]	NCGW2L [3]	Exceedance
MW-7	**1,4-Dichlorobenzene**	**12/14/2006**	**3**	**ug/l**		**3**	**1.4**	**1.6**
MW-7	**Benzene**	**12/03/1997**	**2**	**ug/l**		**1**	**1**	**1**
MW-7	**Benzene**	**12/28/2001**	**5.6**	**ug/l**		**5**	**1**	**4.6**
MW-7	**Benzene**	**06/25/2003**	**6.7**	**ug/l**		**5**	**1**	**5.7**
MW-7	**Benzene**	**12/27/2007**	**4.7**	**ug/l**		**0.12**	**1**	**3.7**
MW-7	**Benzene**	**06/27/2007**	**3.2**	**ug/l**		**0.12**	**1**	**2.2**
MW-7	**Benzene**	**01/12/2006**	**5.1**	**ug/l**		**5**	**1**	**4.1**
MW-7	**Benzene**	**06/13/2001**	**6**	**ug/l**		**5**	**1**	**5**
MW-7	BHC, alpha	11/18/1998	0.63	ug/l		0.05		
MW-7	Carbon disulfide	06/13/2001	16	ug/l		5	700	
MW-7	Carbon disulfide	06/24/1997	66	ug/l		5	700	
MW-7	Carbon disulfide	12/03/1997	3	ug/l		1	700	
MW-7	Carbon disulfide	05/13/1999	8	ug/l		5	700	
MW-7	Carbon disulfide	06/25/2003	50	ug/l		10	700	
MW-7	Carbon disulfide	05/17/2000	5.4	ug/l		5	700	
MW-7	Carbon disulfide	12/12/2000	13	ug/l		10	700	
MW-7	Chloride	06/27/2007	7.7	mg/l		0.05	250	
MW-7	Chloride	02/11/2008	134000	ug/l		5000	250000	
MW-7	Chloroethane	12/06/1995	11	ug/l		10	2800	
MW-7	Chloroethane	01/31/1995	11	ug/l		10	2800	
MW-7	Chloroethane	02/15/1995	11	ug/l		10	2800	
MW-7	Chloroethane	12/03/1997	3	ug/l		1	2800	
MW-7	cis-1,2-Dichloroethene	01/12/2006	7.4	ug/l		5	70	
MW-7	cis-1,2-Dichloroethene	07/07/2006	8	ug/l		5	70	
MW-7	cis-1,2-Dichloroethene	05/17/2000	5.7	ug/l		5	70	
MW-7	cis-1,2-Dichloroethene	12/11/2003	6.1	ug/l		5	70	
MW-7	cis-1,2-Dichloroethene	06/23/2005	7	ug/l		5	70	
MW-7	cis-1,2-Dichloroethene	12/30/2004	7.2	ug/l		5	70	
MW-7	cis-1,2-Dichloroethene	01/02/2003	5.2	ug/l		5	70	
MW-7	cis-1,2-Dichloroethene	06/16/2004	6	ug/l		5	70	
MW-7	cis-1,2-Dichloroethene	11/18/1998	2.7	ug/l		2	70	
MW-7	cis-1,2-Dichloroethene	06/25/2003	10	ug/l		5	70	
MW-7	cis-1,2-Dichloroethene	12/03/1997	3	ug/l		1	70	
MW-7	cis-1,2-Dichloroethene	06/12/2002	5.1	ug/l		5	70	
MW-7	cis-1,2-Dichloroethene	06/13/2001	7.5	ug/l		5	70	
MW-7	cis-1,2-Dichloroethene	12/27/2007	9.2	ug/l		0.14	70	
MW-7	cis-1,2-Dichloroethene	12/14/2006	7.3	ug/l		5	70	
MW-7	cis-1,2-Dichloroethene	12/28/2001	7.3	ug/l		5	70	
MW-7	cis-1,2-Dichloroethene	12/12/2000	7	ug/l		5	70	
MW-7	Methyl tert-butyl ether	12/03/1997	2	ug/l		1		
MW-7	**Methylene chloride**	**03/07/1995**	**11**	**ug/l**		**10**	**4.6**	**6.4**
MW-7	**Methylene chloride**	**01/31/1995**	**29**	**ug/l**		**10**	**4.6**	**24.4**
MW-7	**Methylene chloride**	**02/15/1995**	**26**	**ug/l**		**10**	**4.6**	**21.4**
MW-7	**Methylene chloride**	**12/06/1995**	**20**	**ug/l**		**10**	**4.6**	**15.4**
MW-7	**Methylene chloride**	**10/01/1994**	**24**	**ug/l**		**10**	**4.6**	**19.4**
MW-8	1,1-Dichloroethane	01/31/1995	8	ug/l		5	70	
MW-8	1,1-Dichloroethane	10/01/1994	10	ug/l		5	70	
MW-8	1,1-Dichloroethane	11/18/1998	7.7	ug/l		2	70	
MW-8	1,1-Dichloroethane	12/06/1995	8	ug/l		5	70	
MW-8	1,1-Dichloroethane	05/06/1996	12	ug/l		5	70	
MW-8	1,1-Dichloroethane	02/15/1995	11	ug/l		5	70	

Table 4: Summary of Historical Organic Results

Well ID	Parameter Name [1]	Sample Date	Result	Unit	Qual Code	PQL [2]	NCGW2L [3]	Exceedance
MW-8	1,1-Dichloroethane	05/13/1999	9.3	ug/l		5	70	
MW-8	1,1-Dichloroethane	12/06/1999	8.1	ug/l		5	70	
MW-8	1,1-Dichloroethane	03/07/1995	11	ug/l		5	70	
MW-8	1,1-Dichloroethane	11/11/1996	9	ug/l		5	70	
MW-8	1,1-Dichloroethane	06/24/1997	11	ug/l		5	70	
MW-8	1,1-Dichloroethane	06/04/1998	12	ug/l		5	70	
MW-8	1,1-Dichloroethane	12/03/1997	14	ug/l		1	70	
MW-8	**1,4-Dichlorobenzene**	**02/11/2008**	**5.4**	**ug/l**		**0.21**	**1.4**	**4**
MW-8	BHC, alpha	11/18/1998	0.068	ug/l		0.05		
MW-8	BHC, alpha	04/30/1998	0.073	ug/l		0.05		
MW-8	Carbon disulfide	06/04/1998	8	ug/l		5	700	
MW-8	Carbon disulfide	05/13/1999	6.2	ug/l		5	700	
MW-8	Carbon disulfide	06/12/2001	16	ug/l		5	700	
MW-8	Carbon disulfide	06/24/1997	19	ug/l		5	700	
MW-8	Chloroethane	06/25/2003	11	ug/l		10	2800	
MW-8	Chloroethane	12/03/1997	7	ug/l		1	2800	
MW-8	cis-1,2-Dichloroethene	12/30/2004	6.1	ug/l		5	70	
MW-8	cis-1,2-Dichloroethene	12/03/1997	2	ug/l		1	70	
MW-8	cis-1,2-Dichloroethene	06/25/2003	9.1	ug/l		5	70	
MW-8	cis-1,2-Dichloroethene	06/15/2004	5.7	ug/l		5	70	
MW-8	Lindane	11/18/1998	0.063	ug/l		0.05	0.2	
MW-8	Toluene	12/15/2006	6.5	ug/l		5	1000	
MW-8	Trichloroethylene	12/03/1997	1	ug/l		1	2.8	
MW-9	1,1-Dichloroethane	12/11/2000	5.2	ug/l		5	70	
MW-9	1,1-Dichloroethane	01/12/2006	6	ug/l		5	70	
MW-9	cis-1,2-Dichloroethene	01/12/2006	10.2	ug/l		5	70	
MW-9	cis-1,2-Dichloroethene	12/19/2007	20	ug/l		0.14	70	
MW-9	cis-1,2-Dichloroethene	12/11/2000	15	ug/l		5	70	
MW-9	cis-1,2-Dichloroethene	06/13/2001	11	ug/l		5	70	
MW-9	cis-1,2-Dichloroethene	06/12/2002	8.2	ug/l		5	70	
MW-9	cis-1,2-Dichloroethene	12/27/2001	15	ug/l		5	70	
MW-9	cis-1,2-Dichloroethene	12/29/2004	13	ug/l		5	70	
MW-9	cis-1,2-Dichloroethene	06/22/2005	8	ug/l		5	70	
MW-9	cis-1,2-Dichloroethene	12/12/2003	10	ug/l		5	70	
MW-9	cis-1,2-Dichloroethene	01/02/2003	12	ug/l		5	70	
MW-9	cis-1,2-Dichloroethene	06/24/2003	16	ug/l		5	70	
MW-9	cis-1,2-Dichloroethene	06/15/2004	12	ug/l		5	70	
MW-9	cis-1,2-Dichloroethene	06/27/2007	10	ug/l		0.14	70	
MW-9	cis-1,2-Dichloroethene	12/14/2006	8.3	ug/l		5	70	
MW-9	cis-1,2-Dichloroethene	07/07/2006	12.3	ug/l		5	70	
SW-2	1,1-Dichloroethane	12/07/1995	12	ug/l		5	70	
SW-3	1,1-Dichloroethane	10/01/1994	9	ug/l		5	70	
SW-3	cis-1,2-Dichloroethene	07/07/2006	5.2	ug/l		5	70	
SW-3	Methyl bromide	05/13/1999	11	ug/l		10		
SW-4R	Bromodichloromethane	06/15/2004	13	ug/l		5		
SW-4R	Chlorodibromomethane	06/15/2004	6.8	ug/l		5		
SW-4R	Chloroform	06/15/2004	29	ug/l		5	70	
SW-5	1,1-Dichloroethane	12/03/1997	7	ug/l		1	70	
SW-5	Bromodichloromethane	06/16/2004	12	ug/l		5		
SW-5	Carbon disulfide	12/12/2000	150	ug/l		10	700	
SW-5	Carbon disulfide	06/13/2001	6.6	ug/l		5	700	

Table 4: Summary of Historical Organic Results

Well ID	Parameter Name [1]	Sample Date	Result	Unit	Qual Code	PQL [2]	NCGW2L [3]	Exceedance
SW-5	Chlorodibromomethane	06/16/2004	6.8	ug/l		5		
SW-5	Chloroethane	12/03/1997	2	ug/l		1	2800	
SW-5	Chloroform	06/16/2004	28	ug/l		5	70	
SW-5	cis-1,2-Dichloroethene	12/03/1997	2	ug/l		1	70	
SW-5	Trichloroethylene	12/03/1997	1	ug/l		1	2.8	
EB	Acetone	12/28/2007	12	ug/l	J	0.9	700	
EB	Methyl cyanide	02/11/2008	11.2	ug/l	J	5.96		
EB	Toluene	02/11/2008	0.2	ug/l	J	0.13	1000	
EB	Toluene	06/27/2007	0.15	ug/l	J	0.15	1000	
FB	Acetone	12/28/2007	11	ug/l	J	0.9	700	
FB	Toluene	06/27/2007	0.15	ug/l	J	0.15	1000	
MW-1	1,1-Dichloroethane	12/27/2007	2.5	ug/l	J	0.09	70	
MW-1	1,1-Dichloroethane	12/15/2006	2.1	ug/l	J	5	70	
MW-1	1,1-Dichloroethane	06/28/2007	2.2	ug/l	J	0.09	70	
MW-1	1,4-Dichlorobenzene	12/15/2006	1.3	ug/l	J	3	1.4	
MW-1	Acetone	02/11/2008	2.7	ug/l	J	1.21	700	
MW-1	Acetone	06/28/2007	0.9	ug/l	J	0.9	700	
MW-1	Carbon disulfide	06/28/2007	0.12	ug/l	J	0.12	700	
MW-1	Carbon disulfide	12/27/2007	2	ug/l	J	0.12	700	
MW-1	Chloroform	02/11/2008	1.5	ug/l	J	0.13	70	
MW-1	Tetrachloroethylene	06/28/2007	0.25	ug/l	J	0.25	0.7	
MW-1	Toluene	12/15/2006	2	ug/l	J	5	1000	
MW-1	Toluene	06/28/2007	0.15	ug/l	J	0.15	1000	
MW-1	Trichloroethylene	12/27/2007	0.42	ug/l	J	0.23	2.8	
MW-1	Trichloroethylene	06/28/2007	0.23	ug/l	J	0.23	2.8	
MW-1	Xylene	06/28/2007	1.1	ug/l	J	0.21	530	
MW-10	1,1-Dichloroethane	06/27/2007	0.09	ug/l	J	0.09	70	
MW-10	1,1-Dichloroethane	12/27/2007	0.91	ug/l	J	0.09	70	
MW-10	Acetone	06/27/2007	0.9	ug/l	J	0.9	700	
MW-10	cis-1,2-Dichloroethene	06/27/2007	3.6	ug/l	J	0.14	70	
MW-10	cis-1,2-Dichloroethene	12/14/2006	1.2	ug/l	J	5	70	
MW-10	cis-1,2-Dichloroethene	12/27/2007	3.8	ug/l	J	0.14	70	
MW-11	1,1-Dichloroethane	12/14/2006	1.1	ug/l	J	5	70	
MW-11	1,1-Dichloroethane	06/27/2007	1.4	ug/l	J	0.09	70	
MW-11	1,1-Dichloroethane	12/27/2007	2.9	ug/l	J	0.09	70	
MW-11	Chlorobenzene	12/27/2007	1.6	ug/l	J	0.16	50	
MW-11	Chlorobenzene	12/14/2006	2	ug/l	J	3	50	
MW-11	Chloroethane	12/27/2007	2	ug/l	J	0.4	2800	
MW-11	Chloroethane	12/14/2006	1.3	ug/l	J	10	2800	
MW-11	Chloroethane	06/27/2007	2	ug/l	J	0.4	2800	
MW-11	**Ethylene dichloride**	**12/14/2006**	**1.1**	**ug/l**	**J**	**3**	**0.38**	**0.72**
MW-11	Methylene chloride	12/27/2007	0.7	ug/l	J	0.088	4.6	
MW-11	o-Dichlorobenzene	06/27/2007	0.47	ug/l	J	0.17	620	
MW-11	Tetrachloroethylene	06/27/2007	0.58	ug/l	J	0.25	0.7	
MW-11	**Tetrachloroethylene**	**12/14/2006**	**1.1**	**ug/l**	**J**	**3**	**0.7**	**0.4**
MW-11	Toluene	06/27/2007	0.34	ug/l	J	0.15	1000	
MW-11	Trichloroethylene	12/27/2007	0.55	ug/l	J	0.23	2.8	
MW-11	Trichloroethylene	12/14/2006	1.2	ug/l	J	3	2.8	
MW-11	**Vinyl chloride**	**12/27/2007**	**0.79**	**ug/l**	**J**	**0.15**	**0.015**	**0.775**
MW-11	**Vinyl chloride**	**06/27/2007**	**0.94**	**ug/l**	**J**	**0.15**	**0.015**	**0.925**
MW-11	Xylene	06/27/2007	0.43	ug/l	J	0.21	530	

Table 4: Summary of Historical Organic Results

Well ID	Parameter Name [1]	Sample Date	Result	Unit	Qual Code	PQL [2]	NCGW2L [3]	Exceedance
MW-12	1,1-Dichloroethane	12/14/2006	3.7	ug/l	J	5	70	
MW-12	1,1-Dichloroethane	06/28/2007	2.9	ug/l	J	0.09	70	
MW-12	Chlorobenzene	12/28/2007	1.7	ug/l	J	0.16	50	
MW-12	Chlorobenzene	12/14/2006	1.5	ug/l	J	3	50	
MW-12	Chloroethane	12/14/2006	2	ug/l	J	10	2800	
MW-12	Chloroethane	06/28/2007	2.8	ug/l	J	0.4	2800	
MW-12	Methylene chloride	06/28/2007	1.8	ug/l	J	0.088	4.6	
MW-12	Methylene chloride	12/28/2007	1.8	ug/l	J	0.088	4.6	
MW-12	**Tetrachloroethylene**	**12/14/2006**	**2**	**ug/l**	**J**	**3**	**0.7**	**1.3**
MW-12	Toluene	06/28/2007	0.33	ug/l	J	0.15	1000	
MW-12	Trichloroethylene	12/14/2006	2.4	ug/l	J	3	2.8	
MW-12D	1,1-Dichloroethane	06/28/2007	0.09	ug/l	J	0.09	70	
MW-12D	1,1-Dichloroethane	12/28/2007	0.89	ug/l	J	0.09	70	
MW-12D	Acetone	06/28/2007	0.9	ug/l	J	0.9	700	
MW-12D	Benzene	06/28/2007	0.12	ug/l	J	0.12	1	
MW-12D	Benzene	12/28/2007	0.52	ug/l	J	0.12	1	
MW-12D	Carbon disulfide	12/28/2007	1.7	ug/l	J	0.12	700	
MW-12D	Carbon disulfide	06/28/2007	0.12	ug/l	J	0.12	700	
MW-12D	cis-1,2-Dichloroethene	12/28/2007	0.69	ug/l	J	0.14	70	
MW-12D	cis-1,2-Dichloroethene	06/28/2007	0.14	ug/l	J	0.14	70	
MW-12D	Toluene	06/28/2007	0.15	ug/l	J	0.15	1000	
MW-13	1,1-Dichloroethane	12/19/2007	0.56	ug/l	J	0.09	70	
MW-13	1,1-Dichloroethane	06/28/2007	0.09	ug/l	J	0.09	70	
MW-13	1,4-Dichlorobenzene	06/28/2007	0.15	ug/l	J	0.15	1.4	
MW-13	Benzene	12/19/2007	0.47	ug/l	J	0.12	1	
MW-13	Benzene	06/28/2007	0.12	ug/l	J	0.12	1	
MW-13	cis-1,2-Dichloroethene	06/28/2007	0.14	ug/l	J	0.14	70	
MW-13	cis-1,2-Dichloroethene	12/19/2007	0.71	ug/l	J	0.14	70	
MW-14	1,1-Dichloroethane	06/28/2007	1.3	ug/l	J	0.09	70	
MW-14	1,1-Dichloroethane	12/15/2006	1.4	ug/l	J	5	70	
MW-14	1,1-Dichloroethane	12/28/2007	2.2	ug/l	J	0.09	70	
MW-14	**Benzene**	**12/15/2006**	**1.9**	**ug/l**	**J**	**3**	**1**	**0.9**
MW-14	Chlorobenzene	12/15/2006	1.5	ug/l	J	3	50	
MW-14	Chlorobenzene	12/28/2007	1.7	ug/l	J	0.16	50	
MW-14	Chloroethane	12/28/2007	2	ug/l	J	0.4	2800	
MW-14	Chloroethane	06/28/2007	2.2	ug/l	J	0.4	2800	
MW-14	Chloroethane	12/15/2006	1.5	ug/l	J	10	2800	
MW-14	Naphthalene	06/28/2007	3.5	ug/l	J	0.25	21	
MW-14	Trichloroethylene	06/28/2007	0.86	ug/l	J	0.23	2.8	
MW-14	Trichloroethylene	12/28/2007	0.62	ug/l	J	0.23	2.8	
MW-15	1,1-Dichloroethane	06/28/2007	4.2	ug/l	J	0.09	70	
MW-15	1,1-Dichloroethane	12/19/2007	3.7	ug/l	J	0.09	70	
MW-15	1,1-Dichloroethane	12/15/2006	4.6	ug/l	J	5	70	
MW-15	1,4-Dichlorobenzene	06/28/2007	0.48	ug/l	J	0.15	1.4	
MW-15	Acetone	12/19/2007	5.1	ug/l	J	0.9	700	
MW-15	**Benzene**	**12/15/2006**	**2.2**	**ug/l**	**J**	**3**	**1**	**1.2**
MW-15	Chloroethane	12/19/2007	0.88	ug/l	J	0.4	2800	
MW-15	cis-1,2-Dichloroethene	12/19/2007	4.6	ug/l	J	0.14	70	
MW-15	cis-1,2-Dichloroethene	12/15/2006	3.5	ug/l	J	5	70	
MW-15	Methylene chloride	06/28/2007	1.8	ug/l	J	0.088	4.6	
MW-15	Toluene	06/28/2007	0.73	ug/l	J	0.15	1000	

Table 4: Summary of Historical Organic Results

Well ID	Parameter Name [1]	Sample Date	Result	Unit	Qual Code	PQL [2]	NCGW2L [3]	Exceedance
MW-15	Trichloroethylene	06/28/2007	0.58	ug/l	J	0.23	2.8	
MW-16	Chloride	04/17/2008	1700	ug/l	J	480	250000	
MW-16	Chloroethane	01/08/2008	1.6	ug/l	J	0.4	2800	
MW-16	Xylene	04/17/2008	2.6	ug/l	J	0.21	530	
MW-16	Xylene	01/08/2008	2.2	ug/l	J	0.21	530	
MW-17	1,1-Dichloroethane	12/15/2006	3.2	ug/l	J	5	70	
MW-17	1,1-Dichloroethane	06/28/2007	3	ug/l	J	0.09	70	
MW-17	1,1-Dichloroethane	12/27/2007	3.3	ug/l	J	0.09	70	
MW-17	1,4-Dichlorobenzene	06/28/2007	0.32	ug/l	J	0.15	1.4	
MW-17	1,4-Dichlorobenzene	12/27/2007	0.5	ug/l	J	0.15	1.4	
MW-17	Acetone	06/28/2007	3.5	ug/l	J	0.9	700	
MW-17	**Benzene**	**12/15/2006**	**1.1**	**ug/l**	**J**	**3**	**1**	**0.1**
MW-17	cis-1,2-Dichloroethene	06/28/2007	2.4	ug/l	J	0.14	70	
MW-17	cis-1,2-Dichloroethene	12/15/2006	2.6	ug/l	J	5	70	
MW-17	cis-1,2-Dichloroethene	12/27/2007	3	ug/l	J	0.14	70	
MW-17	Methylene chloride	12/27/2007	0.54	ug/l	J	0.088	4.6	
MW-17	Methylene chloride	06/28/2007	1.2	ug/l	J	0.088	4.6	
MW-17	Tetrachloroethylene	06/28/2007	0.47	ug/l	J	0.25	0.7	
MW-17	Toluene	12/15/2006	2	ug/l	J	5	1000	
MW-17	Trichloroethylene	06/28/2007	0.72	ug/l	J	0.23	2.8	
MW-17	Trichloroethylene	12/27/2007	0.49	ug/l	J	0.23	2.8	
MW-18	Acetone	01/07/2008	5.3	ug/l	J	0.9	700	
MW-18	Carbon disulfide	01/07/2008	0.76	ug/l	J	0.12	700	
MW-1B	1,1-Dichloroethane	12/28/2007	2.8	ug/l	J	0.09	70	
MW-1B	1,1-Dichloroethane	06/28/2007	1.8	ug/l	J	0.09	70	
MW-1B	1,1-Dichloroethane	12/15/2006	1.6	ug/l	J	5	70	
MW-1B	**1,4-Dichlorobenzene**	**12/15/2006**	**1.9**	**ug/l**	**J**	**3**	**1.4**	**0.5**
MW-1B	**Benzene**	**12/15/2006**	**1.3**	**ug/l**	**J**	**3**	**1**	**0.3**
MW-1B	Carbon disulfide	06/28/2007	0.12	ug/l	J	0.12	700	
MW-1B	Carbon disulfide	12/28/2007	0.56	ug/l	J	0.12	700	
MW-1B	cis-1,2-Dichloroethene	06/28/2007	4.1	ug/l	J	0.14	70	
MW-1B	cis-1,2-Dichloroethene	12/15/2006	3.3	ug/l	J	5	70	
MW-1B	Ethylbenzene	12/28/2007	0.96	ug/l	J	0.17	550	
MW-1B	Ethylbenzene	06/28/2007	0.17	ug/l	J	0.17	550	
MW-1B	Methylene chloride	06/28/2007	0.088	ug/l	J	0.088	4.6	
MW-1B	Tetrachloroethylene	06/28/2007	0.25	ug/l	J	0.25	0.7	
MW-1B	Tetrachloroethylene	12/28/2007	0.42	ug/l	J	0.25	0.7	
MW-1B	Trichloroethylene	06/28/2007	0.23	ug/l	J	0.23	2.8	
MW-1B	Xylene	06/28/2007	3.1	ug/l	J	0.21	530	
MW-2	1,1-Dichloroethane	12/15/2006	2	ug/l	J	5	70	
MW-2	1,1-Dichloroethane	06/28/2007	1.9	ug/l	J	0.09	70	
MW-2	1,1-Dichloroethane	12/28/2007	1.5	ug/l	J	0.09	70	
MW-2	1,1-Dichloroethane	02/11/2008	0.5	ug/l	J	0.16	70	
MW-2	Acetone	06/28/2007	0.9	ug/l	J	0.9	700	
MW-2	Acetone	12/28/2007	47	ug/l	J	0.9	700	
MW-2	Acetone	02/11/2008	2.9	ug/l	J	1.21	700	
MW-2	Chlorobenzene	12/28/2007	1.5	ug/l	J	0.16	50	
MW-2	Chlorobenzene	12/15/2006	1.8	ug/l	J	3	50	
MW-2	Chloroethane	12/15/2006	1.9	ug/l	J	10	2800	
MW-2	cis-1,2-Dichloroethene	02/11/2008	0.2	ug/l	J	0.14	70	
MW-2	Metadichlorobenzene	02/11/2008	0.3	ug/l	J	0.13	170	

Table 4: Summary of Historical Organic Results

Well ID	Parameter Name [1]	Sample Date	Result	Unit	Qual Code	PQL [2]	NCGW2L [3]	Exceedance
MW-2	o-Dichlorobenzene	02/11/2008	0.4	ug/l	J	0.13	620	
MW-2	Toluene	02/11/2008	0.2	ug/l	J	0.13	1000	
MW-2	Toluene	06/28/2007	0.15	ug/l	J	0.15	1000	
MW-2	Trichloroethylene	12/15/2006	1.9	ug/l	J	3	2.8	
MW-2	Trichloroethylene	12/28/2007	0.47	ug/l	J	0.23	2.8	
MW-20	1,1-Dichloroethane	01/08/2008	0.94	ug/l	J	0.09	70	
MW-20	Acetone	01/08/2008	3.6	ug/l	J	0.9	700	
MW-21	1,1-Dichloroethane	01/09/2008	2.4	ug/l	J	0.09	70	
MW-21	Benzene	01/09/2008	0.49	ug/l	J	0.12	1	
MW-21	cis-1,2-Dichloroethene	01/09/2008	1.6	ug/l	J	0.14	70	
MW-21	Methylene chloride	01/09/2008	0.7	ug/l	J	0.088	4.6	
MW-23	1,1-Dichloroethane	01/07/2008	1.2	ug/l	J	0.09	70	
MW-23	Acetone	01/07/2008	5.7	ug/l	J	0.9	700	
MW-24	1,1-Dichloroethane	01/08/2008	1.1	ug/l	J	0.09	70	
MW-24	1,1-Dichloroethane	04/17/2008	1.2	ug/l	J	0.09	70	
MW-24	Chlorobenzene	04/17/2008	0.58	ug/l	J	0.16	50	
MW-24	Chloroethane	01/08/2008	0.88	ug/l	J	0.4	2800	
MW-25	1,1-Dichloroethane	01/08/2008	3.4	ug/l	J	0.09	70	
MW-25	Acetone	01/08/2008	9.2	ug/l	J	0.9	700	
MW-25	cis-1,2-Dichloroethene	01/08/2008	1.2	ug/l	J	0.14	70	
MW-25	Tetrachloroethylene	01/08/2008	0.49	ug/l	J	0.25	0.7	
MW-26	1,1-Dichloroethane	01/09/2008	1.7	ug/l	J	0.09	70	
MW-26	1,1-Dichloroethane	04/17/2008	1.6	ug/l	J	0.09	70	
MW-26	Chlorobenzene	01/09/2008	0.78	ug/l	J	0.16	50	
MW-26	Chlorobenzene	04/17/2008	0.81	ug/l	J	0.16	50	
MW-26	Chloroethane	01/09/2008	0.94	ug/l	J	0.4	2800	
MW-26	Chloroethane	04/17/2008	1.5	ug/l	J	0.4	2800	
MW-26	Tetrachloroethylene	04/17/2008	0.48	ug/l	J	0.25	0.7	
MW-26	Trichloroethylene	04/17/2008	0.43	ug/l	J	0.23	2.8	
MW-27	1,1-Dichloroethane	01/09/2008	0.99	ug/l	J	0.09	70	
MW-27	Acetone	01/09/2008	8.5	ug/l	J	0.9	700	
MW-27	Xylene	01/09/2008	0.97	ug/l	J	0.21	530	
MW-3	1,1-Dichloroethane	12/28/2007	1.1	ug/l	J	0.09	70	
MW-3	1,1-Dichloroethane	06/27/2007	0.09	ug/l	J	0.09	70	
MW-3	Acetone	06/27/2007	0.9	ug/l	J	0.9	700	
MW-3	Carbon disulfide	06/27/2007	18	ug/l	J	0.12	700	
MW-3	Chlorobenzene	12/14/2006	1	ug/l	J	3	50	
MW-3	Ethylbenzene	12/14/2006	1.4	ug/l	J	5	550	
MW-3	o-Dichlorobenzene	06/27/2007	0.17	ug/l	J	0.17	620	
MW-3	o-Dichlorobenzene	12/28/2007	0.85	ug/l	J	0.17	620	
MW-3	Tetrachloroethylene	06/27/2007	0.25	ug/l	J	0.25	0.7	
MW-3	Tetrachloroethylene	12/28/2007	0.45	ug/l	J	0.25	0.7	
MW-3	Toluene	12/14/2006	1.5	ug/l	J	5	1000	
MW-3	Trichloroethylene	12/14/2006	1	ug/l	J	3	2.8	
MW-3	**Vinyl chloride**	**06/27/2007**	**0.15**	**ug/l**	**J**	**0.15**	**0.015**	**0.135**
MW-4	Acetone	02/11/2008	2.2	ug/l	J	1.21	700	
MW-4	Chloroform	02/11/2008	0.3	ug/l	J	0.13	70	
MW-4R	1,1-Dichloroethane	12/14/2006	4.3	ug/l	J	5	70	
MW-4R	Acetone	06/27/2007	0.9	ug/l	J	0.9	700	
MW-4R	**Benzene**	**12/14/2006**	**2.4**	**ug/l**	**J**	**3**	**1**	**1.4**
MW-4R	Chlorobenzene	12/27/2007	0.98	ug/l	J	0.16	50	

Table 4: Summary of Historical Organic Results

Well ID	Parameter Name [1]	Sample Date	Result	Unit	Qual Code	PQL [2]	NCGW2L [3]	Exceedance
MW-4R	Chlorobenzene	12/14/2006	1.2	ug/l	J	3	50	
MW-4R	Chloroethane	12/27/2007	3.4	ug/l	J	0.4	2800	
MW-4R	Chloroethane	06/27/2007	3	ug/l	J	0.4	2800	
MW-4R	Chloroethane	12/14/2006	1.8	ug/l	J	10	2800	
MW-4R	Trichloroethylene	06/27/2007	0.23	ug/l	J	0.23	2.8	
MW-5	1,1-Dichloroethane	12/14/2006	2.9	ug/l	J	5	70	
MW-5	1,1-Dichloroethane	06/27/2007	3.6	ug/l	J	0.09	70	
MW-5	1,4-Dichlorobenzene	12/14/2006	1.2	ug/l	J	3	1.4	
MW-5	1,4-Dichlorobenzene	06/27/2007	0.15	ug/l	J	0.15	1.4	
MW-5	Acetone	02/11/2008	5.3	ug/l	J	1.21	700	
MW-5	Acetone	06/27/2007	0.9	ug/l	J	0.9	700	
MW-5	**Benzene**	**12/14/2006**	**2.8**	**ug/l**	**J**	**3**	**1**	**1.8**
MW-5	Carbon disulfide	06/27/2007	0.12	ug/l	J	0.12	700	
MW-5	Methyl ethyl ketone	06/27/2007	0.56	ug/l	J	0.56	4200	
MW-5	Tetrachloroethylene	06/27/2007	0.25	ug/l	J	0.25	0.7	
MW-5	Toluene	06/27/2007	0.15	ug/l	J	0.15	1000	
MW-5	Trichloroethylene	06/27/2007	0.23	ug/l	J	0.23	2.8	
MW-5	Trichloroethylene	12/19/2007	0.55	ug/l	J	0.23	2.8	
MW-6	1,4-Dichlorobenzene	12/19/2007	0.88	ug/l	J	0.15	1.4	
MW-6	Acetone	02/11/2008	3.5	ug/l	J	1.21	700	
MW-6	cis-1,2-Dichloroethene	12/19/2007	2.3	ug/l	J	0.14	70	
MW-7	1,1-Dichloroethane	06/27/2007	2.7	ug/l	J	0.09	70	
MW-7	1,1-Dichloroethane	12/14/2006	3.7	ug/l	J	5	70	
MW-7	1,1-Dichloroethane	12/27/2007	4.9	ug/l	J	0.09	70	
MW-7	Acetone	06/27/2007	8.3	ug/l	J	0.9	700	
MW-7	Acetone	12/27/2007	6.4	ug/l	J	0.9	700	
MW-7	Acetone	02/11/2008	6.5	ug/l	J	1.21	700	
MW-7	**Benzene**	**12/14/2006**	**2.6**	**ug/l**	**J**	**3**	**1**	**1.6**
MW-7	Chlorobenzene	12/14/2006	1.4	ug/l	J	3	50	
MW-7	Chlorobenzene	12/27/2007	0.84	ug/l	J	0.16	50	
MW-7	cis-1,2-Dichloroethene	06/27/2007	4.9	ug/l	J	0.14	70	
MW-7	**Tetrachloroethylene**	**12/14/2006**	**1.2**	**ug/l**	**J**	**3**	**0.7**	**0.5**
MW-7	Tetrachloroethylene	06/27/2007	0.25	ug/l	J	0.25	0.7	
MW-7	Trichloroethylene	12/14/2006	1.2	ug/l	J	3	2.8	
MW-7	Trichloroethylene	06/27/2007	0.23	ug/l	J	0.23	2.8	
MW-7	Trichloroethylene	12/27/2007	0.84	ug/l	J	0.23	2.8	
MW-8	1,1-Dichloroethane	02/11/2008	0.4	ug/l	J	0.16	70	
MW-8	1,1-Dichloroethane	06/28/2007	0.09	ug/l	J	0.09	70	
MW-8	1,4-Dichlorobenzene	06/28/2007	0.15	ug/l	J	0.15	1.4	
MW-8	Acetone	06/28/2007	0.9	ug/l	J	0.9	700	
MW-8	Acetone	02/11/2008	4.6	ug/l	J	1.21	700	
MW-8	Benzene	06/28/2007	0.12	ug/l	J	0.12	1	
MW-8	Benzene	02/11/2008	0.2	ug/l	J	0.16	1	
MW-8	Chlorobenzene	02/11/2008	1.5	ug/l	J	0.13	50	
MW-8	cis-1,2-Dichloroethene	12/15/2006	3.5	ug/l	J	5	70	
MW-8	cis-1,2-Dichloroethene	06/28/2007	2.1	ug/l	J	0.14	70	
MW-8	Toluene	06/28/2007	0.15	ug/l	J	0.15	1000	
MW-9	1,1-Dichloroethane	12/19/2007	2.4	ug/l	J	0.09	70	
MW-9	1,1-Dichloroethane	06/27/2007	1.2	ug/l	J	0.09	70	
MW-9	1,1-Dichloroethane	12/14/2006	1.3	ug/l	J	5	70	
MW-9	1,4-Dichlorobenzene	06/27/2007	0.15	ug/l	J	0.15	1.4	

Table 4: Summary of Historical Organic Results

Well ID	Parameter Name [1]	Sample Date	Result	Unit	Qual Code	PQL [2]	NCGW2L [3]	Exceedance
MW-9	1,4-Dichlorobenzene	12/19/2007	0.42	ug/l	J	0.15	1.4	
SW-4R	Acetone	06/28/2007	0.9	ug/l	J	0.9	700	
SW-5	1,1-Dichloroethane	12/14/2006	1.3	ug/l	J	5	70	
SW-5	1,4-Dichlorobenzene	12/14/2006	1.4	ug/l	J	3	1.4	
SW-5	Acetone	06/27/2007	0.9	ug/l	J	0.9	700	
SW-5	cis-1,2-Dichloroethene	12/14/2006	4.8	ug/l	J	5	70	
TB	Methyl cyanide	02/11/2008	42.4	ug/l	J	5.96		
TB	Toluene	02/11/2008	0.3	ug/l	J	0.13	1000	
TB	Toluene	06/27/2007	0.15	ug/l	J	0.15	1000	

[1] Table only contains detected constituents.

[2] PQL = Practical Quantitation Limit

[3] NCGW2L = North Carolina Ground Water 2L Standard

Table 5: Summary of Historical Background Results

Well ID	Parameter Name [1]	Sample Date	Result	Unit	Qual Code	PQL [2]	NCGW2L [3]	Exceedance
MW-1	1,1-Dichloroethane	10/01/1994	19	ug/l		5	70	
MW-1	1,1-Dichloroethane	01/31/1995	17	ug/l		5	70	
MW-1	1,1-Dichloroethane	02/15/1995	17	ug/l		5	70	
MW-1	1,1-Dichloroethane	03/07/1995	15	ug/l		5	70	
MW-1	1,1-Dichloroethane	12/06/1995	13	ug/l		5	70	
MW-1	1,1-Dichloroethane	05/07/1996	16	ug/l		5	70	
MW-1	1,1-Dichloroethane	11/11/1996	15	ug/l		5	70	
MW-1	1,1-Dichloroethane	06/24/1997	22	ug/l		5	70	
MW-1	1,1-Dichloroethane	12/03/1997	19	ug/l		2	70	
MW-1	1,1-Dichloroethane	06/04/1998	19	ug/l		5	70	
MW-1	1,1-Dichloroethane	11/18/1998	15.1	ug/l		2	70	
MW-1	1,1-Dichloroethane	05/13/1999	20	ug/l		5	70	
MW-1	1,1-Dichloroethane	12/06/1999	18	ug/l		5	70	
MW-1	1,1-Dichloroethane	05/17/2000	17	ug/l		5	70	
MW-1	1,1-Dichloroethane	12/12/2000	17	ug/l		5	70	
MW-1	1,1-Dichloroethane	06/13/2001	15	ug/l		5	70	
MW-1	1,1-Dichloroethane	12/28/2001	13	ug/l		5	70	
MW-1	1,1-Dichloroethane	06/13/2002	17	ug/l		5	70	
MW-1	1,1-Dichloroethane	01/03/2003	8	ug/l		5	70	
MW-1	1,1-Dichloroethane	06/24/2003	8.3	ug/l		5	70	
MW-1	1,1-Dichloroethane	12/11/2003	6.2	ug/l		5	70	
MW-1	1,1-Dichloroethane	06/16/2004	5.4	ug/l		5	70	
MW-1	1,1-Dichloroethane	12/15/2006	2.1	ug/l	J	5	70	
MW-1	1,1-Dichloroethane	06/28/2007	2.2	ug/l	J	0.09	70	
MW-1	1,1-Dichloroethane	12/27/2007	2.5	ug/l	J	0.09	70	
MW-1	1,4-Dichlorobenzene	12/15/2006	1.3	ug/l	J	3	1.4	
MW-1	**1,4-Dichlorobenzene**	**06/28/2007**	**2**	**ug/l**		**0.15**	**1.4**	**0.6**
MW-1	**1,4-Dichlorobenzene**	**12/27/2007**	**3.8**	**ug/l**		**0.15**	**1.4**	**2.4**
MW-1	Acetone	06/28/2007	0.9	ug/l	J	0.9	700	
MW-1	Acetone	02/11/2008	2.7	ug/l	J	1.21	700	
MW-1	Antimony, total	05/17/2000	0.0087	mg/l		0.005	1.4*	
MW-1	Antimony, total	02/11/2008	0.2	ug/l	J	0.08	1.4*	
MW-1	Arsenic	12/28/2001	0.0051	mg/l		0.005	0.05	
MW-1	Arsenic	02/11/2008	1.2	ug/l	J	0.07	50	
MW-1	Barium, total	11/11/1996	0.01	mg/l		0.01	2	
MW-1	Barium, total	06/24/1997	0.048	mg/l		0.01	2	
MW-1	Barium, total	12/03/1997	0.086	mg/l		0.01	2	
MW-1	Barium, total	06/04/1998	0.036	mg/l		0.01	2	
MW-1	Barium, total	11/18/1998	0.03	mg/l		0.01	2	
MW-1	Barium, total	05/13/1999	0.032	mg/l		0.005	2	
MW-1	Barium, total	12/06/1999	0.028	mg/l		0.005	2	
MW-1	Barium, total	05/17/2000	0.038	mg/l		0.005	2	
MW-1	Barium, total	12/12/2000	0.042	mg/l		0.005	2	
MW-1	Barium, total	06/13/2001	0.032	mg/l		0.005	2	
MW-1	Barium, total	12/28/2001	0.042	mg/l		0.005	2	
MW-1	Barium, total	06/13/2002	0.041	mg/l		0.005	2	
MW-1	Barium, total	01/03/2003	0.044	mg/l		0.005	2	
MW-1	Barium, total	06/24/2003	0.058	mg/l		0.005	2	
MW-1	Barium, total	12/15/2006	0.036	mg/l	J	0.1	2	
MW-1	Barium, total	06/28/2007	0.0237	mg/l	J	0.001	2	

Table 5: Summary of Historical Background Results

Well ID	Parameter Name [1]	Sample Date	Result	Unit	Qual Code	PQL [2]	NCGW2L [3]	Exceedance
MW-1	Barium, total	12/27/2007	46.9	ug/l	J	0.2	2000	
MW-1	Barium, total	02/11/2008	27.4	ug/l	J	0.34	2000	
MW-1	**Benzene**	**11/18/1998**	**3**	**ug/l**		**2**	**1**	**2**
MW-1	**Benzene**	**05/13/1999**	**5.7**	**ug/l**		**5**	**1**	**4.7**
MW-1	**Benzene**	**12/06/1999**	**5.7**	**ug/l**		**5**	**1**	**4.7**
MW-1	**Benzene**	**06/13/2001**	**5.9**	**ug/l**		**5**	**1**	**4.9**
MW-1	**Benzene**	**06/13/2002**	**7.2**	**ug/l**		**5**	**1**	**6.2**
MW-1	**Benzene**	**12/30/2004**	**5.7**	**ug/l**		**5**	**1**	**4.7**
MW-1	**Benzene**	**06/23/2005**	**5**	**ug/l**		**5**	**1**	**4**
MW-1	**Benzene**	**01/13/2006**	**6**	**ug/l**		**5**	**1**	**5**
MW-1	**Benzene**	**12/15/2006**	**4.2**	**ug/l**		**3**	**1**	**3.2**
MW-1	**Benzene**	**06/28/2007**	**5**	**ug/l**		**0.12**	**1**	**4**
MW-1	**Benzene**	**12/27/2007**	**5.6**	**ug/l**		**0.12**	**1**	**4.6**
MW-1	Beryllium, total	02/11/2008	0.1	ug/l	J	0.17	4*	
MW-1	Cadmium, total	06/24/1997	0.001	mg/l		0.001	0.0018	
MW-1	Cadmium, total	02/11/2008	0.1	ug/l	J	0.04	1.75	
MW-1	Carbon disulfide	06/24/1997	33	ug/l		5	700	
MW-1	Carbon disulfide	05/13/1999	7.5	ug/l		5	700	
MW-1	Carbon disulfide	05/17/2000	18	ug/l		5	700	
MW-1	Carbon disulfide	06/13/2001	18	ug/l		5	700	
MW-1	Carbon disulfide	12/11/2003	170	ug/l		100	700	
MW-1	Carbon disulfide	06/28/2007	0.12	ug/l	J	0.12	700	
MW-1	Carbon disulfide	12/27/2007	2	ug/l	J	0.12	700	
MW-1	Chloride	06/28/2007	2.8	mg/l		0.05	250	
MW-1	Chloride	02/11/2008	47000	ug/l		5000	250000	
MW-1	Chloroethane	12/03/1997	2	ug/l		2	2800	
MW-1	Chloroethane	11/18/1998	5.7	ug/l		2	2800	
MW-1	Chloroform	02/11/2008	1.5	ug/l	J	0.13	70	
MW-1	Chromium, total	10/01/1994	0.009	mg/l		0.005	0.05	
MW-1	Chromium, total	01/31/1995	0.014	mg/l		0.01	0.05	
MW-1	Chromium, total	03/07/1995	0.014	mg/l		0.01	0.05	
MW-1	Chromium, total	11/11/1996	0.003	mg/l		0.002	0.05	
MW-1	Chromium, total	06/24/1997	0.006	mg/l		0.002	0.05	
MW-1	Chromium, total	12/03/1997	0.025	mg/l		0.002	0.05	
MW-1	Chromium, total	06/04/1998	0.003	mg/l		0.002	0.05	
MW-1	Chromium, total	11/18/1998	0.0023	mg/l		0.002	0.05	
MW-1	Chromium, total	05/17/2000	0.0063	mg/l		0.002	0.05	
MW-1	Chromium, total	12/12/2000	0.0057	mg/l		0.002	0.05	
MW-1	Chromium, total	06/13/2001	0.0035	mg/l		0.002	0.05	
MW-1	Chromium, total	12/28/2001	0.0083	mg/l		0.002	0.05	
MW-1	Chromium, total	06/13/2002	0.01	mg/l		0.002	0.05	
MW-1	Chromium, total	01/03/2003	0.01	mg/l		0.002	0.05	
MW-1	Chromium, total	06/24/2003	0.0061	mg/l		0.002	0.05	
MW-1	Chromium, total	02/11/2008	4.5	ug/l	J	1.38	50	
MW-1	cis-1,2-Dichloroethene	11/18/1998	4.9	ug/l		2	70	
MW-1	cis-1,2-Dichloroethene	05/13/1999	8.3	ug/l		5	70	
MW-1	cis-1,2-Dichloroethene	12/06/1999	8.7	ug/l		5	70	
MW-1	cis-1,2-Dichloroethene	05/17/2000	7.8	ug/l		5	70	
MW-1	cis-1,2-Dichloroethene	12/12/2000	9.7	ug/l		5	70	
MW-1	cis-1,2-Dichloroethene	06/13/2001	9.5	ug/l		5	70	

Table 5: Summary of Historical Background Results

Well ID	Parameter Name [1]	Sample Date	Result	Unit	Qual Code	PQL [2]	NCGW2L [3]	Exceedance
MW-1	cis-1,2-Dichloroethene	12/28/2001	7.4	ug/l		5	70	
MW-1	cis-1,2-Dichloroethene	06/13/2002	12	ug/l		5	70	
MW-1	cis-1,2-Dichloroethene	01/03/2003	6.7	ug/l		5	70	
MW-1	cis-1,2-Dichloroethene	06/24/2003	14	ug/l		5	70	
MW-1	cis-1,2-Dichloroethene	12/11/2003	8.8	ug/l		5	70	
MW-1	cis-1,2-Dichloroethene	06/16/2004	7.8	ug/l		5	70	
MW-1	cis-1,2-Dichloroethene	12/30/2004	11	ug/l		5	70	
MW-1	cis-1,2-Dichloroethene	06/23/2005	10	ug/l		5	70	
MW-1	cis-1,2-Dichloroethene	01/13/2006	11.4	ug/l		5	70	
MW-1	cis-1,2-Dichloroethene	07/06/2006	8.1	ug/l		5	70	
MW-1	cis-1,2-Dichloroethene	12/15/2006	6.6	ug/l		5	70	
MW-1	cis-1,2-Dichloroethene	06/28/2007	10	ug/l		0.14	70	
MW-1	cis-1,2-Dichloroethene	12/27/2007	13	ug/l		0.14	70	
MW-1	Cobalt, total	11/11/1996	0.003	mg/l		0.002	70*	
MW-1	Cobalt, total	06/24/1997	0.003	mg/l		0.003	70*	
MW-1	Cobalt, total	12/03/1997	0.012	mg/l		0.002	70*	
MW-1	Cobalt, total	06/04/1998	0.003	mg/l		0.002	70*	
MW-1	Cobalt, total	11/18/1998	0.0088	mg/l		0.002	70*	
MW-1	Cobalt, total	05/13/1999	0.012	mg/l		0.005	70*	
MW-1	Cobalt, total	12/06/1999	0.014	mg/l		0.005	70*	
MW-1	Cobalt, total	05/17/2000	0.017	mg/l		0.005	70*	
MW-1	Cobalt, total	12/12/2000	0.014	mg/l		0.005	70*	
MW-1	Cobalt, total	12/28/2001	0.014	mg/l		0.005	70*	
MW-1	Cobalt, total	06/13/2002	0.018	mg/l		0.005	70*	
MW-1	Cobalt, total	01/03/2003	0.018	mg/l		0.005	70*	
MW-1	Cobalt, total	06/24/2003	0.0075	mg/l		0.005	70*	
MW-1	Cobalt, total	12/11/2003	0.014	mg/l		0.01	70*	
MW-1	Cobalt, total	06/16/2004	0.013	mg/l		0.01	70*	
MW-1	Cobalt, total	12/30/2004	0.018	mg/l		0.01	70*	
MW-1	Cobalt, total	06/23/2005	0.027	mg/l		0.01	70*	
MW-1	Cobalt, total	01/13/2006	0.01	mg/l		0.01	70*	
MW-1	Cobalt, total	07/06/2006	0.0252	mg/l		0.01	70*	
MW-1	Cobalt, total	12/15/2006	0.0186	mg/l		0.01	70*	
MW-1	Cobalt, total	06/28/2007	0.01	mg/l	J	0.0025	70*	
MW-1	Cobalt, total	12/27/2007	23.7	ug/l		2	70*	
MW-1	Cobalt, total	02/11/2008	0.2	ug/l	J	2.53	70*	
MW-1	Copper	06/24/1997	0.011	mg/l		0.01	1	
MW-1	Copper	12/03/1997	0.043	mg/l		0.01	1	
MW-1	Copper	12/12/2000	0.0024	mg/l		0.002	1	
MW-1	Copper	12/28/2001	0.0079	mg/l		0.002	1	
MW-1	Copper	06/13/2002	0.0075	mg/l		0.002	1	
MW-1	Copper	01/03/2003	0.0092	mg/l		0.002	1	
MW-1	Copper	06/24/2003	0.0065	mg/l		0.002	1	
MW-1	Copper	02/11/2008	1.2	ug/l	J	2.24	1000	
MW-1	DEHP	12/03/1997	13	ug/l		10	2.5	
MW-1	**Iron**	**06/28/2007**	**12200**	**ug/l**		**15**	**300**	**11900**
MW-1	**Iron**	**02/11/2008**	**4406**	**ug/l**		**14**	**300**	**4106**
MW-1	Lead, total	12/03/1997	0.008	mg/l		0.005	0.015	
MW-1	Lead, total	06/04/1998	0.005	mg/l		0.005	0.015	
MW-1	Lead, total	12/27/2007	6.4	ug/l	J	2	15	

Table 5: Summary of Historical Background Results

Well ID	Parameter Name [1]	Sample Date	Result	Unit	Qual Code	PQL [2]	NCGW2L [3]	Exceedance
MW-1	Lead, total	02/11/2008	2.7	ug/l	J	0.04	15	
MW-1	Lindane	11/18/1998	0.055	ug/l		0.05	0.2	
MW-1	**Manganese**	**06/28/2007**	**764**	**ug/l**		**1.4**	**50**	**714**
MW-1	Manganese	02/11/2008	15	ug/l	J	0.5	50	
MW-1	Mercury	03/23/1998	0.0003	mg/l		0.0002	0.0011	
MW-1	Mercury	02/11/2008	0.04	ug/l	J	0.13	1.1	
MW-1	Nickel, total	05/13/1999	0.014	mg/l		0.005	0.1	
MW-1	Nickel, total	12/06/1999	0.014	mg/l		0.005	0.1	
MW-1	Nickel, total	05/17/2000	0.019	mg/l		0.005	0.1	
MW-1	Nickel, total	12/12/2000	0.015	mg/l		0.005	0.1	
MW-1	Nickel, total	06/13/2001	0.0063	mg/l		0.005	0.1	
MW-1	Nickel, total	12/28/2001	0.015	mg/l		0.005	0.1	
MW-1	Nickel, total	06/13/2002	0.016	mg/l		0.005	0.1	
MW-1	Nickel, total	01/03/2003	0.015	mg/l		0.005	0.1	
MW-1	Nickel, total	06/24/2003	0.009	mg/l		0.005	0.1	
MW-1	Nickel, total	12/27/2007	9.9	ug/l	J	2	100	
MW-1	Nickel, total	02/11/2008	0.5	ug/l	J	1.35	100	
MW-1	Silver, total	02/11/2008	0.1	ug/l	J	2.32	18	
MW-1	Sulfate, total	06/28/2007	22	mg/l		0.03	250	
MW-1	Tetrachloroethylene	06/28/2007	0.25	ug/l	J	0.25	0.7	
MW-1	Thallium	12/27/2007	0.064	ug/l	J	0.036	0.28*	
MW-1	Thallium	02/11/2008	0.2	ug/l	J	0.04	0.28*	
MW-1	Toluene	12/15/2006	2	ug/l	J	5	1000	
MW-1	Toluene	06/28/2007	0.15	ug/l	J	0.15	1000	
MW-1	Total Alkalinity	06/28/2007	170	mg/l		5.2	NE	
MW-1	Total Dissolved Solids	06/28/2007	260	mg/l		10	500000	
MW-1	Total Dissolved Solids	02/11/2008	101000	ug/l		1000	500000	
MW-1	Trichloroethylene	06/28/2007	0.23	ug/l	J	0.23	2.8	
MW-1	Trichloroethylene	12/27/2007	0.42	ug/l	J	0.23	2.8	
MW-1	Vanadium	11/11/1996	0.006	mg/l		0.005	3.5*	
MW-1	Vanadium	12/03/1997	0.034	mg/l		0.005	3.5*	
MW-1	Vanadium	06/04/1998	0.008	mg/l		0.005	3.5*	
MW-1	Vanadium	11/18/1998	0.0075	mg/l		0.005	3.5*	
MW-1	Vanadium	02/11/2008	8.7	ug/l	J	1.21	3.5*	
MW-1	Xylene	06/28/2007	1.1	ug/l	J	0.21	530	
MW-1	Zinc	10/01/1994	0.08	mg/l		0.05	1.05	
MW-1	Zinc	03/07/1995	0.051	mg/l		0.05	1.05	
MW-1	Zinc	05/07/1996	0.05	mg/l		0.05	1.05	
MW-1	Zinc	11/11/1996	0.029	mg/l		0.01	1.05	
MW-1	Zinc	06/24/1997	0.14	mg/l		0.01	1.05	
MW-1	Zinc	12/03/1997	0.08	mg/l		0.01	1.05	
MW-1	Zinc	06/04/1998	0.041	mg/l		0.01	1.05	
MW-1	Zinc	05/13/1999	0.023	mg/l		0.01	1.05	
MW-1	Zinc	12/06/1999	0.019	mg/l		0.01	1.05	
MW-1	Zinc	05/17/2000	0.046	mg/l		0.01	1.05	
MW-1	Zinc	12/12/2000	0.047	mg/l		0.01	1.05	
MW-1	Zinc	06/13/2001	0.038	mg/l		0.01	1.05	
MW-1	Zinc	12/28/2001	0.038	mg/l		0.01	1.05	
MW-1	Zinc	06/13/2002	0.051	mg/l		0.01	1.05	
MW-1	Zinc	01/03/2003	0.048	mg/l		0.01	1.05	

Table 5: Summary of Historical Background Results

Well ID	Parameter Name [1]	Sample Date	Result	Unit	Qual Code	PQL [2]	NCGW2L [3]	Exceedance
MW-1	Zinc	06/24/2003	0.044	mg/l		0.01	1.05	
MW-1	Zinc	12/11/2003	0.14	mg/l		0.05	1.05	
MW-1	Zinc	12/30/2004	0.15	mg/l		0.05	1.05	
MW-1	Zinc	06/23/2005	0.2	mg/l		0.05	1.05	
MW-1	Zinc	01/13/2006	0.1	mg/l		0.05	1.05	
MW-1	Zinc	12/15/2006	0.0103	mg/l		0.01	1.05	
MW-1	Zinc	12/27/2007	83.5	ug/l	B	1	1050	
MW-1	Zinc	02/11/2008	4.4	ug/l	J	1.86	1050	
MW-18	Acetone	01/07/2008	5.3	ug/l	J	0.9	700	
MW-18	Barium, total	01/07/2008	40.2	ug/l	J	0.2	2000	
MW-18	Carbon disulfide	01/07/2008	0.76	ug/l	J	0.12	700	
MW-18	Cobalt, total	01/07/2008	92.3	ug/l		2	70*	
MW-18	Copper	01/07/2008	12.6	ug/l		0.6	1000	
MW-18	Nickel, total	01/07/2008	39.1	ug/l	J	2	100	
MW-18	Thallium	01/07/2008	0.413	ug/l	J	0.036	2.8*	
MW-18	Zinc	01/07/2008	12.2	ug/l		1	1050	
MW-1A	1,1-Dichloroethane	12/03/1997	2	ug/l		1	70	
MW-1A	1,1-Dichloroethane	12/28/2001	6.5	ug/l		5	70	
MW-1A	1,1-Dichloroethane	06/25/2003	6.2	ug/l		5	70	
MW-1A	Acetone	06/25/2003	270	ug/l		20	700	
MW-1A	Acetone	12/11/2003	200	ug/l		200	700	
MW-1A	Arsenic	12/11/2000	0.016	mg/l		0.005	0.05	
MW-1A	Arsenic	06/13/2001	0.0069	mg/l		0.005	0.05	
MW-1A	Arsenic	12/28/2001	0.012	mg/l		0.005	0.05	
MW-1A	Arsenic	06/25/2003	0.0067	mg/l		0.005	0.05	
MW-1A	Barium, total	10/01/1994	0.72	mg/l		0.1	2	
MW-1A	Barium, total	01/31/1995	0.807	mg/l		0.5	2	
MW-1A	Barium, total	02/15/1995	0.678	mg/l		0.5	2	
MW-1A	Barium, total	11/11/1996	0.27	mg/l		0.01	2	
MW-1A	Barium, total	06/24/1997	0.029	mg/l		0.01	2	
MW-1A	Barium, total	12/03/1997	0.29	mg/l		0.01	2	
MW-1A	Barium, total	06/04/1998	1	mg/l		0.01	2	
MW-1A	Barium, total	11/18/1998	0.83	mg/l		0.01	2	
MW-1A	Barium, total	12/11/2000	0.96	mg/l		0.005	2	
MW-1A	Barium, total	06/13/2001	0.44	mg/l		0.005	2	
MW-1A	Barium, total	12/28/2001	0.73	mg/l		0.005	2	
MW-1A	Barium, total	06/25/2003	0.48	mg/l		0.005	2	
MW-1A	Beryllium, total	01/31/1995	0.003	mg/l		0.002	4*	
MW-1A	Beryllium, total	12/03/1997	0.001	mg/l		0.001	4*	
MW-1A	Beryllium, total	06/04/1998	0.005	mg/l		0.001	4*	
MW-1A	Beryllium, total	11/18/1998	0.0043	mg/l		0.001	4*	
MW-1A	Beryllium, total	12/11/2000	0.0069	mg/l		0.001	4*	
MW-1A	Beryllium, total	06/13/2001	0.0018	mg/l		0.001	4*	
MW-1A	Beryllium, total	12/28/2001	0.004	mg/l		0.001	4*	
MW-1A	Beryllium, total	06/25/2003	0.002	mg/l		0.001	4*	
MW-1A	Carbon disulfide	06/25/2003	21	ug/l		10	700	
MW-1A	**Chromium, total**	**10/01/1994**	**0.12**	**mg/l**		**0.005**	**0.05**	**0.07**
MW-1A	**Chromium, total**	**01/31/1995**	**0.182**	**mg/l**		**0.01**	**0.05**	**0.132**
MW-1A	**Chromium, total**	**02/15/1995**	**0.082**	**mg/l**		**0.01**	**0.05**	**0.032**
MW-1A	Chromium, total	03/07/1995	0.025	mg/l		0.01	0.05	

Table 5: Summary of Historical Background Results

Well ID	Parameter Name [1]	Sample Date	Result	Unit	Qual Code	PQL [2]	NCGW2L [3]	Exceedance
MW-1A	Chromium, total	12/06/1995	0.021	mg/l		0.01	0.05	
MW-1A	Chromium, total	05/07/1996	0.033	mg/l		0.01	0.05	
MW-1A	Chromium, total	06/24/1997	0.003	mg/l		0.002	0.05	
MW-1A	**Chromium, total**	**12/03/1997**	**0.074**	**mg/l**		**0.004**	**0.05**	**0.024**
MW-1A	**Chromium, total**	**06/04/1998**	**0.4**	**mg/l**		**0.02**	**0.05**	**0.35**
MW-1A	**Chromium, total**	**11/18/1998**	**0.41**	**mg/l**		**0.02**	**0.05**	**0.36**
MW-1A	**Chromium, total**	**12/11/2000**	**0.34**	**mg/l**		**0.002**	**0.05**	**0.29**
MW-1A	**Chromium, total**	**06/13/2001**	**0.066**	**mg/l**		**0.002**	**0.05**	**0.016**
MW-1A	**Chromium, total**	**12/28/2001**	**0.2**	**mg/l**		**0.002**	**0.05**	**0.15**
MW-1A	**Chromium, total**	**06/25/2003**	**0.24**	**mg/l**		**0.002**	**0.05**	**0.19**
MW-1A	Chromium, total	12/11/2003	0.018	mg/l		0.01	0.05	
MW-1A	Cobalt, total	10/01/1994	0.22	mg/l		0.1	70*	
MW-1A	Cobalt, total	01/31/1995	0.146	mg/l		0.01	70*	
MW-1A	Cobalt, total	02/15/1995	0.128	mg/l		0.01	70*	
MW-1A	Cobalt, total	03/07/1995	0.024	mg/l		0.01	70*	
MW-1A	Cobalt, total	12/06/1995	0.031	mg/l		0.01	70*	
MW-1A	Cobalt, total	05/07/1996	0.016	mg/l		0.01	70*	
MW-1A	Cobalt, total	11/11/1996	0.006	mg/l		0.002	70*	
MW-1A	Cobalt, total	06/24/1997	0.003	mg/l		0.003	70*	
MW-1A	Cobalt, total	12/03/1997	0.036	mg/l		0.002	70*	
MW-1A	Cobalt, total	06/04/1998	0.14	mg/l		0.008	70*	
MW-1A	Cobalt, total	11/18/1998	0.083	mg/l		0.004	70*	
MW-1A	Cobalt, total	12/11/2000	0.77	mg/l		0.005	70*	
MW-1A	Cobalt, total	06/13/2001	0.023	mg/l		0.005	70*	
MW-1A	Cobalt, total	12/28/2001	0.057	mg/l		0.005	70*	
MW-1A	Cobalt, total	06/25/2003	0.079	mg/l		0.005	70*	
MW-1A	Cobalt, total	12/11/2003	0.1	mg/l		0.01	70*	
MW-1A	Cobalt, total	06/16/2004	0.066	mg/l		0.01	70*	
MW-1A	Copper	10/01/1994	0.26	mg/l		0.1	1	
MW-1A	Copper	11/11/1996	0.011	mg/l		0.01	1	
MW-1A	Copper	12/03/1997	0.068	mg/l		0.01	1	
MW-1A	Copper	06/04/1998	0.21	mg/l		0.01	1	
MW-1A	Copper	11/18/1998	0.16	mg/l		0.01	1	
MW-1A	Copper	12/11/2000	0.26	mg/l		0.002	1	
MW-1A	Copper	06/13/2001	0.055	mg/l		0.002	1	
MW-1A	Copper	12/28/2001	0.15	mg/l		0.002	1	
MW-1A	Copper	06/25/2003	0.16	mg/l		0.002	1	
MW-1A	**Lead, total**	**10/01/1994**	**0.058**	**mg/l**		**0.01**	**0.015**	**0.043**
MW-1A	**Lead, total**	**01/31/1995**	**0.053**	**mg/l**		**0.01**	**0.015**	**0.038**
MW-1A	**Lead, total**	**02/15/1995**	**0.037**	**mg/l**		**0.01**	**0.015**	**0.022**
MW-1A	Lead, total	11/11/1996	0.007	mg/l		0.005	0.015	
MW-1A	**Lead, total**	**12/03/1997**	**0.025**	**mg/l**		**0.005**	**0.015**	**0.01**
MW-1A	**Lead, total**	**06/04/1998**	**0.07**	**mg/l**		**0.005**	**0.015**	**0.055**
MW-1A	**Lead, total**	**11/18/1998**	**0.075**	**mg/l**		**0.005**	**0.015**	**0.06**
MW-1A	**Lead, total**	**12/11/2000**	**0.058**	**mg/l**		**0.005**	**0.015**	**0.043**
MW-1A	Lead, total	06/13/2001	0.015	mg/l		0.003	0.015	
MW-1A	**Lead, total**	**12/28/2001**	**0.042**	**mg/l**		**0.003**	**0.015**	**0.027**
MW-1A	**Lead, total**	**06/25/2003**	**0.033**	**mg/l**		**0.005**	**0.015**	**0.018**
MW-1A	**Lead, total**	**12/11/2003**	**0.019**	**mg/l**		**0.01**	**0.015**	**0.004**
MW-1A	Lead, total	06/16/2004	0.013	mg/l		0.01	0.015	

Table 5: Summary of Historical Background Results

Well ID	Parameter Name [1]	Sample Date	Result	Unit	Qual Code	PQL [2]	NCGW2L [3]	Exceedance
MW-1A	Mercury	12/03/1997	0.0004	mg/l		0.0002	0.0011	
MW-1A	**Mercury**	**03/23/1998**	**0.0017**	**mg/l**		**0.0002**	**0.0011**	**0.0006**
MW-1A	**Mercury**	**04/30/1998**	**0.0013**	**mg/l**		**0.0002**	**0.0011**	**0.0002**
MW-1A	**Mercury**	**06/04/1998**	**0.0013**	**mg/l**		**0.0002**	**0.0011**	**0.0002**
MW-1A	**Mercury**	**12/11/2000**	**0.02**	**mg/l**		**0.0002**	**0.0011**	**0.0189**
MW-1A	**Nickel, total**	**10/01/1994**	**0.19**	**mg/l**		**0.1**	**0.1**	**0.09**
MW-1A	**Nickel, total**	**01/31/1995**	**0.103**	**mg/l**		**0.05**	**0.1**	**0.003**
MW-1A	Nickel, total	02/15/1995	0.091	mg/l		0.05	0.1	
MW-1A	Nickel, total	12/03/1997	0.053	mg/l		0.05	0.1	
MW-1A	**Nickel, total**	**06/04/1998**	**0.13**	**mg/l**		**0.05**	**0.1**	**0.03**
MW-1A	**Nickel, total**	**11/18/1998**	**0.19**	**mg/l**		**0.05**	**0.1**	**0.09**
MW-1A	**Nickel, total**	**12/11/2000**	**0.26**	**mg/l**		**0.005**	**0.1**	**0.16**
MW-1A	Nickel, total	06/13/2001	0.049	mg/l		0.005	0.1	
MW-1A	**Nickel, total**	**12/28/2001**	**0.15**	**mg/l**		**0.005**	**0.1**	**0.05**
MW-1A	**Nickel, total**	**06/25/2003**	**0.12**	**mg/l**		**0.005**	**0.1**	**0.02**
MW-1A	Vanadium	10/01/1994	0.33	mg/l		0.05	3.5*	
MW-1A	Vanadium	01/31/1995	0.165	mg/l		0.04	3.5*	
MW-1A	Vanadium	02/15/1995	0.11	mg/l		0.04	3.5*	
MW-1A	Vanadium	11/11/1996	0.006	mg/l		0.005	3.5*	
MW-1A	Vanadium	12/03/1997	0.085	mg/l		0.01	3.5*	
MW-1A	Vanadium	06/04/1998	0.2	mg/l		0.05	3.5*	
MW-1A	Vanadium	11/18/1998	0.27	mg/l		0.05	3.5*	
MW-1A	Vanadium	12/11/2000	0.32	mg/l		0.005	3.5*	
MW-1A	Vanadium	06/13/2001	0.072	mg/l		0.005	3.5*	
MW-1A	Vanadium	12/28/2001	0.19	mg/l		0.005	3.5*	
MW-1A	Vanadium	06/25/2003	0.14	mg/l		0.005	3.5*	
MW-1A	Xylene	12/03/1997	3	ug/l		1	530	
MW-1A	Xylene	11/18/1998	7.4	ug/l		2	530	
MW-1A	Xylene	06/16/2004	5.9	ug/l		5	530	
MW-1A	Zinc	10/01/1994	0.29	mg/l		0.05	1.05	
MW-1A	Zinc	01/31/1995	0.265	mg/l		0.05	1.05	
MW-1A	Zinc	02/15/1995	0.287	mg/l		0.05	1.05	
MW-1A	Zinc	03/07/1995	0.056	mg/l		0.05	1.05	
MW-1A	Zinc	05/07/1996	0.061	mg/l		0.05	1.05	
MW-1A	Zinc	11/11/1996	0.01	mg/l		0.01	1.05	
MW-1A	Zinc	06/24/1997	0.059	mg/l		0.01	1.05	
MW-1A	Zinc	12/03/1997	0.093	mg/l		0.01	1.05	
MW-1A	Zinc	06/04/1998	0.32	mg/l		0.01	1.05	
MW-1A	Zinc	11/18/1998	0.25	mg/l		0.01	1.05	
MW-1A	Zinc	12/11/2000	0.31	mg/l		0.01	1.05	
MW-1A	Zinc	06/13/2001	0.093	mg/l		0.01	1.05	
MW-1A	Zinc	12/28/2001	0.2	mg/l		0.01	1.05	
MW-1A	Zinc	06/25/2003	0.26	mg/l		0.01	1.05	
MW-1A	Zinc	12/11/2003	0.05	mg/l		0.05	1.05	
MW-1A	Zinc	06/16/2004	0.74	mg/l		0.05	1.05	
MW-1B	1,1-Dichloroethane	12/15/2006	1.6	ug/l	J	5	70	
MW-1B	1,1-Dichloroethane	06/28/2007	1.8	ug/l	J	0.09	70	
MW-1B	1,1-Dichloroethane	12/28/2007	2.8	ug/l	J	0.09	70	
MW-1B	**1,4-Dichlorobenzene**	**12/15/2006**	**1.9**	**ug/l**	**J**	**3**	**1.4**	**0.5**
MW-1B	**1,4-Dichlorobenzene**	**12/28/2007**	**2.4**	**ug/l**		**0.15**	**1.4**	**1**

Table 5: Summary of Historical Background Results

Well ID	Parameter Name [1]	Sample Date	Result	Unit	Qual Code	PQL [2]	NCGW2L [3]	Exceedance
MW-1B	Arsenic	12/28/2007	3.9	ug/l	J	2	50	
MW-1B	Barium, total	06/25/2003	0.045	mg/l		0.005	2	
MW-1B	Barium, total	12/15/2006	0.0666	mg/l	J	0.1	2	
MW-1B	Barium, total	06/28/2007	0.0443	mg/l	J	0.001	2	
MW-1B	Barium, total	12/28/2007	92	ug/l	J	0.2	2000	
MW-1B	Barium, total	04/17/2008	85.5	ug/l	J	0.2	2000	
MW-1B	Barium, total	04/17/2008	89.6	ug/l	J	0.2	2000	
MW-1B	**Benzene**	**12/15/2006**	**1.3**	**ug/l**	**J**	**3**	**1**	**0.3**
MW-1B	**Benzene**	**06/28/2007**	**1.7**	**ug/l**		**0.12**	**1**	**0.7**
MW-1B	Carbon disulfide	06/28/2007	0.12	ug/l	J	0.12	700	
MW-1B	Carbon disulfide	12/28/2007	0.56	ug/l	J	0.12	700	
MW-1B	Chloride	06/28/2007	2	mg/l		0.05	250	
MW-1B	Chloroform	12/11/2003	8.4	ug/l		5	70	
MW-1B	Chromium, total	06/25/2003	0.0044	mg/l		0.002	0.05	
MW-1B	cis-1,2-Dichloroethene	12/30/2004	5.3	ug/l		5	70	
MW-1B	cis-1,2-Dichloroethene	01/13/2006	5.4	ug/l		5	70	
MW-1B	cis-1,2-Dichloroethene	12/15/2006	3.3	ug/l	J	5	70	
MW-1B	cis-1,2-Dichloroethene	06/28/2007	4.1	ug/l	J	0.14	70	
MW-1B	cis-1,2-Dichloroethene	12/28/2007	6.6	ug/l		0.14	70	
MW-1B	Cobalt, total	06/25/2003	0.029	mg/l		0.005	70*	
MW-1B	Cobalt, total	12/11/2003	0.038	mg/l		0.01	70*	
MW-1B	Cobalt, total	06/16/2004	0.051	mg/l		0.01	70*	
MW-1B	Cobalt, total	12/30/2004	0.12	mg/l		0.01	70*	
MW-1B	Cobalt, total	06/23/2005	0.067	mg/l		0.01	70*	
MW-1B	Cobalt, total	01/13/2006	0.06	mg/l		0.01	70*	
MW-1B	Cobalt, total	07/06/2006	0.0651	mg/l		0.01	70*	
MW-1B	Cobalt, total	12/15/2006	0.0698	mg/l		0.01	70*	
MW-1B	Cobalt, total	06/28/2007	0.0426	mg/l	J	0.0025	70*	
MW-1B	Cobalt, total	12/28/2007	59.7	ug/l		2	70*	
MW-1B	Cobalt, total	04/17/2008	54.9	ug/l		2	70*	
MW-1B	Cobalt, total	04/17/2008	58	ug/l		2	70*	
MW-1B	Copper	06/25/2003	0.0024	mg/l		0.002	1	
MW-1B	Copper	06/28/2007	0.0121	mg/l	J	0.0018	1	
MW-1B	Copper	12/28/2007	4.5	ug/l	J	0.6	1000	
MW-1B	Copper	04/17/2008	1	ug/l	J	0.6	1000	
MW-1B	Copper	04/17/2008	1.4	ug/l	J	0.6	1000	
MW-1B	Ethylbenzene	06/28/2007	0.17	ug/l	J	0.17	550	
MW-1B	Ethylbenzene	12/28/2007	0.96	ug/l	J	0.17	550	
MW-1B	**Iron**	**06/28/2007**	**6680**	**ug/l**		**15**	**300**	**6380**
MW-1B	Lead, total	12/11/2003	0.011	mg/l		0.01	0.015	
MW-1B	Lead, total	06/16/2004	0.01	mg/l		0.01	0.015	
MW-1B	Lead, total	06/28/2007	0.0031	mg/l	J	0.0031	0.015	
MW-1B	Lead, total	04/17/2008	2.3	ug/l	J	2	15	
MW-1B	**Manganese**	**06/28/2007**	**960**	**ug/l**		**1.4**	**50**	**910**
MW-1B	**Mercury**	**06/28/2007**	**1.21**	**ug/l**		**0.11**	**1.1**	**0.11**
MW-1B	Methylene chloride	06/28/2007	0.088	ug/l	J	0.088	4.6	
MW-1B	Methylene chloride	12/28/2007	2.8	ug/l		0.088	4.6	
MW-1B	Nickel, total	06/25/2003	0.0051	mg/l		0.005	0.1	
MW-1B	Nickel, total	12/15/2006	0.0103	mg/l	J	0.05	0.1	
MW-1B	Nickel, total	06/28/2007	0.0013	mg/l	J	0.0013	0.1	

Table 5: Summary of Historical Background Results

Well ID	Parameter Name [1]	Sample Date	Result	Unit	Qual Code	PQL [2]	NCGW2L [3]	Exceedance
MW-1B	Nickel, total	12/28/2007	8.8	ug/l	J	2	100	
MW-1B	Nickel, total	04/17/2008	6.8	ug/l	J	2	100	
MW-1B	Nickel, total	04/17/2008	7.8	ug/l	J	2	100	
MW-1B	Sulfate, total	06/28/2007	4.1	mg/l		0.03	250	
MW-1B	Tetrachloroethylene	06/28/2007	0.25	ug/l	J	0.25	0.7	
MW-1B	Tetrachloroethylene	12/28/2007	0.42	ug/l	J	0.25	0.7	
MW-1B	Thallium	06/28/2007	0.161	ug/l	J	0.036	0.28*	
MW-1B	Thallium	12/28/2007	0.117	ug/l	J	0.036	0.28*	
MW-1B	Thallium	04/17/2008	0.121	ug/l	J	0.036	0.28*	
MW-1B	Thallium	04/17/2008	0.06	ug/l	J	0.036	0.28*	
MW-1B	Total Alkalinity	06/28/2007	19	mg/l		5.2	NE	
MW-1B	Total Dissolved Solids	06/28/2007	78	mg/l		10	500000	
MW-1B	Trichloroethylene	06/28/2007	0.23	ug/l	J	0.23	2.8	
MW-1B	Xylene	06/16/2004	5.2	ug/l		5	530	
MW-1B	Xylene	12/30/2004	5	ug/l		5	530	
MW-1B	Xylene	07/06/2006	7.3	ug/l		5	530	
MW-1B	Xylene	12/15/2006	5.5	ug/l		4	530	
MW-1B	Xylene	06/28/2007	3.1	ug/l	J	0.21	530	
MW-1B	Xylene	12/28/2007	8.8	ug/l		0.21	530	
MW-1B	Zinc	06/25/2003	0.023	mg/l		0.01	1.05	
MW-1B	Zinc	12/11/2003	0.15	mg/l		0.05	1.05	
MW-1B	Zinc	12/15/2006	0.0151	mg/l		0.01	1.05	
MW-1B	Zinc	06/28/2007	0.0289	mg/l	J	0.0034	1.05	
MW-1B	Zinc	12/28/2007	22.5	ug/l	B	1	1050	
MW-1B	Zinc	04/17/2008	16.6	ug/l	B	1	1050	
MW-1B	Zinc	04/17/2008	16.1	ug/l		1	1050	

[1] Table only contains detected constituents.

[2] PQL = Practical Quantitation Limit

[3] NCGW2L = North Carolina Ground Water 2L Standard

* Groundwater Protection Standard

Table 6: Summary of Current Groundwater Results

Well ID	Parameter Name [1]	Sample Date	Result	Unit	Qual Code	PQL [2]	NCGW2L [3]	Exceedance
EB	Methylene chloride	06/19/2008	2.2	ug/l		0.24	4.6	
FB	Methylene chloride	06/19/2008	2.2	ug/l		0.24	4.6	
MW-1	1,1-Dichloroethane	06/20/2008	1.6	ug/l	J	0.33	70	
MW-1	**1,4-Dichlorobenzene**	**06/20/2008**	**3.2**	**ug/l**		**0.2**	**1.4**	**1.8**
MW-1	Barium, total	06/20/2008	49.8	ug/l	J	1	2000	
MW-1	**Benzene**	**06/20/2008**	**4**	**ug/l**		**0.2**	**1**	**3**
MW-1	Carbon disulfide	06/20/2008	0.44	ug/l	J	0.4	700	
MW-1	cis-1,2-Dichloroethene	06/20/2008	8	ug/l		0.3	70	
MW-1	Cobalt, total	06/20/2008	30.2	ug/l		1.1	70*	
MW-1	Lead, total	06/20/2008	2.7	ug/l	J	1.9	15	
MW-1	Mercury	06/20/2008	0.11	ug/l	J	0.11	1.1	
MW-1	Nickel, total	06/20/2008	11.9	ug/l	J	1.8	100	
MW-1	Thallium	06/20/2008	0.046	ug/l	J	0.036	0.28*	
MW-1	Xylene	06/20/2008	0.4	ug/l	J	0.4	530	
MW-1	Zinc	06/20/2008	39.1	ug/l		3.8	1050	
MW-10	1,1-Dichloroethane	06/19/2008	0.78	ug/l	J	0.33	70	
MW-10	Barium, total	06/19/2008	32	ug/l	J	0.2	2000	
MW-10	cis-1,2-Dichloroethene	06/19/2008	2.7	ug/l	J	0.3	70	
MW-10	Zinc	06/19/2008	1.2	ug/l	J	1	1050	
MW-11	1,1-Dichloroethane	06/20/2008	1.5	ug/l	J	0.33	70	
MW-11	1,1,2,2-Tetrachloroethane	06/20/2008	0.98	ug/l	J	0.33	0.18*	
MW-11	**1,4-Dichlorobenzene**	**06/20/2008**	**7.9**	**ug/l**		**0.2**	**1.4**	**6.5**
MW-11	Barium, total	06/20/2008	181	ug/l	B	0.2	2000	
MW-11	**Benzene**	**06/20/2008**	**3.5**	**ug/l**		**0.2**	**1**	**2.5**
MW-11	Chlorobenzene	06/20/2008	2.1	ug/l	J	0.27	50	
MW-11	Chloroethane	06/20/2008	2.6	ug/l	J	0.3	2800	
MW-11	cis-1,2-Dichloroethene	06/20/2008	34	ug/l		0.3	70	
MW-11	Cobalt, total	06/20/2008	98.9	ug/l		2	70*	
MW-11	Lead, total	06/20/2008	4.3	ug/l	J	2	15	
MW-11	Methyl bromide	06/20/2008	2.7	ug/l	J	0.49	NE	
MW-11	Methylene chloride	06/20/2008	1.9	ug/l		0.24	4.6	
MW-11	Nickel, total	06/20/2008	19.6	ug/l	J	2	100	
MW-11	Tetrachloroethylene	06/20/2008	0.51	ug/l	J	0.36	0.7	
MW-11	Thallium	06/20/2008	0.384	ug/l	J	0.036	0.28*	
MW-11	Trichloroethylene	06/20/2008	0.67	ug/l	J	0.25	2.8	
MW-11	**Vinyl chloride**	**06/20/2008**	**0.6**	**ug/l**	**J**	**0.3**	**0.015**	**0.585**
MW-11	Zinc	06/20/2008	54	ug/l		1	1050	
MW-12	1,1-Dichloroethane	06/20/2008	3.6	ug/l	J	0.33	70	
MW-12	**1,4-Dichlorobenzene**	**06/20/2008**	**7.4**	**ug/l**		**0.2**	**1.4**	**6**
MW-12	Acetone	06/20/2008	8	ug/l	J	0.62	700	
MW-12	Barium, total	06/20/2008	89.3	ug/l	J	0.2	2000	
MW-12	**Benzene**	**06/20/2008**	**6.4**	**ug/l**		**0.2**	**1**	**5.4**
MW-12	Chlorobenzene	06/20/2008	1.7	ug/l	J	0.27	50	
MW-12	Chloroethane	06/20/2008	1.3	ug/l	J	0.3	2800	
MW-12	cis-1,2-Dichloroethene	06/20/2008	11	ug/l		0.3	70	
MW-12	Cobalt, total	06/20/2008	3.3	ug/l	J	2	70*	
MW-12	Methylene chloride	06/20/2008	1.8	ug/l		0.24	4.6	
MW-12	**Tetrachloroethylene**	**06/20/2008**	**1**	**ug/l**		**0.36**	**0.7**	**0.3**
MW-12	Thallium	06/20/2008	0.075	ug/l	J	0.036	0.28*	
MW-12	Trichloroethylene	06/20/2008	2.2	ug/l		0.25	2.8	

Table 6: Summary of Current Groundwater Results

Well ID	Parameter Name [1]	Sample Date	Result	Unit	Qual Code	PQL [2]	NCGW2L [3]	Exceedance
MW-12	Zinc	06/20/2008	5.6	ug/l	J	1	1050	
MW-12D	1,1-Dichloroethane	06/20/2008	0.66	ug/l	J	0.33	70	
MW-12D	Acetone	06/20/2008	25	ug/l	J	0.62	700	
MW-12D	Barium, total	06/20/2008	10.5	ug/l	J	0.2	2000	
MW-12D	Bromodichloromethane	06/20/2008	0.77	ug/l	J	0.2	0.56	
MW-12D	Chloroform	06/20/2008	6.4	ug/l		0.2	70	
MW-12D	cis-1,2-Dichloroethene	06/20/2008	0.49	ug/l	J	0.3	70	
MW-12D	Methylene chloride	06/20/2008	2.4	ug/l		0.24	4.6	
MW-12D	Zinc	06/20/2008	149	ug/l		1	1050	
MW-13	Barium, total	06/19/2008	20.4	ug/l	J	0.2	2000	
MW-13	Cobalt, total	06/19/2008	3.5	ug/l	J	2	70*	
MW-13	Nickel, total	06/19/2008	5.9	ug/l	J	2	100	
MW-13	Thallium	06/19/2008	0.04	ug/l	J	0.036	0.28*	
MW-13	Zinc	06/19/2008	13	ug/l		1	1050	
MW-14	1,1-Dichloroethane	06/19/2008	1.6	ug/l	J	0.33	70	
MW-14	**1,4-Dichlorobenzene**	**06/19/2008**	**4**	**ug/l**		**0.2**	**1.4**	**2.6**
MW-14	Barium, total	06/19/2008	102	ug/l	B	0.2	2000	
MW-14	Benzene	06/19/2008	0.68	ug/l	J	0.2	1	
MW-14	Chlorobenzene	06/19/2008	1.5	ug/l	J	0.27	50	
MW-14	Chloroethane	06/19/2008	3	ug/l	J	0.3	2800	
MW-14	cis-1,2-Dichloroethene	06/19/2008	13	ug/l		0.3	70	
MW-14	Cobalt, total	06/19/2008	218	ug/l		2	70*	
MW-14	Methyl bromide	06/19/2008	1.9	ug/l	J	0.49	NE	
MW-14	Nickel, total	06/19/2008	16.2	ug/l	J	2	100	
MW-14	Thallium	06/19/2008	0.118	ug/l	J	0.036	0.28*	
MW-14	Trichloroethylene	06/19/2008	0.66	ug/l	J	0.25	2.8	
MW-14	Zinc	06/19/2008	15.7	ug/l		1	1050	
MW-15	1,1-Dichloroethane	06/19/2008	3.2	ug/l	J	0.33	70	
MW-15	Acetone	06/19/2008	12	ug/l	J	0.62	700	
MW-15	Barium, total	06/19/2008	16.4	ug/l	J	0.2	2000	
MW-15	Benzene	06/19/2008	0.42	ug/l	J	0.2	1	
MW-15	Chloroform	06/19/2008	0.48	ug/l	J	0.2	70	
MW-15	cis-1,2-Dichloroethene	06/19/2008	3.5	ug/l	J	0.3	70	
MW-15	Mercury	06/19/2008	0.12	ug/l	J	0.11	1.1	
MW-15	Zinc	06/19/2008	2	ug/l	J	1	1050	
MW-16	1,1-Dichloroethane	06/20/2008	13	ug/l		0.33	70	
MW-16	**1,2-Dichloropropane**	**06/20/2008**	**0.9**	**ug/l**	**J**	**0.2**	**0.51**	**0.39**
MW-16	**1,4-Dichlorobenzene**	**06/20/2008**	**1.8**	**ug/l**		**0.2**	**1.4**	**0.4**
MW-16	Barium, total	06/20/2008	60.5	ug/l	J	1	2000	
MW-16	**Benzene**	**06/20/2008**	**3.2**	**ug/l**		**0.2**	**1**	**2.2**
MW-16	cis-1,2-Dichloroethene	06/20/2008	12	ug/l		0.3	70	
MW-16	Cobalt, total	06/20/2008	12	ug/l		1.1	70*	
MW-16	Copper	06/20/2008	2.1	ug/l	J	1.6	1000	
MW-16	Mercury	06/20/2008	0.45	ug/l		0.11	1.1	
MW-16	Methylene chloride	06/20/2008	3.2	ug/l		0.24	4.6	
MW-16	Nickel, total	06/20/2008	5.5	ug/l	J	1.8	100	
MW-16	**Tetrachloroethylene**	**06/20/2008**	**2.4**	**ug/l**		**0.36**	**0.7**	**1.7**
MW-16	Thallium	06/20/2008	0.154	ug/l	J	0.036	0.28*	
MW-16	**Trichloroethylene**	**06/20/2008**	**3.5**	**ug/l**		**0.25**	**2.8**	**0.7**
MW-16	Xylene	06/20/2008	2.2	ug/l	J	0.4	530	

Table 6: Summary of Current Groundwater Results

Well ID	Parameter Name [1]	Sample Date	Result	Unit	Qual Code	PQL [2]	NCGW2L [3]	Exceedance
MW-16	Zinc	06/20/2008	10.6	ug/l		3.8	1050	
MW-17	1,1-Dichloroethane	06/19/2008	3.5	ug/l	J	0.33	70	
MW-17	Acetone	06/19/2008	13	ug/l	J	0.62	700	
MW-17	Barium, total	06/19/2008	40.6	ug/l	J	0.2	2000	
MW-17	cis-1,2-Dichloroethene	06/19/2008	2.9	ug/l	J	0.3	70	
MW-17	Cobalt, total	06/19/2008	21.1	ug/l		2	70*	
MW-17	Copper	06/19/2008	3	ug/l	J	0.6	1000	
MW-17	Lead, total	06/19/2008	5.4	ug/l	J	2	15	
MW-17	Mercury	06/19/2008	0.29	ug/l		0.11	1.1	
MW-17	Nickel, total	06/19/2008	3	ug/l	J	2	100	
MW-17	Thallium	06/19/2008	0.057	ug/l	J	0.036	0.28*	
MW-17	Trichloroethylene	06/19/2008	0.57	ug/l	J	0.25	2.8	
MW-17	Zinc	06/19/2008	5.1	ug/l	J	1	1050	
MW-18	Barium, total	06/23/2008	66.7	ug/l	J	1	2000	
MW-18	Chromium, total	06/23/2008	16.1	ug/l		1	50	
MW-18	Cobalt, total	06/23/2008	17.3	ug/l		1.1	70*	
MW-18	Copper	06/23/2008	39.5	ug/l		1.6	1000	
MW-18	Lead, total	06/23/2008	3.9	ug/l	J	1.9	15	
MW-18	Nickel, total	06/23/2008	18.2	ug/l	J	1.8	100	
MW-18	Thallium	06/23/2008	0.374	ug/l	J	0.036	0.28*	
MW-18	Vanadium	06/23/2008	27.4	ug/l		1.4	3.5*	
MW-18	Zinc	06/23/2008	39.9	ug/l		3.8	1050	
MW-19	Barium, total	06/23/2008	17	ug/l	J	0.2	2000	
MW-19	Nickel, total	06/23/2008	2.4	ug/l	J	2	100	
MW-19	Vanadium	06/23/2008	1.3	ug/l	J	1	3.5*	
MW-1B	1,1-Dichloroethane	06/20/2008	1.8	ug/l	J	0.33	70	
MW-1B	**1,4-Dichlorobenzene**	**06/20/2008**	**2.1**	**ug/l**		**0.2**	**1.4**	**0.7**
MW-1B	Barium, total	06/20/2008	78.9	ug/l	J	1	2000	
MW-1B	**Benzene**	**06/20/2008**	**1.7**	**ug/l**		**0.2**	**1**	**0.7**
MW-1B	Carbon disulfide	06/20/2008	0.44	ug/l	J	0.4	700	
MW-1B	cis-1,2-Dichloroethene	06/20/2008	5	ug/l		0.3	70	
MW-1B	Cobalt, total	06/20/2008	56.8	ug/l		1.1	70*	
MW-1B	Ethylbenzene	06/20/2008	0.69	ug/l	J	0.2	550	
MW-1B	**Mercury**	**06/20/2008**	**1.11**	**ug/l**		**0.11**	**1.1**	**0.01**
MW-1B	Methylene chloride	06/20/2008	2.6	ug/l		0.24	4.6	
MW-1B	Nickel, total	06/20/2008	6.5	ug/l	J	1.8	100	
MW-1B	Thallium	06/20/2008	0.132	ug/l	J	0.036	0.28*	
MW-1B	Xylene	06/20/2008	6.8	ug/l		0.4	530	
MW-1B	Zinc	06/20/2008	20	ug/l		3.8	1050	
MW-2	1,1-Dichloroethane	06/19/2008	1.7	ug/l	J	0.33	70	
MW-2	**1,4-Dichlorobenzene**	**06/19/2008**	**4.8**	**ug/l**		**0.2**	**1.4**	**3.4**
MW-2	Acetone	06/19/2008	17	ug/l	J	0.62	700	
MW-2	Barium, total	06/19/2008	136	ug/l	B	0.2	2000	
MW-2	**Benzene**	**06/19/2008**	**1.9**	**ug/l**		**0.2**	**1**	**0.9**
MW-2	Chlorobenzene	06/19/2008	1.7	ug/l	J	0.27	50	
MW-2	Chloroethane	06/19/2008	4	ug/l	J	0.3	2800	
MW-2	cis-1,2-Dichloroethene	06/19/2008	15	ug/l		0.3	70	
MW-2	Cobalt, total	06/19/2008	503	ug/l		2	70*	
MW-2	**Mercury**	**06/19/2008**	**3.58**	**ug/l**		**0.11**	**1.1**	**2.48**
MW-2	Thallium	06/19/2008	0.262	ug/l	J	0.036	0.28*	

Table 6: Summary of Current Groundwater Results

Well ID	Parameter Name [1]	Sample Date	Result	Unit	Qual Code	PQL [2]	NCGW2L [3]	Exceedance
MW-2	Trichloroethylene	06/19/2008	1	ug/l		0.25	2.8	
MW-2	**Vinyl chloride**	**06/19/2008**	**0.51**	**ug/l**	**J**	**0.3**	**0.015**	**0.495**
MW-2	Zinc	06/19/2008	89.3	ug/l		1	1050	
MW-20	1,1-Dichloroethane	06/23/2008	0.77	ug/l	J	0.33	70	
MW-20	Arsenic	06/23/2008	3.1	ug/l	J	2.8	50	
MW-20	Barium, total	06/23/2008	90.7	ug/l	J	1	2000	
MW-20	Beryllium, total	06/23/2008	0.1	ug/l	J	0.1	4*	
MW-20	Chromium, total	06/23/2008	11.4	ug/l		1	50	
MW-20	Cobalt, total	06/23/2008	2.6	ug/l	J	1.1	70*	
MW-20	Copper	06/23/2008	9.7	ug/l	J	1.6	1000	
MW-20	Lead, total	06/23/2008	4	ug/l	J	1.9	15	
MW-20	Nickel, total	06/23/2008	10.4	ug/l	J	1.8	100	
MW-20	Thallium	06/23/2008	0.125	ug/l	J	0.036	0.28*	
MW-20	Vanadium	06/23/2008	11.6	ug/l	J	1.4	3.5*	
MW-20	Zinc	06/23/2008	18.9	ug/l		3.8	1050	
MW-21	1,1-Dichloroethane	06/23/2008	1.8	ug/l	J	0.33	70	
MW-21	Barium, total	06/23/2008	45.2	ug/l	J	1	2000	
MW-21	Benzene	06/23/2008	0.42	ug/l	J	0.2	1	
MW-21	cis-1,2-Dichloroethene	06/23/2008	1.4	ug/l	J	0.3	70	
MW-21	Cobalt, total	06/23/2008	3.8	ug/l	J	1.1	70*	
MW-21	Methylene chloride	06/23/2008	0.91	ug/l	J	0.24	4.6	
MW-21	Nickel, total	06/23/2008	3.1	ug/l	J	1.8	100	
MW-21	Thallium	06/23/2008	0.057	ug/l	J	0.036	0.28*	
MW-21	Trichloroethylene	06/23/2008	0.44	ug/l	J	0.25	2.8	
MW-21	Zinc	06/23/2008	4.3	ug/l	J	3.8	1050	
MW-22	Barium, total	06/23/2008	44.4	ug/l	J	1	2000	
MW-22	Cobalt, total	06/23/2008	1.3	ug/l	J	1.1	70*	
MW-22	Nickel, total	06/23/2008	1.9	ug/l	J	1.8	100	
MW-22	Thallium	06/23/2008	0.045	ug/l	J	0.036	0.28*	
MW-22	Zinc	06/23/2008	6.2	ug/l	J	3.8	1050	
MW-23	1,1-Dichloroethane	06/20/2008	0.73	ug/l	J	0.33	70	
MW-23	Arsenic	06/20/2008	4.4	ug/l	J	2.8	50	
MW-23	Barium, total	06/20/2008	58.2	ug/l	J	1	2000	
MW-23	Beryllium, total	06/20/2008	0.2	ug/l	J	0.1	4*	
MW-23	Chromium, total	06/20/2008	4.3	ug/l	J	1	50	
MW-23	cis-1,2-Dichloroethene	06/20/2008	4.2	ug/l	J	0.3	70	
MW-23	Cobalt, total	06/20/2008	8.5	ug/l	J	1.1	70*	
MW-23	Copper	06/20/2008	2.6	ug/l	J	1.6	1000	
MW-23	Nickel, total	06/20/2008	7.5	ug/l	J	1.8	100	
MW-23	Thallium	06/20/2008	0.07	ug/l	J	0.036	0.28*	
MW-23	Vanadium	06/20/2008	2.1	ug/l	J	1.4	3.5*	
MW-23	Zinc	06/20/2008	7.9	ug/l	J	3.8	1050	
MW-24	1,1-Dichloroethane	06/20/2008	0.92	ug/l	J	0.33	70	
MW-24	**1,4-Dichlorobenzene**	**06/20/2008**	**2.2**	**ug/l**		**0.2**	**1.4**	**0.8**
MW-24	Barium, total	06/20/2008	84.8	ug/l	J	0.2	2000	
MW-24	cis-1,2-Dichloroethene	06/20/2008	4.7	ug/l	J	0.3	70	
MW-24	Cobalt, total	06/20/2008	34.4	ug/l		2	70*	
MW-24	Mercury	06/20/2008	0.16	ug/l	J	0.11	1.1	
MW-24	Nickel, total	06/20/2008	2.2	ug/l	J	2	100	
MW-24	Thallium	06/20/2008	0.082	ug/l	J	0.036	0.28*	

Table 6: Summary of Current Groundwater Results

Well ID	Parameter Name [1]	Sample Date	Result	Unit	Qual Code	PQL [2]	NCGW2L [3]	Exceedance
MW-24	Zinc	06/20/2008	7.7	ug/l	J	1	1050	
MW-25	1,1-Dichloroethane	06/23/2008	2.2	ug/l	J	0.33	70	
MW-25	1,4-Dichlorobenzene	06/23/2008	0.66	ug/l	J	0.2	1.4	
MW-25	Barium, total	06/23/2008	112	ug/l		1	2000	
MW-25	Benzene	06/23/2008	0.62	ug/l	J	0.2	1	
MW-25	Chromium, total	06/23/2008	31.6	ug/l		1	50	
MW-25	cis-1,2-Dichloroethene	06/23/2008	0.72	ug/l	J	0.3	70	
MW-25	Cobalt, total	06/23/2008	4.9	ug/l	J	1.1	70*	
MW-25	Copper	06/23/2008	3.4	ug/l	J	1.6	1000	
MW-25	Lead, total	06/23/2008	2.4	ug/l	J	1.9	15	
MW-25	Nickel, total	06/23/2008	20.4	ug/l	J	1.8	100	
MW-25	Tetrachloroethylene	06/23/2008	0.45	ug/l	J	0.36	0.7	
MW-25	Thallium	06/23/2008	0.215	ug/l	J	0.036	0.28*	
MW-25	Vanadium	06/23/2008	17.3	ug/l	J	1.4	3.5*	
MW-25	Zinc	06/23/2008	23.1	ug/l		3.8	1050	
MW-26	1,1-Dichloroethane	06/20/2008	1.3	ug/l	J	0.33	70	
MW-26	**1,4-Dichlorobenzene**	**06/20/2008**	**2.4**	**ug/l**		**0.2**	**1.4**	**1**
MW-26	Barium, total	06/20/2008	70.1	ug/l	J	0.2	2000	
MW-26	**Benzene**	**06/20/2008**	**1.6**	**ug/l**		**0.2**	**1**	**0.6**
MW-26	Chlorobenzene	06/20/2008	0.71	ug/l	J	0.27	50	
MW-26	Chromium, total	06/20/2008	3.9	ug/l	J	2	50	
MW-26	cis-1,2-Dichloroethene	06/20/2008	27	ug/l		0.3	70	
MW-26	Cobalt, total	06/20/2008	28.9	ug/l		2	70*	
MW-26	Nickel, total	06/20/2008	13	ug/l	J	2	100	
MW-26	Thallium	06/20/2008	0.074	ug/l	J	0.036	0.28*	
MW-26	Zinc	06/20/2008	18.9	ug/l		1	1050	
MW-27	1,1-Dichloroethane	06/20/2008	1.2	ug/l	J	0.33	70	
MW-27	Barium, total	06/20/2008	58	ug/l	J	0.2	2000	
MW-27	cis-1,2-Dichloroethene	06/20/2008	14	ug/l		0.3	70	
MW-27	Nickel, total	06/20/2008	3.7	ug/l	J	2	100	
MW-27	Thallium	06/20/2008	0.041	ug/l	J	0.036	0.28*	
MW-3	1,1-Dichloroethane	06/20/2008	0.67	ug/l	J	0.33	70	
MW-3	**1,4-Dichlorobenzene**	**06/20/2008**	**7**	**ug/l**		**0.2**	**1.4**	**5.6**
MW-3	Acetone	06/20/2008	8.2	ug/l	J	0.62	700	
MW-3	Barium, total	06/20/2008	43.6	ug/l	J	0.2	2000	
MW-3	**Benzene**	**06/20/2008**	**6.7**	**ug/l**		**0.2**	**1**	**5.7**
MW-3	Chlorobenzene	06/20/2008	0.98	ug/l	J	0.27	50	
MW-3	cis-1,2-Dichloroethene	06/20/2008	9.6	ug/l		0.3	70	
MW-3	Cobalt, total	06/20/2008	8.3	ug/l	J	2	70*	
MW-3	Ethylbenzene	06/20/2008	2	ug/l		0.2	550	
MW-3	Lead, total	06/20/2008	3.3	ug/l	J	2	15	
MW-3	Nickel, total	06/20/2008	8.5	ug/l	J	2	100	
MW-3	o-Dichlorobenzene	06/20/2008	0.44	ug/l	J	0.27	620	
MW-3	Tetrachloroethylene	06/20/2008	0.55	ug/l	J	0.36	0.7	
MW-3	Toluene	06/20/2008	1.5	ug/l		0.2	1000	
MW-3	Trichloroethylene	06/20/2008	1.4	ug/l		0.25	2.8	
MW-3	**Vinyl chloride**	**06/20/2008**	**0.93**	**ug/l**	**J**	**0.3**	**0.015**	**0.915**
MW-3	Xylene	06/20/2008	13	ug/l		0.4	530	
MW-3	Zinc	06/20/2008	13.1	ug/l		1	1050	
MW-4R	1,1-Dichloroethane	06/19/2008	5.9	ug/l		0.33	70	

Table 6: Summary of Current Groundwater Results

Well ID	Parameter Name [1]	Sample Date	Result	Unit	Qual Code	PQL [2]	NCGW2L [3]	Exceedance
MW-4R	**1,4-Dichlorobenzene**	**06/19/2008**	**3.3**	**ug/l**		**0.2**	**1.4**	**1.9**
MW-4R	Barium, total	06/19/2008	115	ug/l	B	0.2	2000	
MW-4R	**Benzene**	**06/19/2008**	**1.1**	**ug/l**		**0.2**	**1**	**0.1**
MW-4R	Chlorobenzene	06/19/2008	1	ug/l	J	0.27	50	
MW-4R	Chloroethane	06/19/2008	3.5	ug/l	J	0.3	2800	
MW-4R	cis-1,2-Dichloroethene	06/19/2008	14	ug/l		0.3	70	
MW-4R	Cobalt, total	06/19/2008	146	ug/l		2	70*	
MW-5	1,1-Dichloroethane	06/20/2008	4.2	ug/l	J	0.33	70	
MW-5	1,4-Dichlorobenzene	06/20/2008	1.4	ug/l		0.2	1.4	
MW-5	Barium, total	06/20/2008	67.8	ug/l	J	1	2000	
MW-5	**Benzene**	**06/20/2008**	**3.3**	**ug/l**		**0.2**	**1**	**2.3**
MW-5	Chlorobenzene	06/20/2008	0.43	ug/l	J	0.27	50	
MW-5	cis-1,2-Dichloroethene	06/20/2008	8.2	ug/l		0.3	70	
MW-5	Thallium	06/20/2008	0.044	ug/l	J	0.036	0.28*	
MW-5	Trichloroethylene	06/20/2008	0.67	ug/l	J	0.25	2.8	
MW-5	Zinc	06/20/2008	10.9	ug/l		3.8	1050	
MW-6	Barium, total	06/19/2008	47.2	ug/l	J	0.2	2000	
MW-6	Cobalt, total	06/19/2008	19.3	ug/l		2	70*	
MW-6	Copper	06/19/2008	3.6	ug/l	J	0.6	1000	
MW-6	Lead, total	06/19/2008	2.1	ug/l	J	2	15	
MW-6	Nickel, total	06/19/2008	6.2	ug/l	J	2	100	
MW-6	Thallium	06/19/2008	0.109	ug/l	J	0.036	0.28*	
MW-6	Zinc	06/19/2008	16.5	ug/l		1	1050	
MW-7	1,1-Dichloroethane	06/20/2008	3.3	ug/l	J	0.33	70	
MW-7	**1,4-Dichlorobenzene**	**06/20/2008**	**2**	**ug/l**		**0.2**	**1.4**	**0.6**
MW-7	Barium, total	06/20/2008	9.2	ug/l	J	0.2	2000	
MW-7	**Benzene**	**06/20/2008**	**4.1**	**ug/l**		**0.2**	**1**	**3.1**
MW-7	Chlorobenzene	06/20/2008	0.74	ug/l	J	0.27	50	
MW-7	cis-1,2-Dichloroethene	06/20/2008	6.4	ug/l		0.3	70	
MW-7	Trichloroethylene	06/20/2008	0.8	ug/l	J	0.25	2.8	
MW-9	1,1-Dichloroethane	06/19/2008	1.9	ug/l	J	0.33	70	
MW-9	Barium, total	06/19/2008	119	ug/l	B	0.2	2000	
MW-9	cis-1,2-Dichloroethene	06/19/2008	13	ug/l		0.3	70	
MW-9	Cobalt, total	06/19/2008	16.5	ug/l		2	70*	
MW-9	Copper	06/19/2008	1.3	ug/l	J	0.6	1000	
MW-9	Nickel, total	06/19/2008	32.6	ug/l	J	2	100	

[1] Table only contains detected constituents.

[2] PQL = Practical Quantitation Limit

[3] NCGW2L = North Carolina Ground Water 2L Standard

*Groundwater Protection Standard

Table 7: Summary of Current Surface Water Results

Well ID	Parameter Name [1]	Sample Date	Result	Unit	PQL [2]	NCAC 2B STD[3]	Exceedance
SW-4R	Barium, total	06/20/2008	40	µg/L	1	1,000	
SW-4R	Cobalt, total	06/20/2008	1.9	µg/L	1.1	190	
SW-4R	Thallium	06/20/2008	0.084	µg/L	0.036	0.24	
SW-4R	Vanadium	06/20/2008	2.1	µg/L	1.4	-	
SW-4R	Zinc	06/20/2008	4.1	µg/L	3.8	50	
SW-5	1,1-Dichloroethane	06/19/2008	0.52	µg/L	0.33	6,700	
SW-5	Barium, total	06/19/2008	41.5	µg/L	0.2	1,000	
SW-5	Cobalt, total	06/19/2008	15.7	µg/L	2	190	
SW-5	Zinc	06/19/2008	9.4	µg/L	1	50	

[1] Table only contains detected constituents.

[2] PQL = Practical Quantitation Limit

[3] NCAC 2B STD = North Carolina Surface Water Standard Class C or Class IV as applicable

Table 8A: Carcinogenic Toxicity Values for Oral Ingestion

Contaminant	Well	Reference Dose	Maximum Concentration (ug/L)	LADD Maximum		Concentration July 2007 (ug/L)	LADD July 2007		HI Risk Maximum		Hi Risk July 2007	
		Oral Sfo (ug/kg-day)		Adult (ug/kg-day)	Child (ug/kg-day)		Adult (ug/kg-day)	Child (ug/kg-day)	Adult	Child	Adult	Child
Methylene Chloride	MW-1B	7.5	2.80	0.03	0.01	2.80	0.03	0.01	4.57E-03	1.51E-03	4.57E-03	1.51E-03
	MW-3	7.5	24.00	0.29	0.10	-	-	-	3.92E-02	1.30E-02	-	-
	MW-7	7.5	29.00	0.36	0.12	-	-	-	4.73E-02	1.57E-02	-	-
	MW-11	7.5	0.70	0.01	0.00	0.70	0.01	0.00	1.14E-03	3.78E-04	1.14E-03	3.78E-04
	MW-12	7.5	13.00	0.16	0.05	1.80	0.02	0.01	2.12E-02	7.02E-03	2.94E-03	9.73E-04
	MW-15	7.5	16.00	0.20	0.06	-	-	-	2.61E-02	8.65E-03	-	-
	MW-16	7.5	4.10	0.05	0.02	4.10	0.05	0.02	6.69E-03	2.22E-03	6.69E-03	2.22E-03
	MW-17	7.5	9.70	0.12	0.04	0.54	0.01	0.00	1.58E-02	5.24E-03	8.82E-04	2.92E-04
	MW-21	7.5	0.70	0.01	0.00	0.70	0.01	0.00	1.14E-03	3.78E-04	1.14E-03	3.78E-04
Benzene	MW-1	55	7.20	0.09	0.03	5.60	0.07	0.02	1.60E-03	5.31E-04	1.25E-03	4.13E-04
	MW-1B	55	1.70	0.02	0.01	-	-	-	3.78E-04	1.25E-04	-	-
	MW-2	55	2.80	0.03	0.01	1.80	0.02	0.01	6.23E-04	2.06E-04	4.01E-04	1.33E-04
	MW-3	55	13.00	0.16	0.05	8.00	0.10	0.03	2.89E-03	9.58E-04	1.78E-03	5.89E-04
	MW-4	55	4.00	0.05	0.02	-	-	-	8.91E-04	2.95E-04	-	-
	MW-4R	55	5.60	0.07	0.02	-	-	-	1.25E-03	4.13E-04	-	-
	MW-5	55	6.10	0.07	0.02	3.20	0.04	0.01	1.36E-03	4.49E-04	7.12E-04	2.36E-04
	MW-6	55	1.10	0.01	0.00	1.10	0.01	0.00	2.45E-04	8.11E-05	2.45E-04	8.11E-05
	MW-7	55	6.70	0.08	0.03	4.70	0.06	0.02	1.49E-03	4.94E-04	1.05E-03	3.46E-04
	MW-8	55	0.12	0.00	0.00	-	-	-	2.67E-05	8.84E-06	-	-
	MW-10	55	2.10	0.03	0.01	-	-	-	4.68E-04	1.55E-04	-	-
	MW-11	55	7.70	0.09	0.03	4.20	0.05	0.02	1.71E-03	5.67E-04	9.35E-04	3.09E-04
	MW-12	55	8.20	0.10	0.03	7.10	0.09	0.03	1.83E-03	6.04E-04	1.58E-03	5.23E-04
	MW-12D	55	0.52	0.01	0.00	0.52	0.01	0.00	1.16E-04	3.83E-05	1.16E-04	3.83E-05
	MW-13	55	0.47	0.01	0.00	0.47	0.01	0.00	1.05E-04	3.46E-05	1.05E-04	3.46E-05
	MW-14	55	2.00	0.02	0.01	1.20	0.01	0.00	4.45E-04	1.47E-04	2.67E-04	8.84E-05
	MW-15	55	5.30	0.06	0.02	-	-	-	1.18E-03	3.91E-04	-	-
	MW-16	55	3.30	0.04	0.01	3.30	0.04	0.01	7.35E-04	2.43E-04	7.35E-04	2.43E-04
	MW-17	55	1.40	0.02	0.01	1.10	0.01	0.00	3.12E-04	1.03E-04	2.45E-04	8.11E-05
	MW-21	55	0.49	0.01	0.00	0.49	0.01	0.00	1.09E-04	3.61E-05	1.09E-04	3.61E-05
	MW-24	55	1.60	0.02	0.01	1.60	0.02	0.01	3.56E-04	1.18E-04	3.56E-04	1.18E-04
	MW-26	55	1.90	0.02	0.01	1.90	0.02	0.01	4.23E-04	1.40E-04	4.23E-04	1.40E-04

NOTE:
1. LADD is lifetime average daily dose from ingested groundwater at the specified concentration.
2. Sfo values taken from the Region 9 Risk Based Concentration Table. These values represent a cancer slope factor.
3. During July 2007 sampling "-" designates none of this constituent was detected.
4. Formula used for calculations:

LADD = (C*IR*ED)/(BW*AT)

C = constituent concentration (ug/L)

IR = Ingestion Rate (L/day)	An ingestion rate of 2L/day was used for adults 1L/day for children
ED = Exposure Duration (days)	An exposure duration of 30 years was used for adults, 8 for children
BW = Body weight (kg)	An average weight of 70 kg was used for adults, 28.2 kg for children
AT = Average Time (days)	A time of 70 years for adults and children was used

Table 8B: Carcinogenic Toxicity Values for Inhalation Exposure

Contaminant	Well	Reference Dose	Maximum Concentration	LADD Maximum		Concentration July 2007	LADD July 2007		HI Risk Maximum		HI Risk July 2007	
		Inhalation Sfi (ug/kg-day)	(ug/m^3)	Adult (ug/kg-day)	Child (ug/kg-day)	(ug/m^3)	Adult (ug/kg-day)	Child (ug/kg-day)	Adult	Child	Adult	Child
Methylene Chloride	MW-1B	1.6	2.80	0.17	0.07	2.80	0.17	0.07	1.07E-01	4.26E-02	1.07E-01	4.26E-02
	MW-3	1.6	24.00	1.47	0.58	-	-	-	9.18E-01	3.65E-01	-	-
	MW-7	1.6	29.00	1.78	0.71	-	-	-	1.11E+00	4.41E-01	-	-
	MW-11	1.6	0.70	0.04	0.02	0.70	0.04	0.02	2.68E-02	1.06E-02	2.68E-02	1.06E-02
	MW-12	1.6	13.00	0.80	0.32	1.80	0.11	0.04	4.97E-01	1.98E-01	6.89E-02	2.74E-02
	MW-15	1.6	16.00	0.98	0.39	-	-	-	6.12E-01	2.43E-01	-	-
	MW-16	1.6	4.10	0.25	0.10	4.10	0.25	0.10	1.57E-01	6.23E-02	1.57E-01	6.23E-02
	MW-17	1.6	9.70	0.59	0.24	0.54	0.03	0.01	3.71E-01	1.47E-01	2.07E-02	8.21E-03
	MW-21	1.6	0.70	0.04	0.02	0.70	0.04	0.02	2.68E-02	1.06E-02	2.68E-02	1.06E-02
Benzene	MW-1	27	7.20	0.44	0.18	5.60	0.34	0.14	1.63E-02	6.48E-03	1.27E-02	5.04E-03
	MW-1B	27	1.70	0.10	0.04	-	-	-	3.85E-03	1.53E-03	-	-
	MW-2	27	2.80	0.17	0.07	1.80	0.11	0.04	6.35E-03	2.52E-03	4.08E-03	1.62E-03
	MW-3	27	13.00	0.80	0.32	8.00	0.49	0.19	2.95E-02	1.17E-02	1.81E-02	7.20E-03
	MW-4	27	4.00	0.24	0.10	-	-	-	9.07E-03	3.60E-03	-	-
	MW-4R	27	5.60	0.34	0.14	-	-	-	1.27E-02	5.04E-03	-	-
	MW-5	27	6.10	0.37	0.15	3.20	0.20	0.08	1.38E-02	5.49E-03	7.26E-03	2.88E-03
	MW-6	27	1.10	0.07	0.03	1.10	0.07	0.03	2.49E-03	9.91E-04	2.49E-03	9.91E-04
	MW-7	27	6.70	0.41	0.16	4.70	0.29	0.11	1.52E-02	6.03E-03	1.07E-02	4.23E-03
	MW-8	27	0.12	0.01	0.00	-	-	-	2.72E-04	1.08E-04	-	-
	MW-10	27	2.10	0.13	0.05	-	-	-	4.76E-03	1.89E-03	-	-
	MW-11	27	7.70	0.47	0.19	4.20	0.26	0.10	1.75E-02	6.93E-03	9.52E-03	3.78E-03
	MW-12	27	8.20	0.50	0.20	7.10	0.43	0.17	1.86E-02	7.38E-03	1.61E-02	6.39E-03
	MW-12D	27	0.52	0.03	0.01	0.52	0.03	0.01	1.18E-03	4.68E-04	1.18E-03	4.68E-04
	MW-13	27	0.47	0.03	0.01	0.47	0.03	0.01	1.07E-03	4.23E-04	1.07E-03	4.23E-04
	MW-14	27	2.00	0.12	0.05	1.20	0.07	0.03	4.54E-03	1.80E-03	2.72E-03	1.08E-03
	MW-15	27	5.30	0.32	0.13	-	-	-	1.20E-02	4.77E-03	-	-
	MW-16	27	3.30	0.20	0.08	3.30	0.20	0.08	7.48E-03	2.97E-03	7.48E-03	2.97E-03
	MW-17	27	1.40	0.09	0.03	1.10	0.07	0.03	3.17E-03	1.26E-03	2.49E-03	9.91E-04
	MW-21	27	0.49	0.03	0.01	0.49	0.03	0.01	1.11E-03	4.41E-04	1.11E-03	4.41E-04
	MW-24	27	1.60	0.10	0.04	1.60	0.10	0.04	3.63E-03	1.44E-03	3.63E-03	1.44E-03
	MW-26	27	1.90	0.12	0.05	1.90	0.12	0.05	4.31E-03	1.71E-03	4.31E-03	1.71E-03

NOTE:
1. LADD is lifetime average daily dose inhaled at the specified concentration.
2. Sfi values taken from the Region 9 Risk Based Concentration Table. These values represent a cancer slope factor.
3. During July 2007 sampling "-" designates none of this constituent was detected.
4. HI is the Hazzard Index Risk = LADD/RfD
5. Formula used for calculations:

LADD = (C*IR*ED*K)/(BW*AT)

C = constituent concentration (ug/m^3)

K = Volatilization factor (L/m^3)	A Volatilization factor of 0.5 L/m^3 was used based on EPA published values
IR = Inhalation Rate (m^3/day)	An inhalation rate of 20 m^3/day was used for adults and 12m^3/day for children
ED = Exposure Duration (days)	An exposure duration of 30 years was used for adults, 8 for children
BW = Body weight (kg)	An average weight of 70 kg was used for adults, 28.2 kg for children
AT = Average Time (days)	A times of 70 years for adults and children was used

Alexander County

Table 8C: Carcinogenic Toxicity Values from Dermal Exposure

Contaminant	Well	Reference Dose	Maximum Concentration (ug/L)	LADD Maximum		Concentration 2007 (ug/L)	LADD 2007		HI Risk Maximum		HI Risk 1/25/2007	
		Oral Sfo (ug/kg-day)		Adult (ug/kg-day)	Child (ug/kg-day)		Adult (ug/kg-day)	Child (ug/kg-day)	Adult	Child	Adult	Child
Methylene Chloride	MW-1B	7.5	2.80	3.85E-05	1.19E-05	2.80	3.85E-05	1.19E-05	5.13E-06	1.59E-06	5.13E-06	1.59E-06
	MW-3	7.5	24.00	3.30E-04	1.02E-04	-	-	-	4.40E-05	1.36E-05	-	-
	MW-7	7.5	29.00	3.99E-04	1.24E-04	-	-	-	5.32E-05	1.65E-05	-	-
	MW-11	7.5	0.70	9.63E-06	2.98E-06	0.70	9.63E-06	2.98E-06	1.28E-06	3.98E-07	1.28E-06	3.98E-07
	MW-12	7.5	13.00	1.79E-04	5.54E-05	1.80	2.48E-05	7.67E-06	2.38E-05	7.39E-06	3.30E-06	1.02E-06
	MW-15	7.5	16.00	2.20E-04	6.82E-05	-	-	-	2.93E-05	9.09E-06	-	-
	MW-16	7.5	4.10	5.64E-05	1.75E-05	4.10	5.64E-05	1.75E-05	7.52E-06	2.33E-06	7.52E-06	2.33E-06
	MW-17	7.5	9.70	1.33E-04	4.13E-05	0.54	7.43E-06	2.30E-06	1.78E-05	5.51E-06	9.90E-07	3.07E-07
	MW-21	7.5	0.70	9.63E-06	2.98E-06	0.70	9.63E-06	2.98E-06	1.28E-06	3.98E-07	1.28E-06	3.98E-07
Benzene	MW-1	55	7.20	4.62E-04	1.43E-04	5.60	3.59E-04	1.11E-04	8.40E-06	2.60E-06	6.53E-06	2.02E-06
	MW-1B	55	1.70	1.09E-04	3.38E-05	-	-	-	1.98E-06	6.15E-07	-	-
	MW-2	55	2.80	1.80E-04	5.57E-05	1.80	1.16E-04	3.58E-05	3.27E-06	1.01E-06	2.10E-06	6.51E-07
	MW-3	55	13.00	8.34E-04	2.58E-04	8.00	5.13E-04	1.59E-04	1.52E-05	4.70E-06	9.34E-06	2.89E-06
	MW-4	55	4.00	2.57E-04	7.95E-05	-	-	-	4.67E-06	1.45E-06	-	-
	MW-4R	55	5.60	3.59E-04	1.11E-04	-	-	-	6.53E-06	2.02E-06	-	-
	MW-5	55	6.10	3.92E-04	1.21E-04	3.20	2.05E-04	6.36E-05	7.12E-06	2.21E-06	3.73E-06	1.16E-06
	MW-6	55	1.10	7.06E-05	2.19E-05	1.10	7.06E-05	2.19E-05	1.28E-06	3.98E-07	1.28E-06	3.98E-07
	MW-7	55	6.70	4.30E-04	1.33E-04	4.70	3.02E-04	9.35E-05	7.82E-06	2.42E-06	5.48E-06	1.70E-06
	MW-8	55	0.12	7.70E-06	2.39E-06	-	-	-	1.40E-07	4.34E-08	-	-
	MW-10	55	2.10	1.35E-04	4.18E-05	-	-	-	2.45E-06	7.59E-07	-	-
	MW-11	55	7.70	4.94E-04	1.53E-04	4.20	2.70E-04	8.35E-05	8.99E-06	2.78E-06	4.90E-06	1.52E-06
	MW-12	55	8.20	5.26E-04	1.63E-04	7.10	4.56E-04	1.41E-04	9.57E-06	2.96E-06	8.29E-06	2.57E-06
	MW-12D	55	0.52	3.34E-05	1.03E-05	0.52	3.34E-05	1.03E-05	6.07E-07	1.88E-07	6.07E-07	1.88E-07
	MW-13	55	0.47	3.02E-05	9.35E-06	0.47	3.02E-05	9.35E-06	5.48E-07	1.70E-07	5.48E-07	1.70E-07
	MW-14	55	2.00	1.28E-04	3.98E-05	1.20	7.70E-05	2.39E-05	2.33E-06	7.23E-07	1.40E-06	4.34E-07
	MW-15	55	5.30	3.40E-04	1.05E-04	-	-	-	6.18E-06	1.92E-06	-	-
	MW-16	55	3.30	2.12E-04	6.56E-05	3.30	2.12E-04	6.56E-05	3.85E-06	1.19E-06	3.85E-06	1.19E-06
	MW-17	55	1.40	8.99E-05	2.78E-05	1.10	7.06E-05	2.19E-05	1.63E-06	5.06E-07	1.28E-06	3.98E-07
	MW-21	55	0.49	3.14E-05	9.74E-06	0.49	3.14E-05	9.74E-06	5.72E-07	1.77E-07	5.72E-07	1.77E-07
	MW-24	55	1.60	1.03E-04	3.18E-05	1.60	1.03E-04	3.18E-05	1.87E-06	5.78E-07	1.87E-06	5.78E-07
	MW-26	55	1.90	1.22E-04	3.78E-05	1.90	1.22E-04	3.78E-05	2.22E-06	6.87E-07	2.22E-06	6.87E-07

NOTE:
1. LADD is lifetime average daily dose from dermal contact with contaminated groundwater at the specified concentration.
2. Sfo values taken from the Region 9 Risk Based Concentration Table. These values represent a cancer slope factor.
3. During July2007 sampling "-" designates none of this constituent was detected.
4. Dermal Values used the same RfD values as those used for Oral.
5. HI is the Hazard Index Risk = LADD/RfD
6. Formula used for calculations:

LADD = (C*K*EV*ED*EF*SA)/(BW*AT)

C = constituent concentration (ug/L)	
K = permeability coefficient (cm/day)	contaminant dependent
EV = event frequency	15 min/day
ED = Exposure Duration (years)	30 years for an adult, 8 years for a child
EF = Exposure Frequency (days/year)	365 days per year
SA = skin surface area (cm^2)	20,000cm^2 for adults and 9360 cm^2 for children
BW = Body weight (kg)	70 kg was used for adults, 28.2 kg for children
AT = Average Time (days)	70 years for adults and children

Table 8D: Non-Carcinogenic Toxicity Values for Oral Ingestion

Contaminant	Well	Reference Dose	Maximum Concentration (ug/L)	LADD Maximum		Concentration 12/07-1/08 (ug/L)	LADD July 2007		HI Risk Maximum		Hi Risk July 2007	
		Oral RfD (ug/kg-day)		Adult (ug/kg-day)	Child (ug/kg-day)		Adult (ug/kg-day)	Child (ug/kg-day)	Adult	Child	Adult	Child
1,1 Dichloroethane	MW-1	100	22.00	0.63	0.78	2.50	0.07	0.09	6.29E-03	7.80E-03	7.14E-04	8.87E-04
	MW-1A	100	6.50	0.19	0.23	-	-	-	1.86E-03	2.30E-03	-	-
	MW-1B	100	2.80	0.08	0.10	2.80	0.08	0.10	8.00E-04	9.93E-04	8.00E-04	9.93E-04
	MW-2	100	33.00	0.94	1.17	1.50	0.04	0.05	9.43E-03	1.17E-02	4.29E-04	5.32E-04
	MW-3	100	22.00	0.63	0.78	1.10	0.03	0.04	6.29E-03	7.80E-03	3.14E-04	3.90E-04
	MW-4	100	16.00	0.46	0.57	-	-	-	4.57E-03	5.67E-03	-	-
	MW-4R	100	18.00	0.51	0.64	7.60	0.22	0.27	5.14E-03	6.38E-03	2.17E-03	2.70E-03
	MW-5	100	22.00	0.63	0.78	5.70	0.16	0.20	6.29E-03	7.80E-03	1.63E-03	2.02E-03
	MW-7	100	29.00	0.83	1.03	4.90	0.14	0.17	8.29E-03	1.03E-02	1.40E-03	1.74E-03
	MW-8	100	14.00	0.40	0.50	-	-	-	4.00E-03	4.96E-03	-	-
	MW-9	100	6.00	0.17	0.21	2.40	0.07	0.09	1.71E-03	2.13E-03	6.86E-04	8.51E-04
	MW-10	100	0.91	0.03	0.03	0.91	0.03	0.03	2.60E-04	3.23E-04	2.60E-04	3.23E-04
	MW-11	100	11.00	0.31	0.39	2.90	0.08	0.10	3.14E-03	3.90E-03	8.29E-04	1.03E-03
	MW-12	100	17.00	0.49	0.60	5.00	0.14	0.18	4.86E-03	6.03E-03	1.43E-03	1.77E-03
	MW-12D	100	0.89	0.03	0.03	0.89	0.03	0.03	2.54E-04	3.16E-04	2.54E-04	3.16E-04
	MW-13	100	0.56	0.02	0.02	0.56	0.02	0.02	1.60E-04	1.99E-04	1.60E-04	1.99E-04
	MW-14	100	11.00	0.31	0.39	2.20	0.06	0.08	3.14E-03	3.90E-03	6.29E-04	7.80E-04
	MW-15	100	53.00	1.51	1.88	3.70	0.11	0.13	1.51E-02	1.88E-02	1.06E-03	1.31E-03
	MW-16	100	21.00	0.60	0.74	21.00	0.60	0.74	6.00E-03	7.45E-03	6.00E-03	7.45E-03
	MW-17	100	17.00	0.49	0.60	3.30	0.09	0.12	4.86E-03	6.03E-03	9.43E-04	1.17E-03
	MW-20	100	0.94	0.03	0.03	0.94	0.03	0.03	2.69E-04	3.33E-04	2.69E-04	3.33E-04
	MW-21	100	2.40	0.07	0.09	2.40	0.07	0.09	6.86E-04	8.51E-04	6.86E-04	8.51E-04
	MW-23	100	1.20	0.03	0.04	1.20	0.03	0.04	3.43E-04	4.26E-04	3.43E-04	4.26E-04
	MW-24	100	1.10	0.03	0.04	1.10	0.03	0.04	3.14E-04	3.90E-04	3.14E-04	3.90E-04
	MW-25	100	3.40	0.10	0.12	3.40	0.10	0.12	9.71E-04	1.21E-03	9.71E-04	1.21E-03
	MW-26	100	1.70	0.05	0.06	1.70	0.05	0.06	4.86E-04	6.03E-04	4.86E-04	6.03E-04
	MW-27	100	0.99	0.03	0.04	0.99	0.03	0.04	2.83E-04	3.51E-04	2.83E-04	3.51E-04
1,2-Dichloropropane	MW-3	1.1	11.00	0.31	0.39	-	-	-	2.86E-01	3.55E-01	-	-
	MW-16	1.1	1.00	0.03	0.04	1.00	0.03	0.04	2.60E-02	3.22E-02	2.60E-02	3.22E-02
Xylenes	MW-1	200	5.10	0.15	0.18	-	-	-	7.29E-04	9.04E-04	-	-
	MW-1A	200	7.40	0.21	0.26	-	-	-	1.06E-03	1.31E-03	-	-
	MW-1B	200	8.80	0.25	0.31	8.80	0.25	0.31	1.26E-03	1.56E-03	1.26E-03	1.56E-03
	MW-3	200	34.00	0.97	1.21	15.00	0.43	0.53	4.86E-03	6.03E-03	2.14E-03	2.66E-03
	MW-6	200	5.20	0.15	0.18	-	-	-	7.43E-04	9.22E-04	-	-
	MW-8	200	5.00	0.14	0.18	-	-	-	7.14E-04	8.87E-04	-	-
	MW-11	200	5.10	0.15	0.18	-	-	-	7.29E-04	9.04E-04	-	-
	MW-12	200	5.20	0.15	0.18	-	-	-	7.43E-04	9.22E-04	-	-
	MW-14	200	5.10	0.15	0.18	-	-	-	7.29E-04	9.04E-04	-	-
	MW-16	200	2.20	0.06	0.08	2.20	0.06	0.08	3.14E-04	3.90E-04	3.14E-04	3.90E-04
	MW-27	200	0.97	0.03	0.03	0.97	0.03	0.03	1.39E-04	1.72E-04	1.39E-04	1.72E-04

Table 8D: Non-Carcinogenic Toxicity Values for Oral Ingestion

Contaminant	Well	Reference Dose	Maximum Concentration (ug/L)	LADD Maximum		Concentration 12/07-1/08 (ug/L)	LADD July 2007		HI Risk Maximum		Hi Risk July 2007	
		Oral RfD (ug/kg-day)		Adult (ug/kg-day)	Child (ug/kg-day)		Adult (ug/kg-day)	Child (ug/kg-day)	Adult	Child	Adult	Child
Tetrachloroethene	MW-1	10	0.25	0.01	0.01	-	-	-	7.14E-04	8.87E-04	-	-
	MW-1B	10	0.42	0.01	0.01	0.42	0.01	0.01	1.20E-03	1.49E-03	1.20E-03	1.49E-03
	MW-3	10	1.00	0.03	0.04	0.45	0.01	0.02	2.86E-03	3.55E-03	1.29E-03	1.60E-03
	MW-5	10	1.00	0.03	0.04	-	-	-	2.86E-03	3.55E-03	-	-
	MW-7	10	1.20	0.03	0.04	-	-	-	3.43E-03	4.26E-03	-	-
	MW-11	10	1.10	0.03	0.04	-	-	-	3.14E-03	3.90E-03	-	-
	MW-12	10	2.00	0.06	0.07	1.00	0.03	0.04	5.71E-03	7.09E-03	2.86E-03	3.55E-03
	MW-16	10	2.50	0.07	0.09	2.50	0.07	0.09	7.14E-03	8.87E-03	7.14E-03	8.87E-03
	MW-17	10	0.47	0.01	0.02	-	-	-	1.34E-03	1.67E-03	-	-
	MW-25	10	0.49	0.01	0.02	0.49	0.01	0.02	1.40E-03	1.74E-03	1.40E-03	1.74E-03
Benzene	MW-1	4	7.20	0.21	0.26	5.60	0.16	0.20	5.14E-02	6.38E-02	4.00E-02	4.96E-02
	MW-1B	4	1.70	0.05	0.06	-	-	-	1.21E-02	1.51E-02	-	-
	MW-2	4	2.80	0.08	0.10	1.80	0.05	0.06	2.00E-02	2.48E-02	1.29E-02	1.60E-02
	MW-3	4	13.00	0.37	0.46	8.00	0.23	0.28	9.29E-02	1.15E-01	5.71E-02	7.09E-02
	MW-4	4	4.00	0.11	0.14	-	-	-	2.86E-02	3.55E-02	-	-
	MW-4R	4	5.60	0.16	0.20	-	-	-	4.00E-02	4.96E-02	-	-
	MW-5	4	6.10	0.17	0.22	3.20	0.09	0.11	4.36E-02	5.41E-02	2.29E-02	2.84E-02
	MW-6	4	1.10	0.03	0.04	1.10	0.03	0.04	7.86E-03	9.75E-03	7.86E-03	9.75E-03
	MW-7	4	6.70	0.19	0.24	4.70	0.13	0.17	4.79E-02	5.94E-02	3.36E-02	4.17E-02
	MW-8	4	0.12	0.00	0.00	-	-	-	8.57E-04	1.06E-03	-	-
	MW-10	4	2.10	0.06	0.07	-	-	-	1.50E-02	1.86E-02	-	-
	MW-11	4	7.70	0.22	0.27	4.20	0.12	0.15	5.50E-02	6.83E-02	3.00E-02	3.72E-02
	MW-12	4	8.20	0.23	0.29	7.10	0.20	0.25	5.86E-02	7.27E-02	5.07E-02	6.29E-02
	MW-12D	4	0.52	0.01	0.02	0.52	0.01	0.02	3.71E-03	4.61E-03	3.71E-03	4.61E-03
	MW-13	4	0.47	0.01	0.02	0.47	0.01	0.02	3.36E-03	4.17E-03	3.36E-03	4.17E-03
	MW-14	4	2.00	0.06	0.07	1.20	0.03	0.04	1.43E-02	1.77E-02	8.57E-03	1.06E-02
	MW-15	4	5.30	0.15	0.19	-	-	-	3.79E-02	4.70E-02	-	-
	MW-16	4	3.30	0.09	0.12	3.30	0.09	0.12	2.36E-02	2.93E-02	2.36E-02	2.93E-02
	MW-17	4	1.40	0.04	0.05	1.10	0.03	0.04	1.00E-02	1.24E-02	7.86E-03	9.75E-03
	MW-21	4	0.49	0.01	0.02	0.49	0.01	0.02	3.50E-03	4.34E-03	3.50E-03	4.34E-03
	MW-24	4	1.60	0.05	0.06	1.60	0.05	0.06	1.14E-02	1.42E-02	1.14E-02	1.42E-02
	MW-26	4	1.90	0.05	0.07	1.90	0.05	0.07	1.36E-02	1.68E-02	1.36E-02	1.68E-02
Methylene Chloride	MW-1B	60	2.80	0.08	0.10	2.80	0.08	0.10	1.33E-03	1.65E-03	1.33E-03	1.65E-03
	MW-3	60	24.00	0.69	0.85	-	-	-	1.14E-02	1.42E-02	-	-
	MW-7	60	29.00	0.83	1.03	-	-	-	1.38E-02	1.71E-02	-	-
	MW-11	60	0.70	0.02	0.02	0.70	0.02	0.02	3.33E-04	4.14E-04	3.33E-04	4.14E-04
	MW-12	60	13.00	0.37	0.46	1.80	0.05	0.06	6.19E-03	7.68E-03	8.57E-04	1.06E-03
	MW-15	60	16.00	0.46	0.57	-	-	-	7.62E-03	9.46E-03	-	-
	MW-16	60	4.10	0.12	0.15	4.10	0.12	0.15	1.95E-03	2.42E-03	1.95E-03	2.42E-03
	MW-17	60	9.70	0.28	0.34	0.54	0.02	0.02	4.62E-03	5.73E-03	2.57E-04	3.19E-04
	MW-21	60	0.70	0.02	0.02	0.70	0.02	0.02	3.33E-04	4.14E-04	3.33E-04	4.14E-04

Table 8D: Non-Carcinogenic Toxicity Values for Oral Ingestion

Contaminant	Well	Reference Dose	Maximum Concentration (ug/L)	LADD Maximum		Concentration 12/07-1/08 (ug/L)	LADD July 2007		HI Risk Maximum		Hi Risk July 2007	
		Oral RfD (ug/kg-day)		Adult (ug/kg-day)	Child (ug/kg-day)		Adult (ug/kg-day)	Child (ug/kg-day)	Adult	Child	Adult	Child
p-dichlorobenzene	MW-1	30	3.80	0.11	0.13	3.80	0.11	0.13	3.62E-03	4.49E-03	3.62E-03	4.49E-03
	MW-1B	30	2.40	0.07	0.09	2.40	0.07	0.09	2.29E-03	2.84E-03	2.29E-03	2.84E-03
	MW-2	30	5.20	0.15	0.18	4.40	0.13	0.16	4.95E-03	6.15E-03	4.19E-03	5.20E-03
	MW-3	30	11.00	0.31	0.39	9.80	0.28	0.35	1.05E-02	1.30E-02	9.33E-03	1.16E-02
	MW-4	30	3.00	0.09	0.11	-	-	-	2.86E-03	3.55E-03	-	-
	MW-4R	30	3.60	0.10	0.13	3.60	0.10	0.13	3.43E-03	4.26E-03	3.43E-03	4.26E-03
	MW-5	30	1.20	0.03	0.04	-	-	-	1.14E-03	1.42E-03	-	-
	MW-6	30	0.88	0.03	0.03	0.88	0.03	0.03	8.38E-04	1.04E-03	8.38E-04	1.04E-03
	MW-7	30	3.00	0.09	0.11	2.10	0.06	0.07	2.86E-03	3.55E-03	2.00E-03	2.48E-03
	MW-8	30	0.15	0.00	0.01	-	-	-	1.43E-04	1.77E-04	-	-
	MW-9	30	0.42	0.01	0.01	0.42	0.01	0.01	4.00E-04	4.96E-04	4.00E-04	4.96E-04
	MW-11	30	11.60	0.33	0.41	5.90	0.17	0.21	1.10E-02	1.37E-02	5.62E-03	6.97E-03
	MW-12	30	10.90	0.31	0.39	7.40	0.21	0.26	1.04E-02	1.29E-02	7.05E-03	8.75E-03
	MW-13	30	0.15	0.00	0.01	-	-	-	1.43E-04	1.77E-04	-	-
	MW-14	30	7.50	0.21	0.27	4.60	0.13	0.16	7.14E-03	8.87E-03	4.38E-03	5.44E-03
	MW-15	30	0.48	0.01	0.02	-	-	-	4.57E-04	5.67E-04	-	-
	MW-16	30	1.80	0.05	0.06	1.80	0.05	0.06	1.71E-03	2.13E-03	1.71E-03	2.13E-03
	MW-17	30	0.50	0.01	0.02	0.50	0.01	0.02	4.76E-04	5.91E-04	4.76E-04	5.91E-04
	MW-23	30	1.10	0.03	0.04	1.10	0.03	0.04	1.05E-03	1.30E-03	1.05E-03	1.30E-03
	MW-24	30	2.70	0.08	0.10	2.70	0.08	0.10	2.57E-03	3.19E-03	2.57E-03	3.19E-03
	MW-26	30	3.10	0.09	0.11	3.10	0.09	0.11	2.95E-03	3.66E-03	2.95E-03	3.66E-03
Trichloroethene	MW-1	0.3	0.42	0.01	0.01	0.42	0.01	0.01	4.00E-02	4.96E-02	4.00E-02	4.96E-02
	MW-1B	0.3	0.23	0.01	0.01	-	-	-	2.19E-02	2.72E-02	-	-
	MW-2	0.3	6.00	0.17	0.21	0.47	0.01	0.02	5.71E-01	7.09E-01	4.48E-02	5.56E-02
	MW-3	0.3	5.00	0.14	0.18	2.00	0.06	0.07	4.76E-01	5.91E-01	1.90E-01	2.36E-01
	MW-4	0.3	3.00	0.09	0.11	-	-	-	2.86E-01	3.55E-01	-	-
	MW-4R	0.3	0.23	0.01	0.01	-	-	-	2.19E-02	2.72E-02	-	-
	MW-5	0.3	4.00	0.11	0.14	0.55	0.02	0.02	3.81E-01	4.73E-01	5.24E-02	6.50E-02
	MW-7	0.3	1.20	0.03	0.04	0.84	0.02	0.03	1.14E-01	1.42E-01	8.00E-02	9.93E-02
	MW-8	0.3	1.00	0.03	0.04	-	-	-	9.52E-02	1.18E-01	-	-
	MW-11	0.3	1.20	0.03	0.04	0.55	0.02	0.02	1.14E-01	1.42E-01	5.24E-02	6.50E-02
	MW-12	0.3	2.40	0.07	0.09	2.20	0.06	0.08	2.29E-01	2.84E-01	2.10E-01	2.60E-01
	MW-14	0.3	0.86	0.02	0.03	0.62	0.02	0.02	8.19E-02	1.02E-01	5.90E-02	7.33E-02
	MW-15	0.3	0.58	0.02	0.02	-	-	-	5.52E-02	6.86E-02	-	-
	MW-16	0.3	3.70	0.11	0.13	3.70	0.11	0.13	3.52E-01	4.37E-01	3.52E-01	4.37E-01
	MW-17	0.3	0.72	0.02	0.03	0.49	0.01	0.02	6.86E-02	8.51E-02	4.67E-02	5.79E-02

Table 8D: Non-Carcinogenic Toxicity Values for Oral Ingestion

Contaminant	Well	Reference Dose	Maximum Concentration (ug/L)	LADD Maximum		Concentration 12/07-1/08 (ug/L)	LADD July 2007		HI Risk Maximum		Hi Risk July 2007	
		Oral RfD (ug/kg-day)		Adult (ug/kg-day)	Child (ug/kg-day)		Adult (ug/kg-day)	Child (ug/kg-day)	Adult	Child	Adult	Child
cis-1,2 Dichloroethylene	MW-1	10	13.00	0.37	0.46	13.00	0.37	0.46	3.71E-02	4.61E-02	3.71E-02	4.61E-02
	MW-1B	10	6.60	0.19	0.23	6.60	0.19	0.23	1.89E-02	2.34E-02	1.89E-02	2.34E-02
	MW-2	10	18.00	0.51	0.64	18.00	0.51	0.64	5.14E-02	6.38E-02	5.14E-02	6.38E-02
	MW-3	10	30.00	0.86	1.06	13.00	0.37	0.46	8.57E-02	1.06E-01	3.71E-02	4.61E-02
	MW-4	10	20.00	0.57	0.71	-	-	-	5.71E-02	7.09E-02	-	-
	MW-4R	10	36.00	1.03	1.28	18.00	0.51	0.64	1.03E-01	1.28E-01	5.14E-02	6.38E-02
	MW-5	10	19.00	0.54	0.67	10.00	0.29	0.35	5.43E-02	6.74E-02	2.86E-02	3.55E-02
	MW-6	10	13.00	0.37	0.46	2.30	0.07	0.08	3.71E-02	4.61E-02	6.57E-03	8.16E-03
	MW-7	10	10.00	0.29	0.35	9.20	0.26	0.33	2.86E-02	3.55E-02	2.63E-02	3.26E-02
	MW-8	10	9.10	0.26	0.32	-	-	-	2.60E-02	3.23E-02	-	-
	MW-9	10	20.00	0.57	0.71	20.00	0.57	0.71	5.71E-02	7.09E-02	5.71E-02	7.09E-02
	MW-10	10	3.80	0.11	0.13	3.80	0.11	0.13	1.09E-02	1.35E-02	1.09E-02	1.35E-02
	MW-11	10	51.00	1.46	1.81	42.00	1.20	1.49	1.46E-01	1.81E-01	1.20E-01	1.49E-01
	MW-12	10	14.00	0.40	0.50	14.00	0.40	0.50	4.00E-02	4.96E-02	4.00E-02	4.96E-02
	MW-12D	10	0.69	0.02	0.02	0.69	0.02	0.02	1.97E-03	2.45E-03	1.97E-03	2.45E-03
	MW-13	10	0.71	0.02	0.03	0.71	0.02	0.03	2.03E-03	2.52E-03	2.03E-03	2.52E-03
	MW-14	10	19.00	0.54	0.67	19.00	0.54	0.67	5.43E-02	6.74E-02	5.43E-02	6.74E-02
	MW-15	10	6.60	0.19	0.23	4.60	0.13	0.16	1.89E-02	2.34E-02	1.31E-02	1.63E-02
	MW-16	10	16.00	0.46	0.57	16.00	0.46	0.57	4.57E-02	5.67E-02	4.57E-02	5.67E-02
	MW-17	10	3.00	0.09	0.11	3.00	0.09	0.11	8.57E-03	1.06E-02	8.57E-03	1.06E-02
	MW-21	10	1.60	0.05	0.06	1.60	0.05	0.06	4.57E-03	5.67E-03	4.57E-03	5.67E-03
	MW-23	10	7.80	0.22	0.28	7.80	0.22	0.28	2.23E-02	2.77E-02	2.23E-02	2.77E-02
	MW-24	10	8.20	0.23	0.29	8.20	0.23	0.29	2.34E-02	2.91E-02	2.34E-02	2.91E-02
	MW-25	10	1.20	0.03	0.04	1.20	0.03	0.04	3.43E-03	4.26E-03	3.43E-03	4.26E-03
	MW-26	10	32.00	0.91	1.13	32.00	0.91	1.13	9.14E-02	1.13E-01	9.14E-02	1.13E-01
	MW-27	10	21.00	0.60	0.74	21.00	0.60	0.74	6.00E-02	7.45E-02	6.00E-02	7.45E-02

NOTE:
1. LADD is lifetime average daily dose from ingested groundwater at the specified concentration.
2. RfD values taken from the Region 9 Risk Based Concentration Table. These values represent a daily exposure level that is not harmful to human health, over a lifetime.
3. During July 2007 sampling "-" designates none of this constituent was detected.
4. Formula used for calculations:

LADD = (C*IR*ED)/(BW*AT)

C = constituent concentration (ug/L)

IR = Ingestion Rate (L/day)	An ingestion rate of 2L/day was used for adults 1L/day for children
ED = Exposure Duration (days)	An exposure duration of 30 years was used for adults, 8 for children
BW = Body weight (kg)	An average weight of 70 kg was used for adults, 28.2 kg for children
AT = Average Time (days)	Times of 30 years for adults and 8 for children were used

Table 8E: Non-Carcinogenic Toxicity Values for Inhalation Exposure

Contaminant	Well	Reference Dose	Maximum Concentration (ug/L)	LADD Maximum		Concentration 12/07& 1/08 (ug/L)	LADD July 2007		HI Risk Maximum		HI Risk July 2007	
		Inhalation RfD (ug/kg-day)		Adult (ug/kg-day)	Child (ug/kg-day)		Adult (ug/kg-day)	Child (ug/kg-day)	Adult	Child	Adult	Child
1,1 Dichloroethane	MW-1	140	22.00	3.14	4.68	2.50	0.36	0.53	2.24E-02	3.34E-02	2.55E-03	3.80E-03
	MW-1A	140	6.50	0.93	1.38	-	-	-	6.63E-03	9.88E-03	-	-
	MW-1B	140	2.80	0.40	0.60	2.80	0.40	0.60	2.86E-03	4.26E-03	2.86E-03	4.26E-03
	MW-2	140	33.00	4.71	7.02	1.50	0.21	0.32	3.37E-02	5.02E-02	1.53E-03	2.28E-03
	MW-3	140	22.00	3.14	4.68	1.10	0.16	0.23	2.24E-02	3.34E-02	1.12E-03	1.67E-03
	MW-4	140	16.00	2.29	3.40	-	-	-	1.63E-02	2.43E-02	-	-
	MW-4R	140	18.00	2.57	3.83	7.60	1.09	1.62	1.84E-02	2.74E-02	7.76E-03	1.16E-02
	MW-5	140	22.00	3.14	4.68	5.70	0.81	1.21	2.24E-02	3.34E-02	5.82E-03	8.66E-03
	MW-7	140	29.00	4.14	6.17	4.90	0.70	1.04	2.96E-02	4.41E-02	5.00E-03	7.45E-03
	MW-8	140	14.00	2.00	2.98	-	-	-	1.43E-02	2.13E-02	-	-
	MW-9	140	6.00	0.86	1.28	2.40	0.34	0.51	6.12E-03	9.12E-03	2.45E-03	3.65E-03
	MW-10	140	0.91	0.13	0.19	0.91	0.13	0.19	9.29E-04	1.38E-03	9.29E-04	1.38E-03
	MW-11	140	11.00	1.57	2.34	2.90	0.41	0.62	1.12E-02	1.67E-02	2.96E-03	4.41E-03
	MW-12	140	17.00	2.43	3.62	5.00	0.71	1.06	1.73E-02	2.58E-02	5.10E-03	7.60E-03
	MW-12D	140	0.89	0.13	0.19	0.89	0.13	0.19	9.08E-04	1.35E-03	9.08E-04	1.35E-03
	MW-13	140	0.56	0.08	0.12	0.56	0.08	0.12	5.71E-04	8.51E-04	5.71E-04	8.51E-04
	MW-14	140	11.00	1.57	2.34	2.20	0.31	0.47	1.12E-02	1.67E-02	2.24E-03	3.34E-03
	MW-15	140	53.00	7.57	11.28	3.70	0.53	0.79	5.41E-02	8.05E-02	3.78E-03	5.62E-03
	MW-16	140	21.00	3.00	4.47	21.00	3.00	4.47	2.14E-02	3.19E-02	2.14E-02	3.19E-02
	MW-17	140	17.00	2.43	3.62	3.30	0.47	0.70	1.73E-02	2.58E-02	3.37E-03	5.02E-03
	MW-20	140	0.94	0.13	0.20	0.94	0.13	0.20	9.59E-04	1.43E-03	9.59E-04	1.43E-03
	MW-21	140	2.40	0.34	0.51	2.40	0.34	0.51	2.45E-03	3.65E-03	2.45E-03	3.65E-03
	MW-23	140	1.20	0.17	0.26	1.20	0.17	0.26	1.22E-03	1.82E-03	1.22E-03	1.82E-03
	MW-24	140	1.10	0.16	0.23	1.10	0.16	0.23	1.12E-03	1.67E-03	1.12E-03	1.67E-03
	MW-25	140	3.40	0.49	0.72	3.40	0.49	0.72	3.47E-03	5.17E-03	3.47E-03	5.17E-03
	MW-26	140	1.70	0.24	0.36	1.70	0.24	0.36	1.73E-03	2.58E-03	1.73E-03	2.58E-03
	MW-27	140	0.99	0.14	0.21	0.99	0.14	0.21	1.01E-03	1.50E-03	1.01E-03	1.50E-03
1,2-Dichloropropane	MW-3	1.1	11.00	1.57	2.34	-	-	-	1.43E+00	2.13E+00	-	-
	MW-16	1.1	1.00	0.14	0.21	1.00	0.14	0.21	1.30E-01	1.93E-01	1.30E-01	1.93E-01
Xylenes	MW-1	29	5.10	0.73	1.09	-	-	-	2.51E-02	3.74E-02	-	-
	MW-1A	29	7.40	1.06	1.57	-	-	-	3.65E-02	5.43E-02	-	-
	MW-1B	29	8.80	1.26	1.87	8.80	1.26	1.87	4.33E-02	6.46E-02	4.33E-02	6.46E-02
	MW-3	29	34.00	4.86	7.23	15.00	2.14	3.19	1.67E-01	2.49E-01	7.39E-02	1.10E-01
	MW-6	29	5.20	0.74	1.11	-	-	-	2.56E-02	3.82E-02	-	-
	MW-8	29	5.00	0.71	1.06	-	-	-	2.46E-02	3.67E-02	-	-
	MW-11	29	5.10	0.73	1.09	-	-	-	2.51E-02	3.74E-02	-	-
	MW-12	29	5.20	0.74	1.11	-	-	-	2.56E-02	3.82E-02	-	-
	MW-14	29	5.10	0.73	1.09	-	-	-	2.51E-02	3.74E-02	-	-
	MW-16	29	2.20	0.31	0.47	2.20	0.31	0.47	1.08E-02	1.61E-02	1.08E-02	1.61E-02
	MW-27	29	0.97	0.14	0.21	0.97	0.14	0.21	4.78E-03	7.12E-03	4.78E-03	7.12E-03

Table 8E: Non-Carcinogenic Toxicity Values for Inhalation Exposure

Contaminant	Well	Reference Dose	Maximum Concentration (ug/L)	LADD Maximum		Concentration 12/07& 1/08 (ug/L)	LADD July 2007		HI Risk Maximum		HI Risk July 2007	
		Inhalation RfD (ug/kg-day)		Adult (ug/kg-day)	Child (ug/kg-day)		Adult (ug/kg-day)	Child (ug/kg-day)	Adult	Child	Adult	Child
Tetrachloroethene	MW-1	10	0.25	0.04	0.05	-	-	-	3.57E-03	5.32E-03	-	-
	MW-1B	10	0.42	0.06	0.09	0.42	0.06	0.09	6.00E-03	8.94E-03	6.00E-03	8.94E-03
	MW-3	10	1.00	0.14	0.21	0.45	0.06	0.10	1.43E-02	2.13E-02	6.43E-03	9.57E-03
	MW-5	10	1.00	0.14	0.21	-	-	-	1.43E-02	2.13E-02	-	-
	MW-7	10	1.20	0.17	0.26	-	-	-	1.71E-02	2.55E-02	-	-
	MW-11	10	1.10	0.16	0.23	-	-	-	1.57E-02	2.34E-02	-	-
	MW-12	10	2.00	0.29	0.43	1.00	0.14	0.21	2.86E-02	4.26E-02	1.43E-02	2.13E-02
	MW-16	10	2.50	0.36	0.53	2.50	0.36	0.53	3.57E-02	5.32E-02	3.57E-02	5.32E-02
	MW-17	10	0.47	0.07	0.10	-	-	-	6.71E-03	1.00E-02	-	-
	MW-25	10	0.49	0.07	0.10	0.49	0.07	0.10	7.00E-03	1.04E-02	7.00E-03	1.04E-02
Benzene	MW-1	8.6	7.20	1.03	1.53	5.60	0.80	1.19	1.20E-01	1.78E-01	9.30E-02	1.39E-01
	MW-1B	8.6	1.70	0.24	0.36	-	-	-	2.82E-02	4.21E-02	-	-
	MW-2	8.6	2.80	0.40	0.60	1.80	0.26	0.38	4.65E-02	6.93E-02	2.99E-02	4.45E-02
	MW-3	8.6	13.00	1.86	2.77	8.00	1.14	1.70	2.16E-01	3.22E-01	1.33E-01	1.98E-01
	MW-4	8.6	4.00	0.57	0.85	-	-	-	6.64E-02	9.90E-02	-	-
	MW-4R	8.6	5.60	0.80	1.19	-	-	-	9.30E-02	1.39E-01	-	-
	MW-5	8.6	6.10	0.87	1.30	3.20	0.46	0.68	1.01E-01	1.51E-01	5.32E-02	7.92E-02
	MW-6	8.6	1.10	0.16	0.23	1.10	0.16	0.23	1.83E-02	2.72E-02	1.83E-02	2.72E-02
	MW-7	8.6	6.70	0.96	1.43	4.70	0.67	1.00	1.11E-01	1.66E-01	7.81E-02	1.16E-01
	MW-8	8.6	0.12	0.02	0.03	-	-	-	1.99E-03	2.97E-03	-	-
	MW-10	8.6	2.10	0.30	0.45	-	-	-	3.49E-02	5.20E-02	-	-
	MW-11	8.6	7.70	1.10	1.64	4.20	0.60	0.89	1.28E-01	1.90E-01	6.98E-02	1.04E-01
	MW-12	8.6	8.20	1.17	1.74	7.10	1.01	1.51	1.36E-01	2.03E-01	1.18E-01	1.76E-01
	MW-12D	8.6	0.52	0.07	0.11	0.52	0.07	0.11	8.64E-03	1.29E-02	8.64E-03	1.29E-02
	MW-13	8.6	0.47	0.07	0.10	0.47	0.07	0.10	7.81E-03	1.16E-02	7.81E-03	1.16E-02
	MW-14	8.6	2.00	0.29	0.43	1.20	0.17	0.26	3.32E-02	4.95E-02	1.99E-02	2.97E-02
	MW-15	8.6	5.30	0.76	1.13	-	-	-	8.80E-02	1.31E-01	-	-
	MW-16	8.6	3.30	0.47	0.70	3.30	0.47	0.70	5.48E-02	8.16E-02	5.48E-02	8.16E-02
	MW-17	8.6	1.40	0.20	0.30	1.10	0.16	0.23	2.33E-02	3.46E-02	1.83E-02	2.72E-02
	MW-21	8.6	0.49	0.07	0.10	0.49	0.07	0.10	8.14E-03	1.21E-02	8.14E-03	1.21E-02
	MW-24	8.6	1.60	0.23	0.34	1.60	0.23	0.34	2.66E-02	3.96E-02	2.66E-02	3.96E-02
	MW-26	8.6	1.90	0.27	0.40	1.90	0.27	0.40	3.16E-02	4.70E-02	3.16E-02	4.70E-02
Methylene Chloride	MW-1B	860	2.80	0.40	0.60	2.80	0.40	0.60	4.65E-04	6.93E-04	4.65E-04	6.93E-04
	MW-3	860	24.00	3.43	5.11	-	-	-	3.99E-03	5.94E-03	-	-
	MW-7	860	29.00	4.14	6.17	-	-	-	4.82E-03	7.17E-03	-	-
	MW-11	860	0.70	0.10	0.15	0.70	0.10	0.15	1.16E-04	1.73E-04	1.16E-04	1.73E-04
	MW-12	860	13.00	1.86	2.77	1.80	0.26	0.38	2.16E-03	3.22E-03	2.99E-04	4.45E-04
	MW-15	860	16.00	2.29	3.40	-	-	-	2.66E-03	3.96E-03	-	-
	MW-16	860	4.10	0.59	0.87	4.10	0.59	0.87	6.81E-04	1.01E-03	6.81E-04	1.01E-03
	MW-17	860	9.70	1.39	2.06	0.54	0.08	0.11	1.61E-03	2.40E-03	8.97E-05	1.34E-04
	MW-21	860	0.70	0.10	0.15	0.70	0.10	0.15	1.16E-04	1.73E-04	1.16E-04	1.73E-04

Table 8E: Non-Carcinogenic Toxicity Values for Inhalation Exposure

Contaminant	Well	Reference Dose	Maximum Concentration (ug/L)	LADD Maximum		Concentration 12/07& 1/08 (ug/L)	LADD July 2007		HI Risk Maximum		HI Risk July 2007	
		Inhalation RfD (ug/kg-day)		Adult (ug/kg-day)	Child (ug/kg-day)		Adult (ug/kg-day)	Child (ug/kg-day)	Adult	Child	Adult	Child
p-dichlorobenzene	MW-1	230	3.80	0.54	0.81	3.80	0.54	0.81	2.36E-03	3.52E-03	2.36E-03	3.52E-03
	MW-1B	230	2.40	0.34	0.51	2.40	0.34	0.51	1.49E-03	2.22E-03	1.49E-03	2.22E-03
	MW-2	230	5.20	0.74	1.11	4.40	0.63	0.94	3.23E-03	4.81E-03	2.73E-03	4.07E-03
	MW-3	230	11.00	1.57	2.34	9.80	1.40	2.09	6.83E-03	1.02E-02	6.09E-03	9.07E-03
	MW-4	230	3.00	0.43	0.64	-	-	-	1.86E-03	2.78E-03	-	-
	MW-4R	230	3.60	0.51	0.77	3.60	0.51	0.77	2.24E-03	3.33E-03	2.24E-03	3.33E-03
	MW-5	230	1.20	0.17	0.26	-	-	-	7.45E-04	1.11E-03	-	-
	MW-6	230	0.88	0.13	0.19	0.88	0.13	0.19	5.47E-04	8.14E-04	5.47E-04	8.14E-04
	MW-7	230	3.00	0.43	0.64	2.10	0.30	0.45	1.86E-03	2.78E-03	1.30E-03	1.94E-03
	MW-8	230	0.15	0.02	0.03	-	-	-	9.32E-05	1.39E-04	-	-
	MW-9	230	0.42	0.06	0.09	0.42	0.06	0.09	2.61E-04	3.89E-04	2.61E-04	3.89E-04
	MW-11	230	11.60	1.66	2.47	5.90	0.84	1.26	7.20E-03	1.07E-02	3.66E-03	5.46E-03
	MW-12	230	10.90	1.56	2.32	7.40	1.06	1.57	6.77E-03	1.01E-02	4.60E-03	6.85E-03
	MW-13	230	0.15	0.02	0.03	-	-	-	9.32E-05	1.39E-04	-	-
	MW-14	230	7.50	1.07	1.60	4.60	0.66	0.98	4.66E-03	6.94E-03	2.86E-03	4.26E-03
	MW-15	230	0.48	0.07	0.10	-	-	-	2.98E-04	4.44E-04	-	-
	MW-16	230	1.80	0.26	0.38	1.80	0.26	0.38	1.12E-03	1.67E-03	1.12E-03	1.67E-03
	MW-17	230	0.50	0.07	0.11	0.50	0.07	0.11	3.11E-04	4.63E-04	3.11E-04	4.63E-04
	MW-23	230	1.10	0.16	0.23	1.10	0.16	0.23	6.83E-04	1.02E-03	6.83E-04	1.02E-03
	MW-24	230	2.70	0.39	0.57	2.70	0.39	0.57	1.68E-03	2.50E-03	1.68E-03	2.50E-03
	MW-26	230	3.10	0.44	0.66	3.10	0.44	0.66	1.93E-03	2.87E-03	1.93E-03	2.87E-03
Trichloroethene	MW-1	10	0.42	0.06	0.09	0.42	0.06	0.09	6.00E-03	8.94E-03	6.00E-03	8.94E-03
	MW-1B	10	0.23	0.03	0.05	-	-	-	3.29E-03	4.89E-03	-	-
	MW-2	10	6.00	0.86	1.28	0.47	0.07	0.10	8.57E-02	1.28E-01	6.71E-03	1.00E-02
	MW-3	10	5.00	0.71	1.06	2.00	0.29	0.43	7.14E-02	1.06E-01	2.86E-02	4.26E-02
	MW-4	10	3.00	0.43	0.64	-	-	-	4.29E-02	6.38E-02	-	-
	MW-4R	10	0.23	0.03	0.05	-	-	-	3.29E-03	4.89E-03	-	-
	MW-5	10	4.00	0.57	0.85	0.55	0.08	0.12	5.71E-02	8.51E-02	7.86E-03	1.17E-02
	MW-7	10	1.20	0.17	0.26	0.84	0.12	0.18	1.71E-02	2.55E-02	1.20E-02	1.79E-02
	MW-8	10	1.00	0.14	0.21	-	-	-	1.43E-02	2.13E-02	-	-
	MW-11	10	1.20	0.17	0.26	0.55	0.08	0.12	1.71E-02	2.55E-02	7.86E-03	1.17E-02
	MW-12	10	2.40	0.34	0.51	2.20	0.31	0.47	3.43E-02	5.11E-02	3.14E-02	4.68E-02
	MW-14	10	0.86	0.12	0.18	0.62	0.09	0.13	1.23E-02	1.83E-02	8.86E-03	1.32E-02
	MW-15	10	0.58	0.08	0.12	-	-	-	8.29E-03	1.23E-02	-	-
	MW-16	10	3.70	0.53	0.79	3.70	0.53	0.79	5.29E-02	7.87E-02	5.29E-02	7.87E-02
	MW-17	10	0.72	0.10	0.15	0.49	0.07	0.10	1.03E-02	1.53E-02	7.00E-03	1.04E-02

Table 8E: Non-Carcinogenic Toxicity Values for Inhalation Exposure

Contaminant	Well	Reference Dose	Maximum Concentration (ug/L)	LADD Maximum		Concentration 12/07& 1/08 (ug/L)	LADD July 2007		HI Risk Maximum		HI Risk July 2007	
		Inhalation RfD (ug/kg-day)		Adult (ug/kg-day)	Child (ug/kg-day)		Adult (ug/kg-day)	Child (ug/kg-day)	Adult	Child	Adult	Child
cis-1,2 Dichloroethylene	MW-1	10	13.00	1.86	2.77	13.00	1.86	2.77	1.86E-01	2.77E-01	1.86E-01	2.77E-01
	MW-1B	10	6.60	0.94	1.40	6.60	0.94	1.40	9.43E-02	1.40E-01	9.43E-02	1.40E-01
	MW-2	10	18.00	2.57	3.83	18.00	2.57	3.83	2.57E-01	3.83E-01	2.57E-01	3.83E-01
	MW-3	10	30.00	4.29	6.38	13.00	1.86	2.77	4.29E-01	6.38E-01	1.86E-01	2.77E-01
	MW-4	10	20.00	2.86	4.26	-	-	-	2.86E-01	4.26E-01	-	-
	MW-4R	10	36.00	5.14	7.66	18.00	2.57	3.83	5.14E-01	7.66E-01	2.57E-01	3.83E-01
	MW-5	10	19.00	2.71	4.04	10.00	1.43	2.13	2.71E-01	4.04E-01	1.43E-01	2.13E-01
	MW-6	10	13.00	1.86	2.77	2.30	0.33	0.49	1.86E-01	2.77E-01	3.29E-02	4.89E-02
	MW-7	10	10.00	1.43	2.13	9.20	1.31	1.96	1.43E-01	2.13E-01	1.31E-01	1.96E-01
	MW-8	10	9.10	1.30	1.94	-	-	-	1.30E-01	1.94E-01	-	-
	MW-9	10	20.00	2.86	4.26	20.00	2.86	4.26	2.86E-01	4.26E-01	2.86E-01	4.26E-01
	MW-10	10	3.80	0.54	0.81	3.80	0.54	0.81	5.43E-02	8.09E-02	5.43E-02	8.09E-02
	MW-11	10	51.00	7.29	10.85	42.00	6.00	8.94	7.29E-01	1.09E+00	6.00E-01	8.94E-01
	MW-12	10	14.00	2.00	2.98	14.00	2.00	2.98	2.00E-01	2.98E-01	2.00E-01	2.98E-01
	MW-12D	10	0.69	0.10	0.15	0.69	0.10	0.15	9.86E-03	1.47E-02	9.86E-03	1.47E-02
	MW-13	10	0.71	0.10	0.15	0.71	0.10	0.15	1.01E-02	1.51E-02	1.01E-02	1.51E-02
	MW-14	10	19.00	2.71	4.04	19.00	2.71	4.04	2.71E-01	4.04E-01	2.71E-01	4.04E-01
	MW-15	10	6.60	0.94	1.40	4.60	0.66	0.98	9.43E-02	1.40E-01	6.57E-02	9.79E-02
	MW-16	10	16.00	2.29	3.40	16.00	2.29	3.40	2.29E-01	3.40E-01	2.29E-01	3.40E-01
	MW-17	10	3.00	0.43	0.64	3.00	0.43	0.64	4.29E-02	6.38E-02	4.29E-02	6.38E-02
	MW-21	10	1.60	0.23	0.34	1.60	0.23	0.34	2.29E-02	3.40E-02	2.29E-02	3.40E-02
	MW-23	10	7.80	1.11	1.66	7.80	1.11	1.66	1.11E-01	1.66E-01	1.11E-01	1.66E-01
	MW-24	10	8.20	1.17	1.74	8.20	1.17	1.74	1.17E-01	1.74E-01	1.17E-01	1.74E-01
	MW-25	10	1.20	0.17	0.26	1.20	0.17	0.26	1.71E-02	2.55E-02	1.71E-02	2.55E-02
	MW-26	10	32.00	4.57	6.81	32.00	4.57	6.81	4.57E-01	6.81E-01	4.57E-01	6.81E-01
	MW-27	10	21.00	3.00	4.47	21.00	3.00	4.47	3.00E-01	4.47E-01	3.00E-01	4.47E-01

NOTE:
1. LADD is lifetime average daily dose inhaled at the specified concentration.
2. RfD values taken from the Region 9 Risk Based Concentration Table. These values represent a daily exposure level that is not harmful to human health, over a lifetime.
3. During July 2007 sampling "-" designates none of this constituent was detected.
4. HI is the Hazzard Index Risk = LADD/RfD
5. Formula used for calculations:

LADD = (C*IR*ED*K)/(BW*AT)

C = constituent concentration (ug/L)
K = Volatilization factor (L/m^3) — A Volatilization factor of 0.5 L/m^3 was used based on EPA published values
IR = Inhalation Rate (m^3/day) — An inhalation rate of 20 m^3/day was used for adults and 12m^3/day for children
ED = Exposure Duration (days) — An exposure duration of 30 years was used for adults, 8 for children
BW = Body weight (kg) — An average weight of 70 kg was used for adults, 28.2 kg for children
AT = Average Time (days) — Times of 30 years for adults and 8 for children were used

Table 8F: Non-Carcinogenic Toxicity Values from Dermal Exposure

Contaminant	Well	Reference Dose	Maximum Concentration (ug/L)	LADD Maximum		Concentration 12/07-1/08 (ug/L)	LADD July 2007		HI Risk Maximum		HI Risk July 2007	
		Oral RfD (ug/kg-day)		Adult (ug/kg-day)	Child (ug/kg-day)		Adult (ug/kg-day)	Child (ug/kg-day)	Adult	Child	Adult	Child
1,1 Dichloroethane	MW-1	100	22.00	1.40E-03	1.62E-03	2.50	1.59E-04	1.84E-04	1.40E-05	1.62E-05	1.59E-06	1.84E-06
	MW-1A	100	6.50	4.13E-04	4.79E-04	-	-	-	4.13E-06	4.79E-06	-	-
	MW-1B	100	2.80	1.78E-04	2.06E-04	2.80	1.78E-04	2.06E-04	1.78E-06	2.06E-06	1.78E-06	2.06E-06
	MW-2	100	33.00	2.09E-03	2.43E-03	1.50	9.52E-05	1.11E-04	2.09E-05	2.43E-05	9.52E-07	1.11E-06
	MW-3	100	22.00	1.40E-03	1.62E-03	1.10	6.98E-05	8.11E-05	1.40E-05	1.62E-05	6.98E-07	8.11E-07
	MW-4	100	16.00	1.02E-03	1.18E-03	-	-	-	1.02E-05	1.18E-05	-	-
	MW-4R	100	18.00	1.14E-03	1.33E-03	7.60	4.82E-04	5.60E-04	1.14E-05	1.33E-05	4.82E-06	5.60E-06
	MW-5	100	22.00	1.40E-03	1.62E-03	5.70	3.62E-04	4.20E-04	1.40E-05	1.62E-05	3.62E-06	4.20E-06
	MW-7	100	29.00	1.84E-03	2.14E-03	4.90	3.11E-04	3.61E-04	1.84E-05	2.14E-05	3.11E-06	3.61E-06
	MW-8	100	14.00	8.89E-04	1.03E-03	-	-	-	8.89E-06	1.03E-05	-	-
	MW-9	100	6.00	3.81E-04	4.42E-04	2.40	1.52E-04	1.77E-04	3.81E-06	4.42E-06	1.52E-06	1.77E-06
	MW-10	100	0.91	5.78E-05	6.71E-05	0.91	5.78E-05	6.71E-05	5.78E-07	6.71E-07	5.78E-07	6.71E-07
	MW-11	100	11.00	6.98E-04	8.11E-04	2.90	1.84E-04	2.14E-04	6.98E-06	8.11E-06	1.84E-06	2.14E-06
	MW-12	100	17.00	1.08E-03	1.25E-03	5.00	3.17E-04	3.69E-04	1.08E-05	1.25E-05	3.17E-06	3.69E-06
	MW-12D	100	0.89	5.65E-05	6.56E-05	0.89	5.65E-05	6.56E-05	5.65E-07	6.56E-07	5.65E-07	6.56E-07
	MW-13	100	0.56	3.55E-05	4.13E-05	0.56	3.55E-05	4.13E-05	3.55E-07	4.13E-07	3.55E-07	4.13E-07
	MW-14	100	11.00	6.98E-04	8.11E-04	2.20	1.40E-04	1.62E-04	6.98E-06	8.11E-06	1.40E-06	1.62E-06
	MW-15	100	53.00	3.36E-03	3.91E-03	3.70	2.35E-04	2.73E-04	3.36E-05	3.91E-05	2.35E-06	2.73E-06
	MW-16	100	21.00	1.33E-03	1.55E-03	21.00	1.33E-03	1.55E-03	1.33E-05	1.55E-05	1.33E-05	1.55E-05
	MW-17	100	17.00	1.08E-03	1.25E-03	3.30	2.09E-04	2.43E-04	1.08E-05	1.25E-05	2.09E-06	2.43E-06
	MW-20	100	0.94	5.97E-05	6.93E-05	0.94	5.97E-05	6.93E-05	5.97E-07	6.93E-07	5.97E-07	6.93E-07
	MW-21	100	2.40	1.52E-04	1.77E-04	2.40	1.52E-04	1.77E-04	1.52E-06	1.77E-06	1.52E-06	1.77E-06
	MW-23	100	1.20	7.62E-05	8.85E-05	1.20	7.62E-05	8.85E-05	7.62E-07	8.85E-07	7.62E-07	8.85E-07
	MW-24	100	1.10	6.98E-05	8.11E-05	1.10	6.98E-05	8.11E-05	6.98E-07	8.11E-07	6.98E-07	8.11E-07
	MW-25	100	3.40	2.16E-04	2.51E-04	3.40	2.16E-04	2.51E-04	2.16E-06	2.51E-06	2.16E-06	2.51E-06
	MW-26	100	1.70	1.08E-04	1.25E-04	1.70	1.08E-04	1.25E-04	1.08E-06	1.25E-06	1.08E-06	1.25E-06
	MW-27	100	0.99	6.28E-05	7.30E-05	0.99	6.28E-05	7.30E-05	6.28E-07	7.30E-07	6.28E-07	7.30E-07
1,2-Dichloropropane	MW-3	1.1	11.00	7.84E-04	9.11E-04	-	-	-	7.13E-04	8.28E-04	-	-
	MW-16	1.1	1.00	7.13E-05	8.28E-05	1.00	7.13E-05	8.28E-05	6.48E-05	7.53E-05	6.48E-05	7.53E-05
Xylenes	MW-1	200	5.10	2.91E-03	3.38E-03	-	-	-	1.45E-05	1.69E-05	-	-
	MW-1A	200	7.40	4.22E-03	4.90E-03	-	-	-	2.11E-05	2.45E-05	-	-
	MW-1B	200	8.80	5.02E-03	5.83E-03	8.80	5.02E-03	5.83E-03	2.51E-05	2.92E-05	2.51E-05	2.92E-05
	MW-3	200	34.00	1.94E-02	2.25E-02	15.00	8.56E-03	9.94E-03	9.70E-05	1.13E-04	4.28E-05	4.97E-05
	MW-6	200	5.20	2.97E-03	3.45E-03	-	-	-	1.48E-05	1.72E-05	-	-
	MW-8	200	5.00	2.85E-03	3.31E-03	-	-	-	1.43E-05	1.66E-05	-	-
	MW-11	200	5.10	2.91E-03	3.38E-03	-	-	-	1.45E-05	1.69E-05	-	-
	MW-12	200	5.20	2.97E-03	3.45E-03	-	-	-	1.48E-05	1.72E-05	-	-
	MW-14	200	5.10	2.91E-03	3.38E-03	-	-	-	1.45E-05	1.69E-05	-	-
	MW-16	200	2.20	1.26E-03	1.46E-03	2.20	1.26E-03	1.46E-03	6.28E-06	7.29E-06	6.28E-06	7.29E-06
	MW-27	200	0.97	5.53E-04	6.43E-04	0.97	5.53E-04	6.43E-04	2.77E-06	3.21E-06	2.77E-06	3.21E-06

Table 8F: Non-Carcinogenic Toxicity Values from Dermal Exposure

Contaminant	Well	Reference Dose	Maximum Concentration (ug/L)	LADD Maximum		Concentration 12/07-1/08 (ug/L)	LADD July 2007		HI Risk Maximum		HI Risk July 2007	
		Oral RfD (ug/kg-day)		Adult (ug/kg-day)	Child (ug/kg-day)		Adult (ug/kg-day)	Child (ug/kg-day)	Adult	Child	Adult	Child
Tetrachloroethene	MW-1	10	0.25	8.56E-05	9.94E-05	-	-	-	8.56E-06	9.94E-06	-	-
	MW-1B	10	0.42	1.44E-04	1.67E-04	0.42	1.44E-04	1.67E-04	1.44E-05	1.67E-05	1.44E-05	1.67E-05
	MW-3	10	1.00	3.42E-04	3.98E-04	0.45	1.54E-04	1.79E-04	3.42E-05	3.98E-05	1.54E-05	1.79E-05
	MW-5	10	1.00	3.42E-04	3.98E-04	-	-	-	3.42E-05	3.98E-05	-	-
	MW-7	10	1.20	4.11E-04	4.77E-04	-	-	-	4.11E-05	4.77E-05	-	-
	MW-11	10	1.10	3.77E-04	4.37E-04	-	-	-	3.77E-05	4.37E-05	-	-
	MW-12	10	2.00	6.85E-04	7.95E-04	1.00	3.42E-04	3.98E-04	6.85E-05	7.95E-05	3.42E-05	3.98E-05
	MW-16	10	2.50	8.56E-04	9.94E-04	2.50	8.56E-04	9.94E-04	8.56E-05	9.94E-05	8.56E-05	9.94E-05
	MW-17	10	0.47	1.61E-04	1.87E-04	-	-	-	1.61E-05	1.87E-05	-	-
	MW-25	10	0.49	1.68E-04	1.95E-04	0.49	1.68E-04	1.95E-04	1.68E-05	1.95E-05	1.68E-05	1.95E-05
Benzene	MW-1	4	7.20	1.08E-03	1.25E-03	5.60	8.39E-04	9.74E-04	2.70E-04	3.13E-04	2.10E-04	2.44E-04
	MW-1B	4	1.70	2.55E-04	2.96E-04	-	-	-	6.36E-05	7.39E-05	-	-
	MW-2	4	2.80	4.19E-04	4.87E-04	1.80	2.70E-04	3.13E-04	1.05E-04	1.22E-04	6.74E-05	7.83E-05
	MW-3	4	13.00	1.95E-03	2.26E-03	8.00	1.20E-03	1.39E-03	4.87E-04	5.65E-04	3.00E-04	3.48E-04
	MW-4	4	4.00	5.99E-04	6.96E-04	-	-	-	1.50E-04	1.74E-04	-	-
	MW-4R	4	5.60	8.39E-04	9.74E-04	-	-	-	2.10E-04	2.44E-04	-	-
	MW-5	4	6.10	9.14E-04	1.06E-03	3.20	4.79E-04	5.57E-04	2.28E-04	2.65E-04	1.20E-04	1.39E-04
	MW-6	4	1.10	1.65E-04	1.91E-04	1.10	1.65E-04	1.91E-04	4.12E-05	4.78E-05	4.12E-05	4.78E-05
	MW-7	4	6.70	1.00E-03	1.17E-03	4.70	7.04E-04	8.18E-04	2.51E-04	2.91E-04	1.76E-04	2.04E-04
	MW-8	4	0.12	1.80E-05	2.09E-05	-	-	-	4.49E-06	5.22E-06	-	-
	MW-10	4	2.10	3.14E-04	3.65E-04	-	-	-	7.86E-05	9.13E-05	-	-
	MW-11	4	7.70	1.15E-03	1.34E-03	4.20	6.29E-04	7.31E-04	2.88E-04	3.35E-04	1.57E-04	1.83E-04
	MW-12	4	8.20	1.23E-03	1.43E-03	7.10	1.06E-03	1.24E-03	3.07E-04	3.57E-04	2.66E-04	3.09E-04
	MW-12D	4	0.52	7.79E-05	9.05E-05	0.52	7.79E-05	9.05E-05	1.95E-05	2.26E-05	1.95E-05	2.26E-05
	MW-13	4	0.47	7.04E-05	8.18E-05	0.47	7.04E-05	8.18E-05	1.76E-05	2.04E-05	1.76E-05	2.04E-05
	MW-14	4	2.00	3.00E-04	3.48E-04	1.20	1.80E-04	2.09E-04	7.49E-05	8.70E-05	4.49E-05	5.22E-05
	MW-15	4	5.30	7.94E-04	9.22E-04	-	-	-	1.98E-04	2.31E-04	-	-
	MW-16	4	3.30	4.94E-04	5.74E-04	3.30	4.94E-04	5.74E-04	1.24E-04	1.44E-04	1.24E-04	1.44E-04
	MW-17	4	1.40	2.10E-04	2.44E-04	1.10	1.65E-04	1.91E-04	5.24E-05	6.09E-05	4.12E-05	4.78E-05
	MW-21	4	0.49	7.34E-05	8.52E-05	0.49	7.34E-05	8.52E-05	1.83E-05	2.13E-05	1.83E-05	2.13E-05
	MW-24	4	1.60	2.40E-04	2.78E-04	1.60	2.40E-04	2.78E-04	5.99E-05	6.96E-05	5.99E-05	6.96E-05
	MW-26	4	1.90	2.85E-04	3.31E-04	1.90	2.85E-04	3.31E-04	7.11E-05	8.26E-05	7.11E-05	8.26E-05
Methylene Chloride	MW-1B	60	2.80	8.99E-05	1.04E-04	2.80	8.99E-05	1.04E-04	1.50E-06	1.74E-06	1.50E-06	1.74E-06
	MW-3	60	24.00	7.70E-04	8.95E-04	-	-	-	1.28E-05	1.49E-05	-	-
	MW-7	60	29.00	9.31E-04	1.08E-03	-	-	-	1.55E-05	1.80E-05	-	-
	MW-11	60	0.70	2.25E-05	2.61E-05	0.70	2.25E-05	2.61E-05	3.74E-07	4.35E-07	3.74E-07	4.35E-07
	MW-12	60	13.00	4.17E-04	4.85E-04	1.80	5.78E-05	6.71E-05	6.95E-06	8.08E-06	9.63E-07	1.12E-06
	MW-15	60	16.00	5.13E-04	5.96E-04	-	-	-	8.56E-06	9.94E-06	-	-
	MW-16	60	4.10	1.32E-04	1.53E-04	4.10	1.32E-04	1.53E-04	2.19E-06	2.55E-06	2.19E-06	2.55E-06
	MW-17	60	9.70	3.11E-04	3.62E-04	0.54	1.73E-05	2.01E-05	5.19E-06	6.03E-06	2.89E-07	3.36E-07
	MW-21	60	0.70	2.25E-05	2.61E-05	0.70	2.25E-05	2.61E-05	3.74E-07	4.35E-07	3.74E-07	4.35E-07

Table 8F: Non-Carcinogenic Toxicity Values from Dermal Exposure

Contaminant	Well	Reference Dose	Maximum Concentration (ug/L)	LADD Maximum		Concentration 12/07-1/08 (ug/L)	LADD July 2007		HI Risk Maximum		HI Risk July 2007	
		Oral RfD (ug/kg-day)		Adult (ug/kg-day)	Child (ug/kg-day)		Adult (ug/kg-day)	Child (ug/kg-day)	Adult	Child	Adult	Child
p-dichlorobenzene	MW-1	30	3.80	1.68E-03	1.95E-03	3.80	1.68E-03	1.95E-03	5.60E-05	6.51E-05	5.60E-05	6.51E-05
	MW-1B	30	2.40	1.06E-03	1.23E-03	2.40	1.06E-03	1.23E-03	3.54E-05	4.11E-05	3.54E-05	4.11E-05
	MW-2	30	5.20	2.30E-03	2.67E-03	4.40	1.95E-03	2.26E-03	7.66E-05	8.90E-05	6.48E-05	7.53E-05
	MW-3	30	11.00	4.86E-03	5.65E-03	9.80	4.33E-03	5.03E-03	1.62E-04	1.88E-04	1.44E-04	1.68E-04
	MW-4	30	3.00	1.33E-03	1.54E-03	-	-	-	4.42E-05	5.14E-05	-	-
	MW-4R	30	3.60	1.59E-03	1.85E-03	3.60	1.59E-03	1.85E-03	5.31E-05	6.16E-05	5.31E-05	6.16E-05
	MW-5	30	1.20	5.31E-04	6.16E-04	-	-	-	1.77E-05	2.05E-05	-	-
	MW-6	30	0.88	3.89E-04	4.52E-04	0.88	3.89E-04	4.52E-04	1.30E-05	1.51E-05	1.30E-05	1.51E-05
	MW-7	30	3.00	1.33E-03	1.54E-03	2.10	9.29E-04	1.08E-03	4.42E-05	5.14E-05	3.10E-05	3.60E-05
	MW-8	30	0.15	6.63E-05	7.70E-05	-	-	-	2.21E-06	2.57E-06	-	-
	MW-9	30	0.42	1.86E-04	2.16E-04	0.42	1.86E-04	2.16E-04	6.19E-06	7.19E-06	6.19E-06	7.19E-06
	MW-11	30	11.60	5.13E-03	5.96E-03	5.90	2.61E-03	3.03E-03	1.71E-04	1.99E-04	8.70E-05	1.01E-04
	MW-12	30	10.90	4.82E-03	5.60E-03	7.40	3.27E-03	3.80E-03	1.61E-04	1.87E-04	1.09E-04	1.27E-04
	MW-13	30	0.15	6.63E-05	7.70E-05	-	-	-	2.21E-06	2.57E-06	-	-
	MW-14	30	7.50	3.32E-03	3.85E-03	4.60	2.03E-03	2.36E-03	1.11E-04	1.28E-04	6.78E-05	7.88E-05
	MW-15	30	0.48	2.12E-04	2.47E-04	-	-	-	7.07E-06	8.22E-06	-	-
	MW-16	30	1.80	7.96E-04	9.25E-04	1.80	7.96E-04	9.25E-04	2.65E-05	3.08E-05	2.65E-05	3.08E-05
	MW-17	30	0.50	2.21E-04	2.57E-04	0.50	2.21E-04	2.57E-04	7.37E-06	8.56E-06	7.37E-06	8.56E-06
	MW-23	30	1.10	4.86E-04	5.65E-04	1.10	4.86E-04	5.65E-04	1.62E-05	1.88E-05	1.62E-05	1.88E-05
	MW-24	30	2.70	1.19E-03	1.39E-03	2.70	1.19E-03	1.39E-03	3.98E-05	4.62E-05	3.98E-05	4.62E-05
	MW-26	30	3.10	1.37E-03	1.59E-03	3.10	1.37E-03	1.59E-03	4.57E-05	5.31E-05	4.57E-05	5.31E-05
Trichloroethene	MW-1	0.3	0.42	4.79E-05	5.57E-05	0.42	4.79E-05	5.57E-05	1.60E-04	1.86E-04	1.60E-04	1.86E-04
	MW-1B	0.3	0.23	2.62E-05	3.05E-05	-	-	-	8.75E-05	1.02E-04	-	-
	MW-2	0.3	6.00	6.85E-04	7.95E-04	0.47	5.36E-05	6.23E-05	2.28E-03	2.65E-03	1.79E-04	2.08E-04
	MW-3	0.3	5.00	5.71E-04	6.63E-04	2.00	2.28E-04	2.65E-04	1.90E-03	2.21E-03	7.61E-04	8.84E-04
	MW-4	0.3	3.00	3.42E-04	3.98E-04	-	-	-	1.14E-03	1.33E-03	-	-
	MW-4R	0.3	0.23	2.62E-05	3.05E-05	-	-	-	8.75E-05	1.02E-04	-	-
	MW-5	0.3	4.00	4.56E-04	5.30E-04	0.55	6.28E-05	7.29E-05	1.52E-03	1.77E-03	2.09E-04	2.43E-04
	MW-7	0.3	1.20	1.37E-04	1.59E-04	0.84	9.58E-05	1.11E-04	4.56E-04	5.30E-04	3.19E-04	3.71E-04
	MW-8	0.3	1.00	1.14E-04	1.33E-04	-	-	-	3.80E-04	4.42E-04	-	-
	MW-11	0.3	1.20	1.37E-04	1.59E-04	0.55	6.28E-05	7.29E-05	4.56E-04	5.30E-04	2.09E-04	2.43E-04
	MW-12	0.3	2.40	2.74E-04	3.18E-04	2.20	2.51E-04	2.92E-04	9.13E-04	1.06E-03	8.37E-04	9.72E-04
	MW-14	0.3	0.86	9.81E-05	1.14E-04	0.62	7.07E-05	8.22E-05	3.27E-04	3.80E-04	2.36E-04	2.74E-04
	MW-15	0.3	0.58	6.62E-05	7.69E-05	-	-	-	2.21E-04	2.56E-04	-	-
	MW-16	0.3	3.70	4.22E-04	4.90E-04	3.70	4.22E-04	4.90E-04	1.41E-03	1.63E-03	1.41E-03	1.63E-03
	MW-17	0.3	0.72	8.22E-05	9.54E-05	0.49	5.59E-05	6.50E-05	2.74E-04	3.18E-04	1.86E-04	2.17E-04

Table 8F: Non-Carcinogenic Toxicity Values from Dermal Exposure

Contaminant	Well	Reference Dose	Maximum Concentration (ug/L)	LADD Maximum		Concentration 12/07-1/08 (ug/L)	LADD July 2007		HI Risk Maximum		HI Risk July 2007	
		Oral RfD (ug/kg-day)		Adult (ug/kg-day)	Child (ug/kg-day)		Adult (ug/kg-day)	Child (ug/kg-day)	Adult	Child	Adult	Child
cis-1,2 Dichloroethylene	MW-1	10	13.00	9.27E-04	1.08E-03	13.00	9.27E-04	1.08E-03	9.27E-05	1.08E-04	9.27E-05	1.08E-04
	MW-1B	10	6.60	4.71E-04	5.47E-04	6.60	4.71E-04	5.47E-04	4.71E-05	5.47E-05	4.71E-05	5.47E-05
	MW-2	10	18.00	1.28E-03	1.49E-03	18.00	1.28E-03	1.49E-03	1.28E-04	1.49E-04	1.28E-04	1.49E-04
	MW-3	10	30.00	2.14E-03	2.49E-03	13.00	9.27E-04	1.08E-03	2.14E-04	2.49E-04	9.27E-05	1.08E-04
	MW-4	10	20.00	1.43E-03	1.66E-03	-	-	-	1.43E-04	1.66E-04	-	-
	MW-4R	10	36.00	2.57E-03	2.98E-03	18.00	1.28E-03	1.49E-03	2.57E-04	2.98E-04	1.28E-04	1.49E-04
	MW-5	10	19.00	1.35E-03	1.57E-03	10.00	7.13E-04	8.28E-04	1.35E-04	1.57E-04	7.13E-05	8.28E-05
	MW-6	10	13.00	9.27E-04	1.08E-03	2.30	1.64E-04	1.91E-04	9.27E-05	1.08E-04	1.64E-05	1.91E-05
	MW-7	10	10.00	7.13E-04	8.28E-04	9.20	6.56E-04	7.62E-04	7.13E-05	8.28E-05	6.56E-05	7.62E-05
	MW-8	10	9.10	6.49E-04	7.54E-04	-	-	-	6.49E-05	7.54E-05	-	-
	MW-9	10	20.00	1.43E-03	1.66E-03	20.00	1.43E-03	1.66E-03	1.43E-04	1.66E-04	1.43E-04	1.66E-04
	MW-10	10	3.80	2.71E-04	3.15E-04	3.80	2.71E-04	3.15E-04	2.71E-05	3.15E-05	2.71E-05	3.15E-05
	MW-11	10	51.00	3.64E-03	4.23E-03	42.00	3.00E-03	3.48E-03	3.64E-04	4.23E-04	3.00E-04	3.48E-04
	MW-12	10	14.00	9.98E-04	1.16E-03	14.00	9.98E-04	1.16E-03	9.98E-05	1.16E-04	9.98E-05	1.16E-04
	MW-12D	10	0.69	4.92E-05	5.72E-05	0.69	4.92E-05	5.72E-05	4.92E-06	5.72E-06	4.92E-06	5.72E-06
	MW-13	10	0.71	5.06E-05	5.88E-05	0.71	5.06E-05	5.88E-05	5.06E-06	5.88E-06	5.06E-06	5.88E-06
	MW-14	10	19.00	1.35E-03	1.57E-03	19.00	1.35E-03	1.57E-03	1.35E-04	1.57E-04	1.35E-04	1.57E-04
	MW-15	10	6.60	4.71E-04	5.47E-04	4.60	3.28E-04	3.81E-04	4.71E-05	5.47E-05	3.28E-05	3.81E-05
	MW-16	10	16.00	1.14E-03	1.33E-03	16.00	1.14E-03	1.33E-03	1.14E-04	1.33E-04	1.14E-04	1.33E-04
	MW-17	10	3.00	2.14E-04	2.49E-04	3.00	2.14E-04	2.49E-04	2.14E-05	2.49E-05	2.14E-05	2.49E-05
	MW-21	10	1.60	1.14E-04	1.33E-04	1.60	1.14E-04	1.33E-04	1.14E-05	1.33E-05	1.14E-05	1.33E-05
	MW-23	10	7.80	5.56E-04	6.46E-04	7.80	5.56E-04	6.46E-04	5.56E-05	6.46E-05	5.56E-05	6.46E-05
	MW-24	10	8.20	5.85E-04	6.79E-04	8.20	5.85E-04	6.79E-04	5.85E-05	6.79E-05	5.85E-05	6.79E-05
	MW-25	10	1.20	8.56E-05	9.94E-05	1.20	8.56E-05	9.94E-05	8.56E-06	9.94E-06	8.56E-06	9.94E-06
	MW-26	10	32.00	2.28E-03	2.65E-03	32.00	2.28E-03	2.65E-03	2.28E-04	2.65E-04	2.28E-04	2.65E-04
	MW-27	10	21.00	1.50E-03	1.74E-03	21.00	1.50E-03	1.74E-03	1.50E-04	1.74E-04	1.50E-04	1.74E-04

NOTE:
1. LADD is lifetime average daily dose from dermal contact with contaminated groundwater at the specified concentration.
2. RfD values taken from the Region 9 Risk Based Concentration Table. These values represent a daily exposure level that is not harmful to human health, over a lifetime.
3. During July 2007 sampling "-" designates none of this constituent was detected.
4. Dermal Values used the same RfD values as those used for Oral.
5. HI is the Hazard Index Risk = LADD/RfD
6. Formula used for calculations:

LADD = (C*K*EV*ED*EF*SA)/(BW*AT)

C = constituent concentration (ug/L)	
K = permeability coefficient (cm/day)	contaminant dependent
EV = event frequency	15 min/day
ED = Exposure Duration (years)	30 years for an adult, 8 years for a child
EF = Exposure Frequency (days/year)	365 days per year
SA = skin surface area (cm^2)	20,000cm^2 for adults and 9360 cm^2 for children
BW = Body weight (kg)	70 kg was used for adults, 28.2 kg for children
AT = Average Time (days)	30 years for adults and 8 for children

Table 9: Timeline / Schedule of Corrective Action

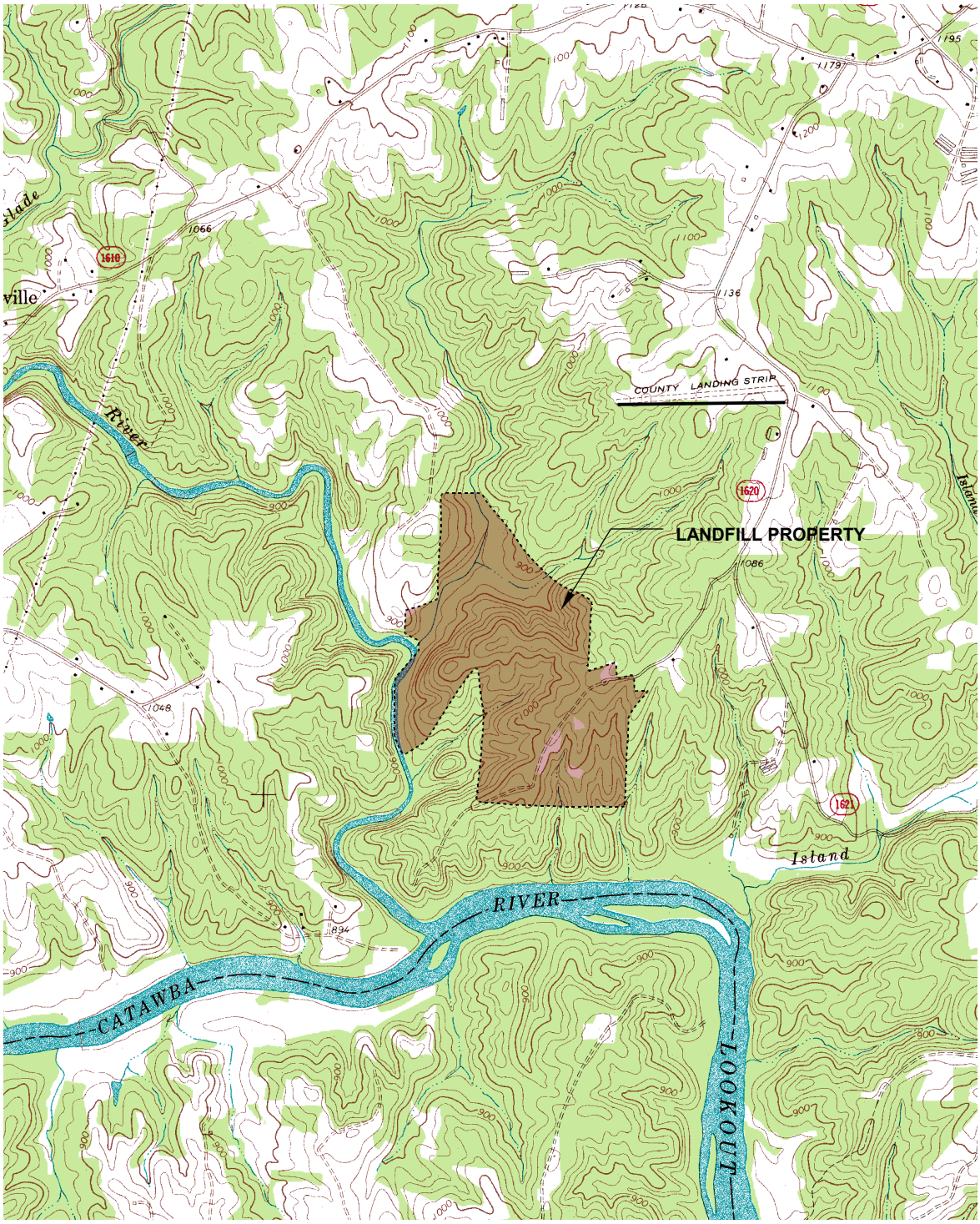
Date after CAP Approval	Description of Event
March - April 2009	Preparation and submittal of off-site well installation permits (MW-32, MW-33); preparation and submittal of HRC injection permits. Scheduling of well installation, HRC injection events, tree thinning for phytoremediation.
May 2009	Monitoring well installation, tree thinning for phytoremediation & hybrid willow planting.
June 2009	Semi-Annual Assessment Sampling & Monitoring w/ implementation of full suite of MNA performance parameters.
July 2009	HRC Injection Event Report (~30 days after injection)
December 2009	Semi-Annual Assessment Sampling & Monitoring.
March 2010	HRC injection events.
April-May 2010	Submittal of HRC injection report to Underground Injection Control Section.
June 2010	Semi-Annual Assessment Sampling & Monitoring. Daily water level logging of MW-24 and MW-26 using dedicated transducer probes.
December 2010	Semi-Annual Assessment Sampling & Monitoring.
February 2011	Initial summary report.
June 2011	Semi-Annual Assessment Sampling & Monitoring. Evaluation of effectiveness for MNA with HRC Injection.
July 2011	Cease HRC injection if Evaluation of Effectiveness indicates and if SWS agrees.
December 2011	Semi-Annual Assessment Sampling & Monitoring.
February 2012 to February 2015	Semi-Annual Assessment Sampling & Monitoring; reduction of MNA analytical requirements as determined through Evaluation of Effectiveness Report and SWS approval.
March 2015	Phytoremediation Evaluation of Effectiveness Report
April 2015	Cease phytoremediation activities if Evaluation of Effectiveness indicates and if SWS agrees.

PLATES

Topographic Map with Landfill Location

PLATE 1

Alexander County Landfill



QUADRANGLE LEGEND

ROAD CLASSIFICATION

Primary highway, hard surface

Light-duty road, hard or improved surface

Secondary highway, hard surface

Unimproved road

Interstate Route

U. S. Route

State Route

NOTE: Topographical map assembled from corresponding USGS 7.5-min. quadrangles of the subject region.

Date Completed	08/04/2008
Created By	M. German
Project Name	Corrective Action Plan
Site Name	Alexander County Landfill
Project Number	G07060.0

Municipal Engineering Services Company, PA

0 1/2 1 MILE

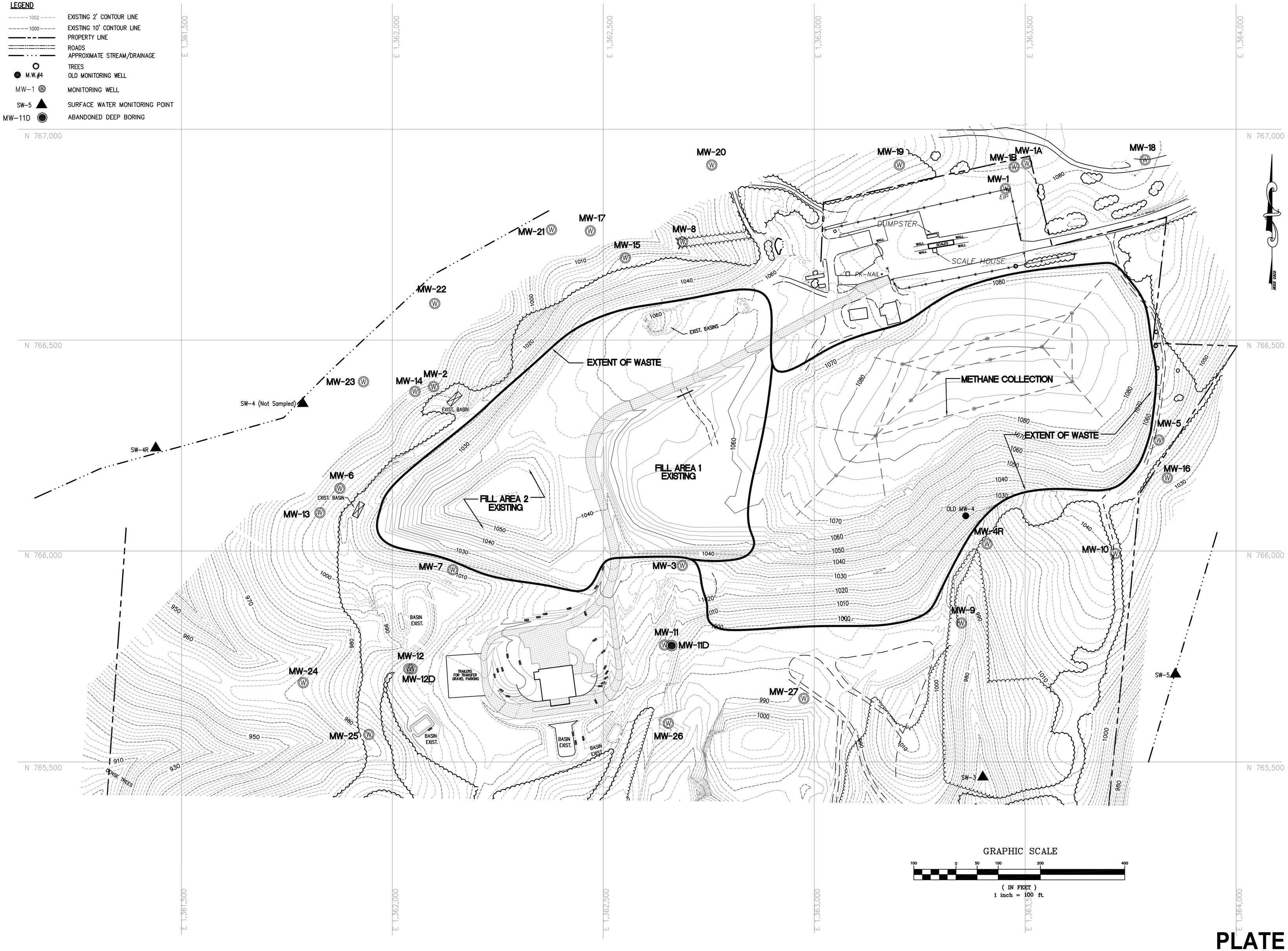


PLATE 2

Municipal Engineering Services Company, P.A.
P.O. BOX 97 GARNER, N.C. 27529 (919) 772-5393
P.O. BOX 349 BOONE, N.C. 28607 (828) 262-1767

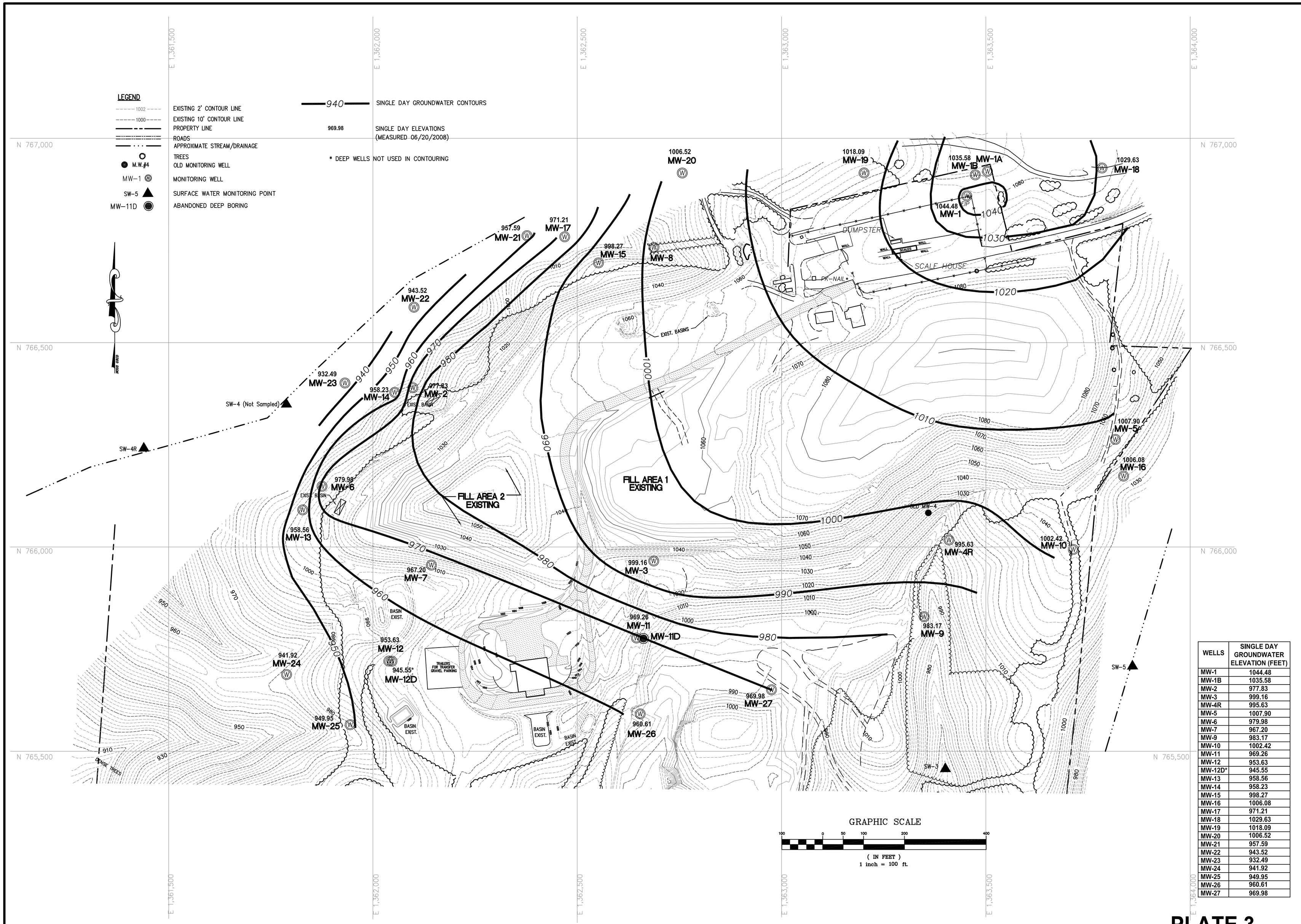
CONSTRUCTION AND DEMOLITION LANDFILL FACILITY
ALEXANDER COUNTY NORTH CAROLINA

DATE	BY	REV.	DESCRIPTION

SITE MAP WITH SAMPLING LOCATIONS

SCALE:	1" = 100'
DATE:	01/23/09
DRWN. BY:	K. BUSSIE
CHKD. BY:	S. PATRICK
PROJECT NUMBER	G07060.0
DRAWING NO. PLATE 2	SHEET NO. 1 OF 1

H:\C&D CAP\Alexander\AlexanderCoCAP - REVISED\CADPlates\Plate 2- Site Map with well Locations.dwg, Model, 1/26/2009 8:31:38 AM, spatrick, SKP



WELLS	SINGLE DAY GROUNDWATER ELEVATION (FEET)
MW-1	1044.48
MW-1B	1035.58
MW-2	977.83
MW-3	999.16
MW-4R	995.63
MW-5	1007.90
MW-6	979.98
MW-7	967.20
MW-9	983.17
MW-10	1002.42
MW-11	969.26
MW-12	953.63
MW-12D*	945.55
MW-13	958.56
MW-14	958.23
MW-15	998.27
MW-16	1006.08
MW-17	971.21
MW-18	1029.63
MW-19	1018.09
MW-20	1006.52
MW-21	957.59
MW-22	943.52
MW-23	932.49
MW-24	941.92
MW-25	949.95
MW-26	960.61
MW-27	969.98

PLATE 3

Municipal Services Engineering Company, P.A.
P.O. BOX 349 BOONE, N.C. 28607 (828) 262-1767
P.O. BOX 97 GARNER, N.C. 27529 (919) 772-5393

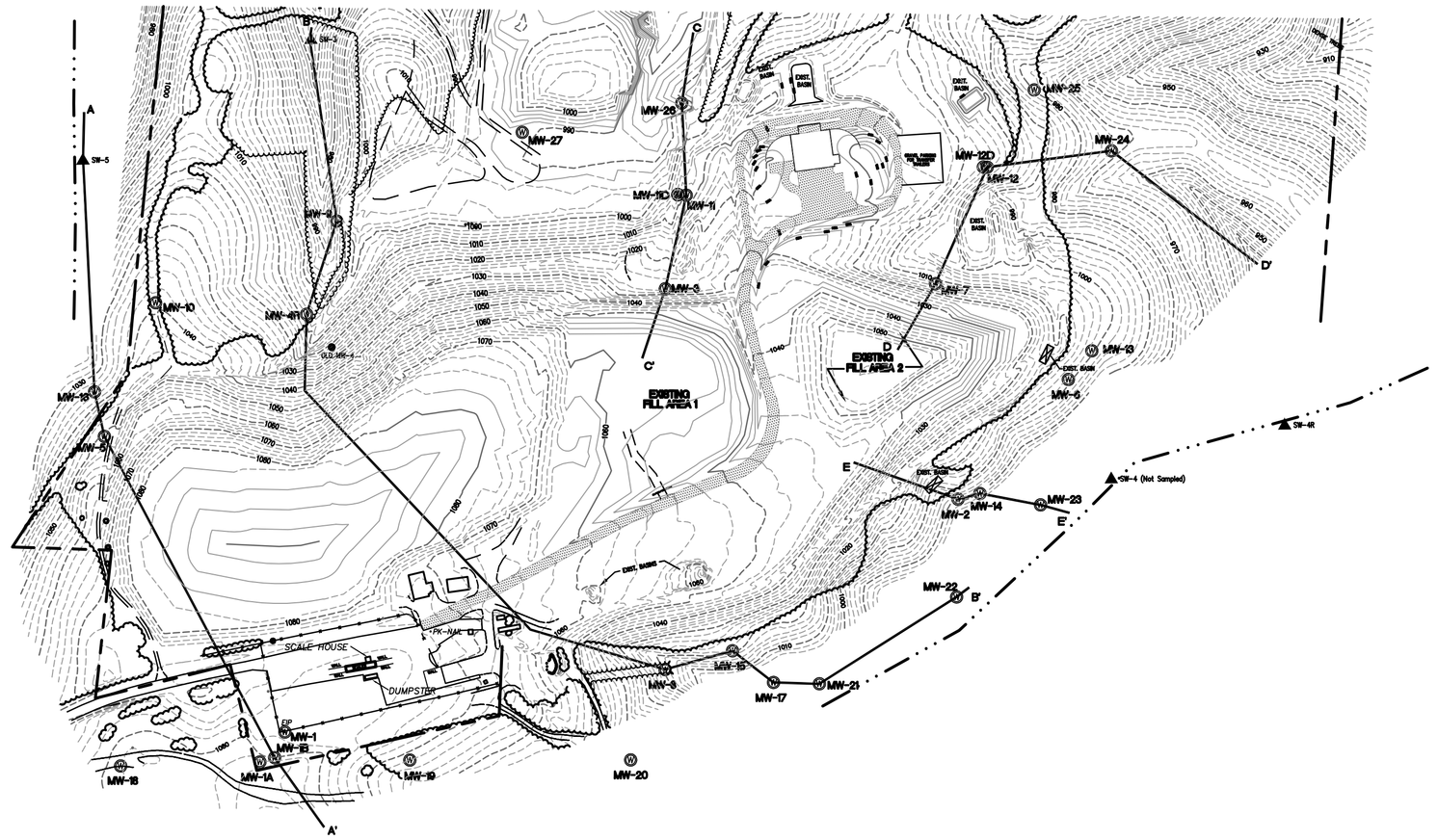
CONSTRUCTION AND DEMOLITION LANDFILL FACILITY
ALEXANDER COUNTY NORTH CAROLINA

DATE	BY	REV.	DESCRIPTION

SINGLE DAY POTENTIOMETRIC MAP

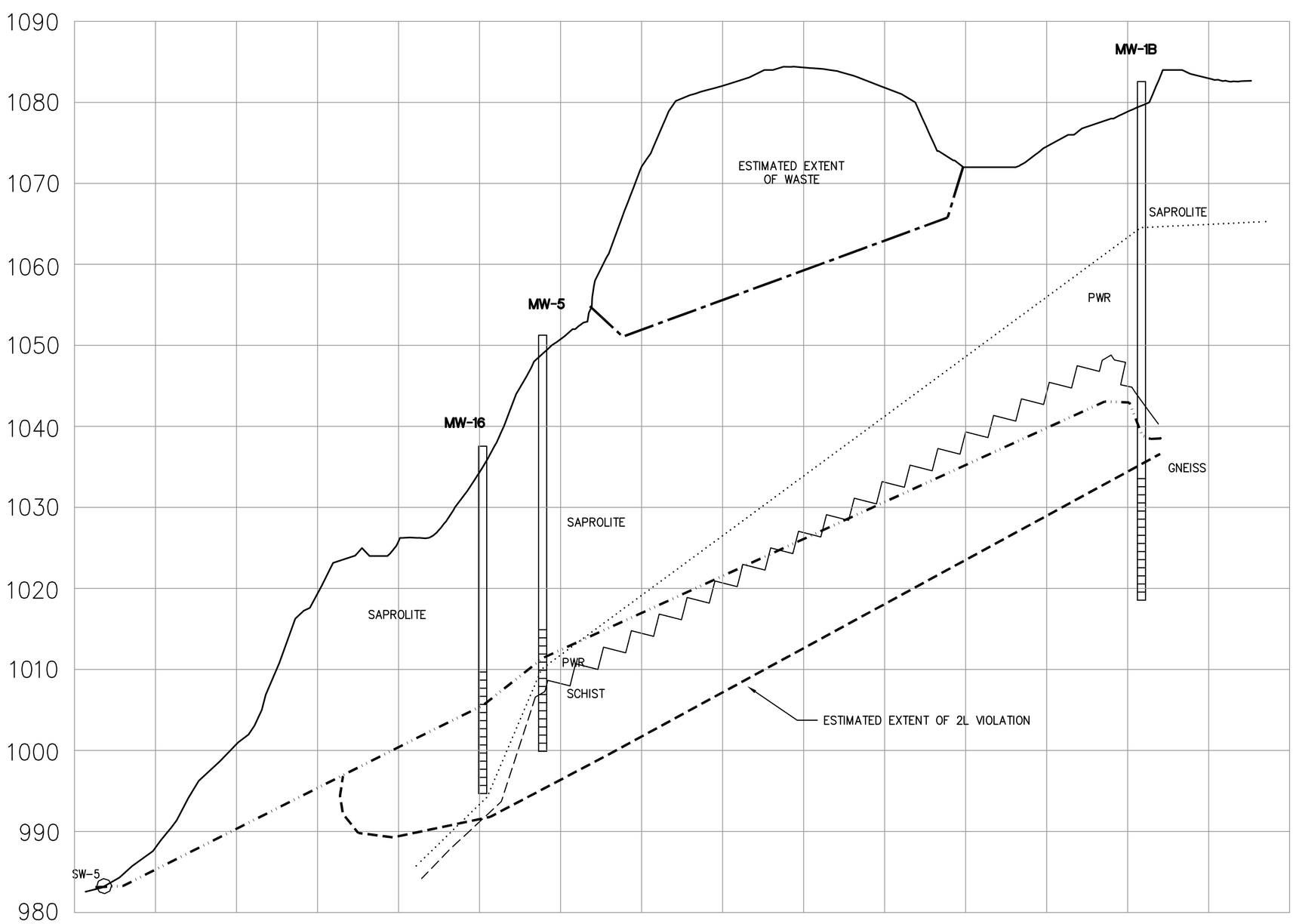
SCALE: 1" = 100'
DATE: 09/15/08
DRWN. BY: M. GERMAN
CHKD. BY: S. PATRICK
PROJECT NUMBER G07060.0
DRAWING NO. PLATE 3
SHEET NO. 1 OF 1

H:\C&D CAP\Alexander\AlexanderCoCAP - REVISED\CADPlates\Plate 5- single daydwg, Model, 1/26/2009 8:39:12 AM, spatrick, SKP



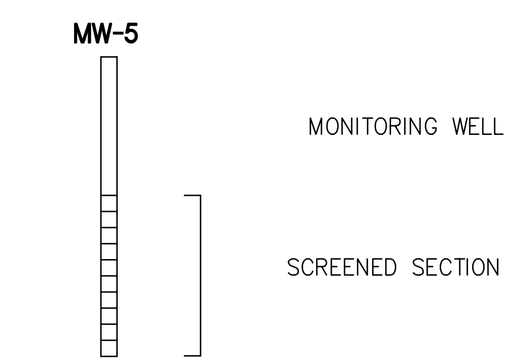
LEGEND

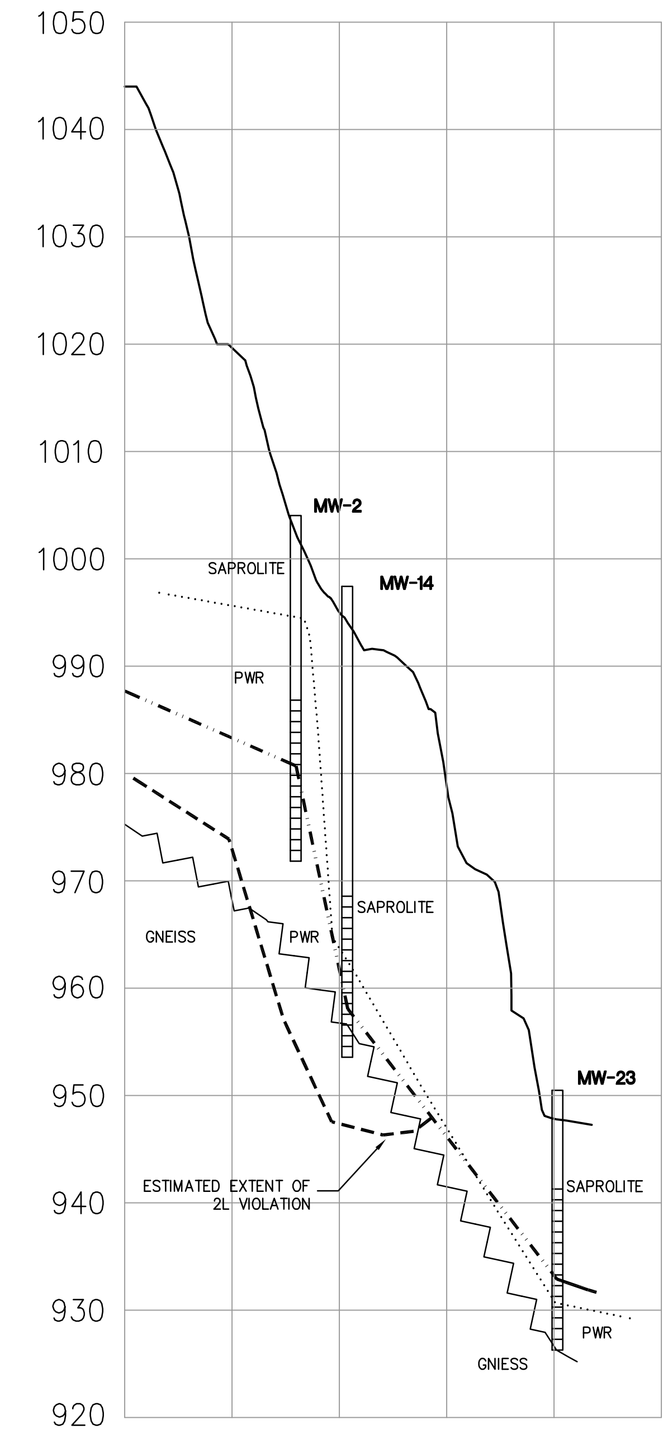
1002	EXISTING 2' CONTOUR LINE
1000	EXISTING 10' CONTOUR LINE
	PROPERTY LINE
	ROADS
	APPROXIMATE STREAM/DRAINAGE
	TREES
M.W.#4	OLD MONITORING WELL
MW-1	MONITORING WELL
SW-5	SURFACE WATER MONITORING POINT
MW-11D	ABANDONED DEEP BORING



SECTION A-A'

APPROX. SCALE HORIZ. 1" = 100'
VERT. 1" = 10'





SECTION E-E'

APPROX. SCALE HORIZ. 1" = 100'
VERT. 1" = 10'

	GROUNDSURFACE
	AVERAGE GROUNDWATER
	TOP OF COMPETENT ROCK
	ESTIMATED STRATIGRAPHIC CONTACT
	ESTIMATED BASE OF MSW
	ESTIMATED EXTENT OF 2L IMPACT

NOTE:
- NUMBERS SHOWN IN THIS PLATE ARE IN UNITS OF FEET UNLESS INDICATED OTHERWISE.
- SOIL PROFILES SHOWN HEREIN ARE INTERPOLATED FROM AVAILABLE BORING RECORDS.
- SOIL PROFILE BOUNDARIES DO NOT NECESSARILY INDICATE ABRUPT CHANGES IN SOIL TEXTURES.

PLATE 4A

Municipal Services Engineering Company, P.A.
P.O. BOX 97 GARNER, N.C. 27529 (919) 772-5393
P.O. BOX 349 BOONE, N.C. 28607 (828) 262-1767

CONSTRUCTION AND DEMOLITION LANDFILL FACILITY
ALEXANDER COUNTY NORTH CAROLINA

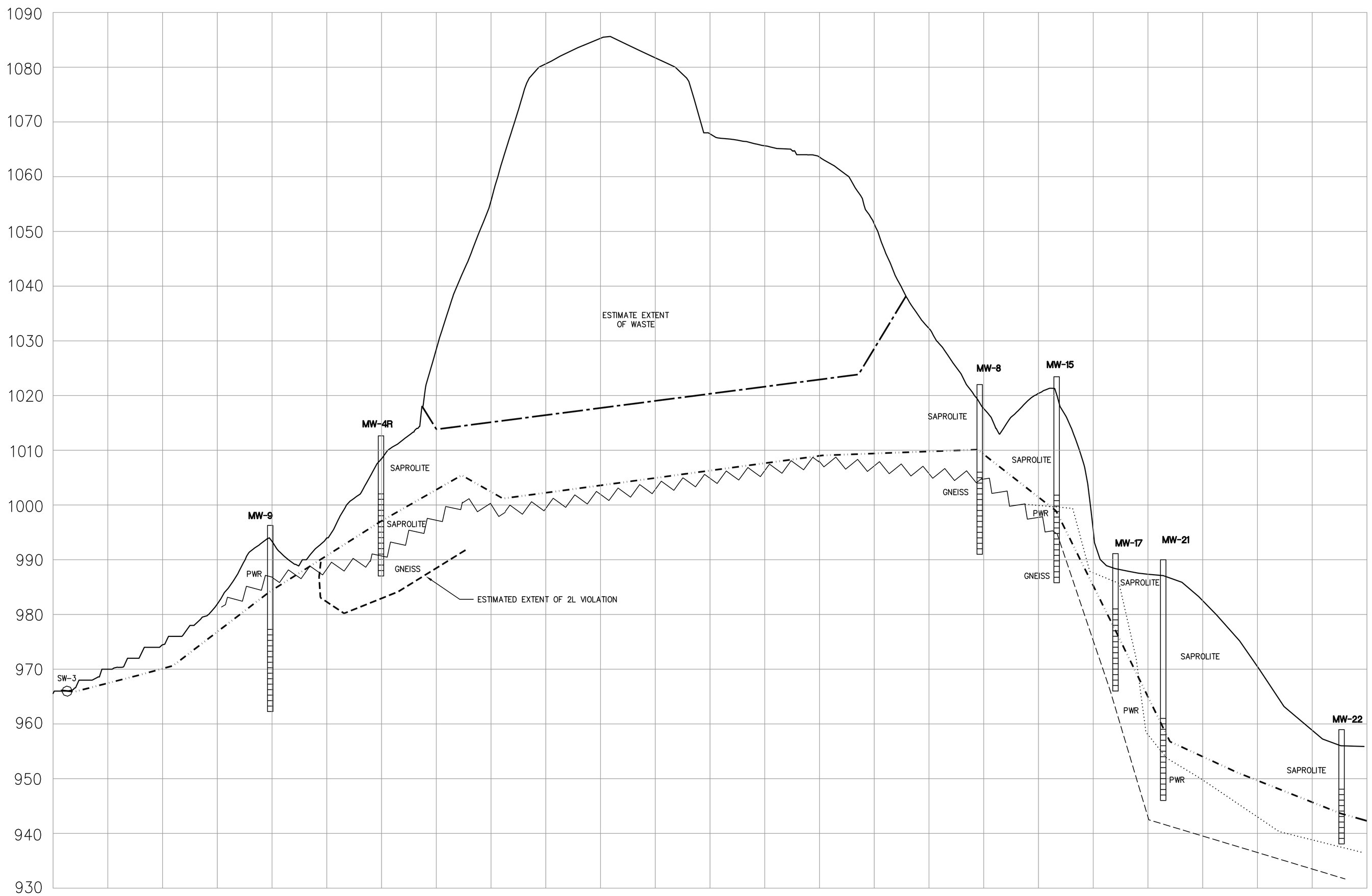
DATE	BY	REV.	DESCRIPTION

CROSS SECTIONS A-A' & E-E'

SCALE:	1" = 100'
DATE:	9/15/2008
DRWN. BY:	M. GERMAN
CHKD. BY:	S. PATRICK
PROJECT NUMBER	G07060.0
DRAWING NO.	PLATE 4A
SHEET NO.	1 OF 1

NOTE:
- NUMBERS SHOWN IN THIS PLATE ARE IN UNITS OF FEET UNLESS INDICATED OTHERWISE.
- SOIL PROFILES SHOWN HEREIN ARE INTERPOLATED FROM AVAILABLE BORING RECORDS.
- SOIL PROFILE BOUNDARIES DO NOT NECESSARILY INDICATE ABRUPT CHANGES IN SOIL TEXTURES.

GROUNDSURFACE
AVERAGE GROUNDWATER
TOP OF COMPETENT ROCK
ESTIMATED TOP OF COMPETENT ROCK
ESTIMATED STRATIGRAPHIC CONTACT
ESTIMATED BASE OF MSW
ESTIMATED EXTENT OF 2L IMPACT



MW-9
MONITORING WELL
SCREENED SECTION

SECTION B-B'

APPROX. SCALE HORIZ. 1" = 100'
VERT. 1" = 10'

PLATE 4B

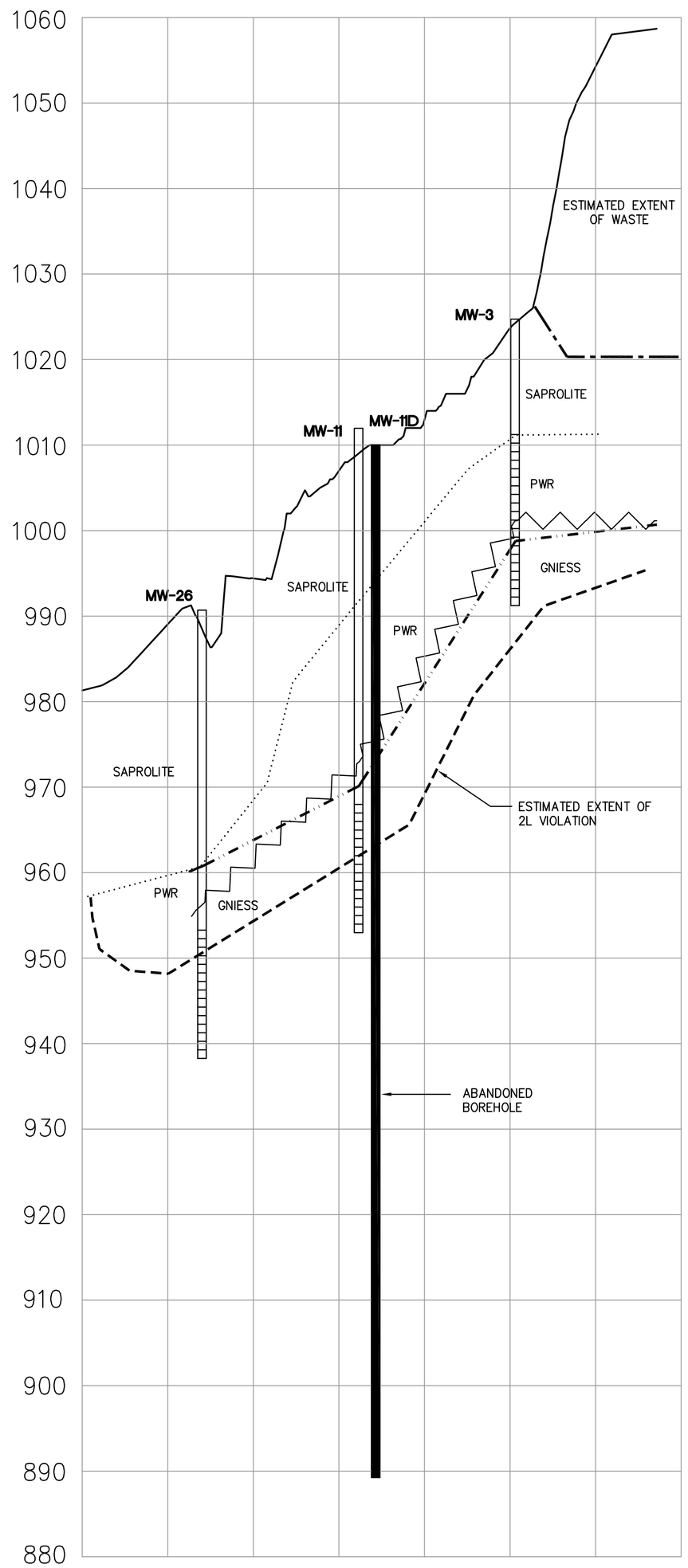
Municipal Services Engineering Company, P.A.
P.O. BOX 97 GARNER, N.C. 27529 (919) 772-5393
P.O. BOX 349 BOONE, N.C. 28607 (828) 262-7767

CONSTRUCTION AND DEMOLITION LANDFILL FACILITY
ALEXANDER COUNTY
NORTH CAROLINA

DATE	BY	REV.	DESCRIPTION

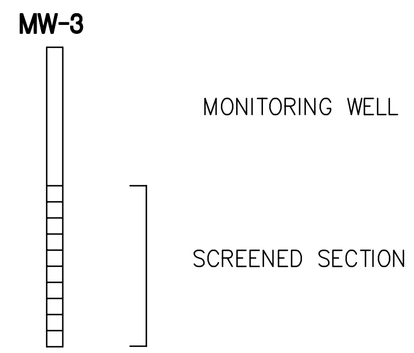
CROSS SECTION B-B'

SCALE: AS SHOWN
DATE: 09/20/2008
DRWN. BY: M. GERMAN
CHKD. BY: S. PATRICK
PROJECT NUMBER G07060.0
DRAWING NO. PLATE 4B
SHEET NO. 1 OF 1

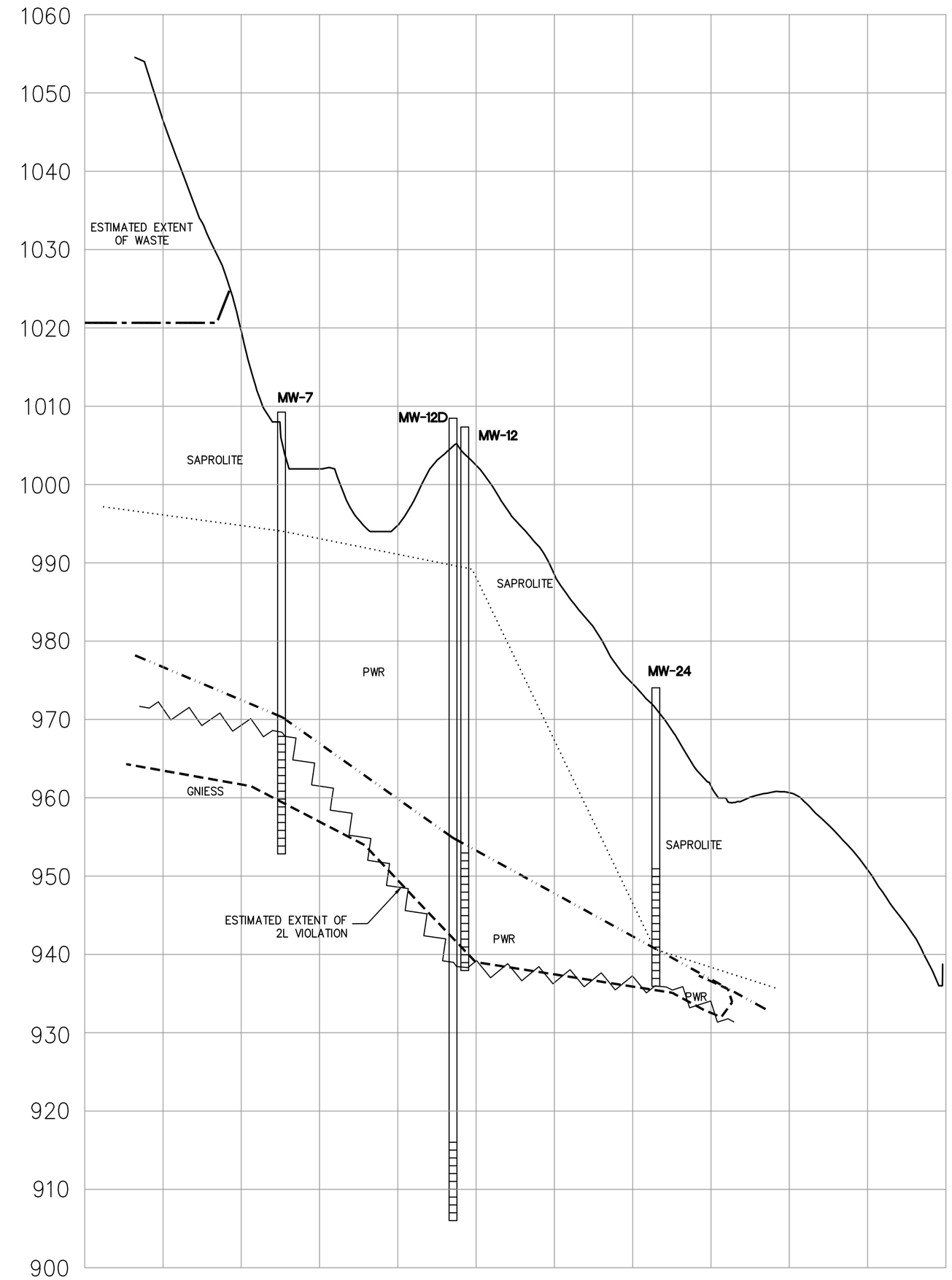


SECTION C-C'

APPROX. SCALE HORIZ. 1" = 100'
VERT. 1" = 10'



GROUNDSURFACE
AVERAGE GROUNDWATER
TOP OF COMPETENT ROCK
ESTIMATED STRATIGRAPHIC CONTACT
ESTIMATED BASE OF MSW
ESTIMATED EXTENT OF 2L IMPACT



SECTION D-D'

APPROX. SCALE HORIZ. 1" = 100'
VERT. 1" = 10'

NOTE:
- NUMBERS SHOWN IN THIS PLATE ARE IN UNITS OF FEET UNLESS INDICATED OTHERWISE.
- SOIL PROFILES SHOWN HEREIN ARE INTERPOLATED FROM AVAILABLE BORING RECORDS.
- SOIL PROFILE BOUNDARIES DO NOT NECESSARILY INDICATE ABRUPT CHANGES IN SOIL TEXTURES.

PLATE 4C

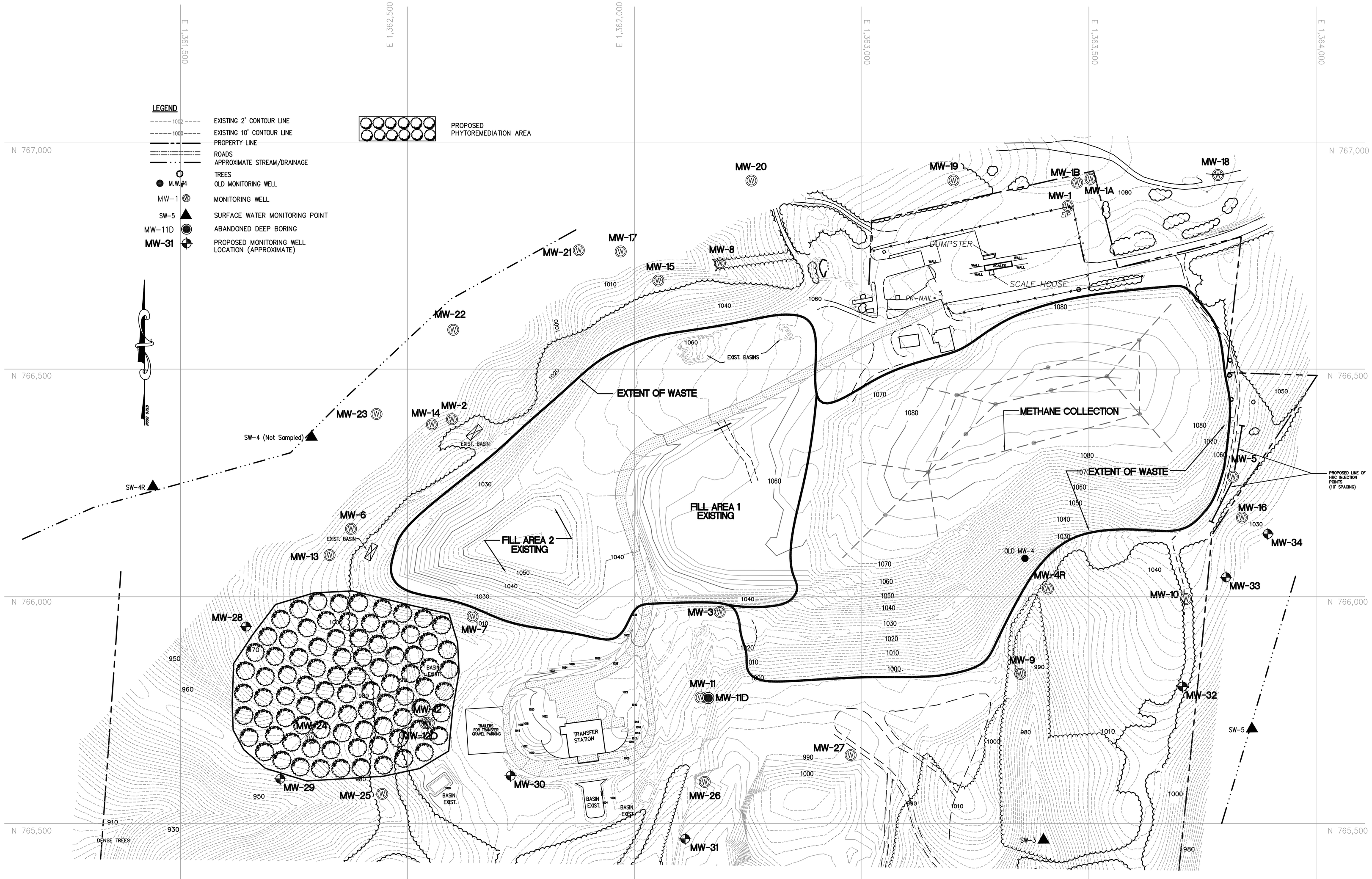
Municipal Engineering Services Company, P.A.
P.O. BOX 97 GARNER, N.C. 27529 (919) 772-5393
P.O. BOX 349 BOONE, N.C. 28607 (828) 262-1767

CONSTRUCTION AND DEMOLITION LANDFILL FACILITY
ALEXANDER COUNTY
NORTH CAROLINA

DATE	BY	REV.	DESCRIPTION

CROSS SECTIONS C-C' & D-D'

SCALE: 1" = 100'
DATE: 09/15/2008
DRWN. BY: M. GERMAN
CHKD. BY: S. PATRICK
PROJECT NUMBER G07060.0
DRAWING NO. PLATE 4C
SHEET NO. 1 OF 1



GRAPHIC SCALE

100 0 50 100 200 400

(IN FEET)
1 inch = 100 ft.

PLATE 5

Municipal Services Engineering Company, P.A.
P.O. BOX 348 BOONE, N.C. 28607 (828) 262-1767
P.O. BOX 97 GARNER, N.C. 27529 (919) 772-5393

CONSTRUCTION AND DEMOLITION LANDFILL FACILITY
ALEXANDER COUNTY NORTH CAROLINA

DATE	BY	REV.	DESCRIPTION

REMEDIATION AREA MAP

SCALE:	1" = 100'
DATE:	01/19/09
DRWN. BY:	M. GERMAN
CHKD. BY:	S. PATRICK
PROJECT NUMBER	G07060.0
DRAWING NO.	PLATE 5
SHEET NO.	1 OF 1

H:\C&D CAP\Alexander\AlexanderC&CAP - REVISED\CADPlates\Plate 7- Phytoremediation area.dwg, PLATE 7, 1/26/2009 8:57:24 AM, spatrick, SKP

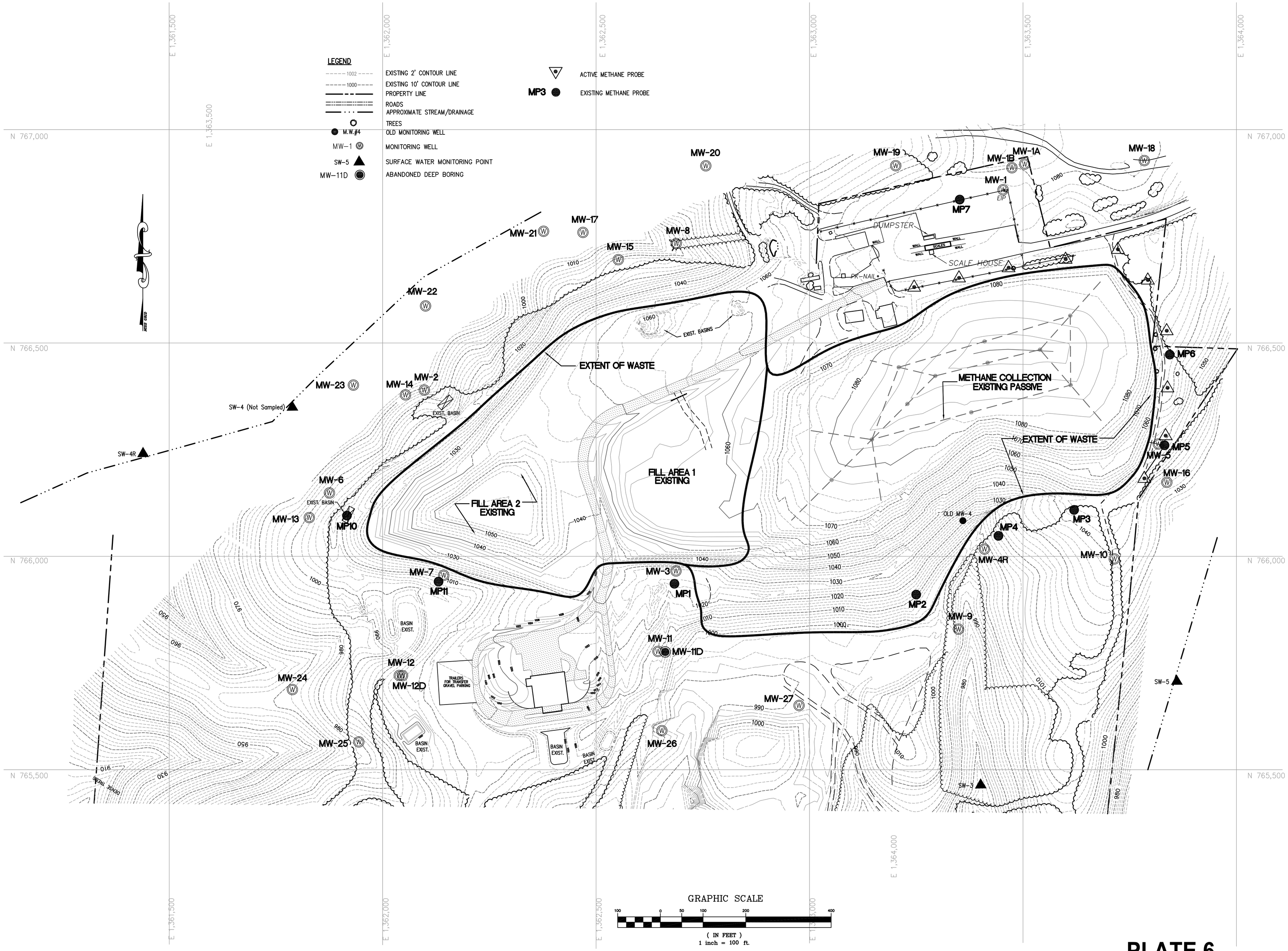


PLATE 6

Engineering Company, P.A.
P.O. BOX 349 BOONE, N.C. 28607
(828) 262-1767

Municipal Services
P.O. BOX 97 GARNER, N.C. 27529
(919) 772-5393

CONSTRUCTION AND DEMOLITION
LANDFILL FACILITY
ALEXANDER COUNTY
NORTH CAROLINA

DATE	BY	REV.	DESCRIPTION

METHANE EXTRACTION SYSTEM

SCALE:	1" = 100'
DATE:	09/15/08
DRWN. BY:	M. GERMAN
CHKD. BY:	S. PATRICK
PROJECT NUMBER	G07060.0
DRAWING NO.	PLATE 6
SHEET NO.	1 OF 1

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APPENDIX A

BIOSCREEN Natural Attenuation Decision Support System

Air Force Center for Environmental Excellence — *Version 1.4*

Alexander County
MW-24
Run Name

Data Input Instructions:

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

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

1. HYDROGEOLOGY

Seepage Velocity*	*Vs*	135.1	*(ft/yr)*
or		↑ or	
Hydraulic Conductivity	*K*	4.9E-04	*(cm/sec)*
Hydraulic Gradient	*i*	0.0453	*(ft/ft)*
Porosity	*n*	0.17	*(-)*

2. DISPERSION

Longitudinal Dispersivity*	*alpha x*	18.8	*(ft)*
Transverse Dispersivity*	*alpha y*	1.9	*(ft)*
Vertical Dispersivity*	*alpha z*	0.0	*(ft)*
or		↑ or	
Estimated Plume Length	*Lp*	550	*(ft)*

3. ADSORPTION

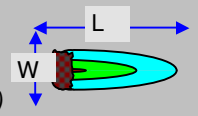
Retardation Factor*	*R*	1.1	*(-)*
or		↑ or	
Soil Bulk Density	*rho*		*(kg/l)*
Partition Coefficient	*Koc*		*(L/kg)*
FractionOrganicCarbon	*foc*		*(-)*

4. BIODEGRADATION

1st Order Decay Coeff*	*lambda*	3.5E-1	*(per yr)*
or		↑ or	
Solute Half-Life	*t-half*	2.00	*(year)*
or Instantaneous Reaction Model			
Delta Oxygen*	*DO*	5.4	*(mg/L)*
Delta Nitrate*	*NO3*	0.185	*(mg/L)*
Observed Ferrous Iron*	*Fe2+*	40.125	*(mg/L)*
Delta Sulfate*	*SO4*	13	*(mg/L)*
Observed Methane*	*CH4*	0.001	*(mg/L)*

5. GENERAL

Modeled Area Length*	650	*(ft)*
Modeled Area Width*	400	*(ft)*
Simulation Time*	6	*(yr)*



6. SOURCE DATA

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

Source Zones:

Width* (ft)	Conc. (mg/L)*
150	0.0011
50	0.02
15	0.045
50	0.02
150	0.0011

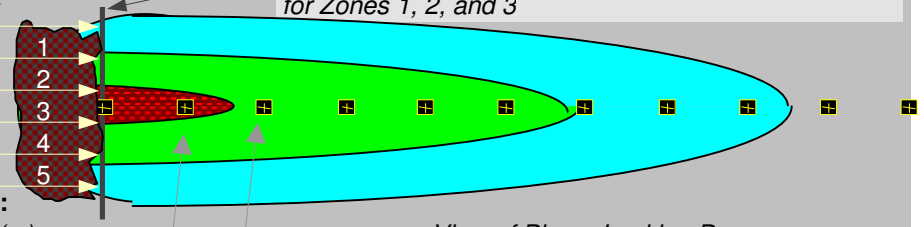
Source Halflife (see Help):

<1	500	*(yr)*

Inst. React. ↑ ↑ 1st Order

Soluble Mass 15 *(Kg)*
In Source NAPL, Soil

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



View of Plume Looking Down

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

7. FIELD DATA FOR COMPARISON

Concentration (mg/L)		.037			.013						
Dist. from Source (ft)	0	65	130	195	260	325	390	455	520	585	650

8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE — **View Output**

RUN ARRAY — **View Output**

Help

Recalculate This Sheet

Paste Example Dataset

Restore Formulas for Vs, Dispersivities, R, lambda, other

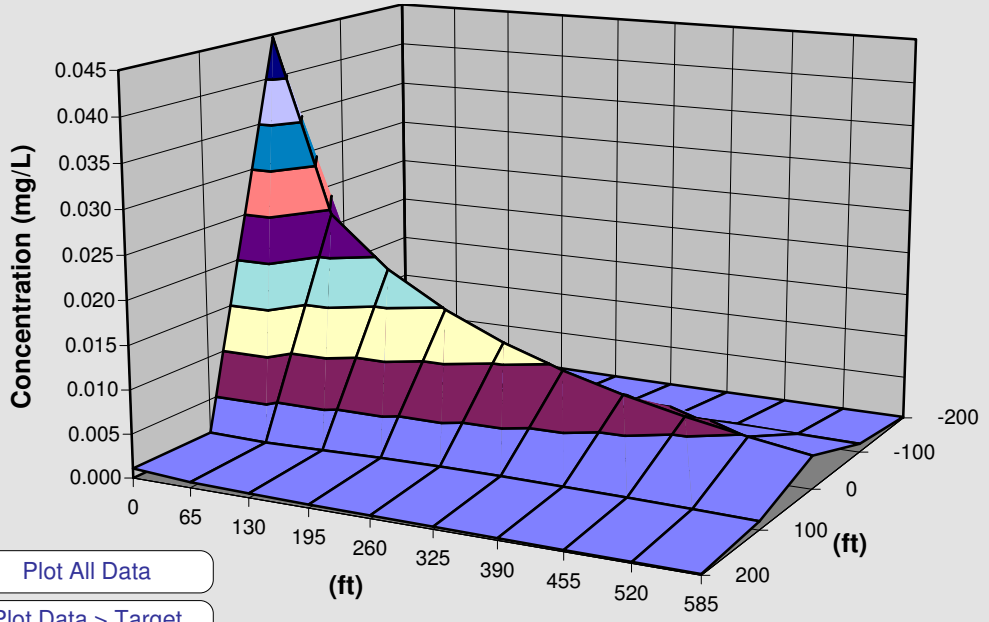
DISSOLVED HYDROCARBON CONCENTRATIONS IN PLUME (mg/L at Z=0)

Transverse Distance (ft) ↓ / Distance from Source (ft)	0	65	130	195	260	325	390	455	520	585	650
200	1.091E-03	6.304E-04	4.919E-04	3.995E-04	3.291E-04	2.730E-04	2.272E-04	1.893E-04	1.569E-04	1.282E-04	1.018E-04
100	1.091E-03	9.724E-04	1.140E-03	1.314E-03	1.393E-03	1.393E-03	1.337E-03	1.241E-03	1.117E-03	9.686E-04	8.008E-04
0	4.465E-02	2.446E-02	1.870E-02	1.480E-02	1.182E-02	9.482E-03	7.622E-03	6.116E-03	4.865E-03	3.796E-03	2.864E-03
-100	1.091E-03	9.724E-04	1.140E-03	1.314E-03	1.393E-03	1.393E-03	1.337E-03	1.241E-03	1.117E-03	9.686E-04	8.008E-04
-200	1.091E-03	6.304E-04	4.919E-04	3.995E-04	3.291E-04	2.730E-04	2.272E-04	1.893E-04	1.569E-04	1.282E-04	1.018E-04
MASS FLUX (mg/day)	5.35E+1	4.93E+1	3.91E+1	3.25E+1	2.72E+1	2.28E+1	1.91E+1	1.60E+1	1.32E+1	1.07E+1	8.31E+0

Model to Display:

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

Time: **6 Years** Target Level: **0.001** mg/L Displayed Model: **1st Order Decay**



Plot All Data

Plot Data > Target

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

Plume Mass if No Biodegradation	1.17E-01	*(Kg)*
- Actual Plume Mass	5.52E-02	*(Kg)*
= Plume Mass Removed by Biodeg	**6.16E-02**	*(Kg)*
	(53 %)	

Change in Electron Acceptor/Byproduct Masses:

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

Contam. Mass in Source (t=0 Years)	15.0	*(Kg)*
Contam. Mass in Source Now (t=6Years)	14.9	*(Kg)*
Current Volume of Groundwater in Plume	2.0	*(ac-ft)*
Flowrate of Water Through Source Zone	2.188	*(ac-ft/yr)*

Mass HELP

Recalculate

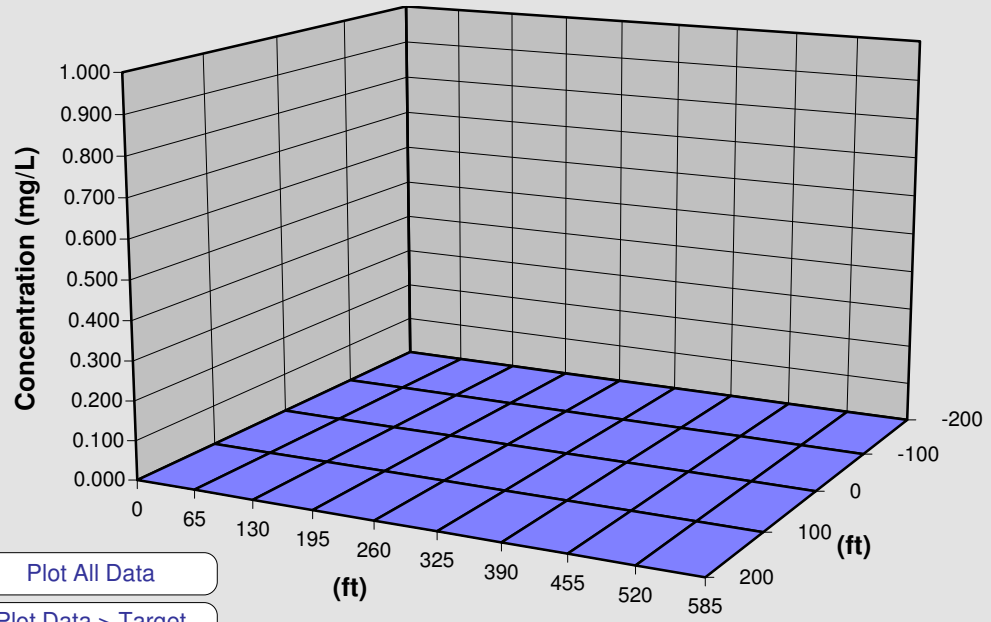
DISSOLVED HYDROCARBON CONCENTRATIONS IN PLUME (mg/L at Z=0)

Transverse Distance (ft) ↓ / Distance from Source (ft)	0	65	130	195	260	325	390	455	520	585	650
200	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
100	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
0	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
-100	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
-200	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
MASS FLUX (mg/day)	5.35E+1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0

Model to Display:

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

Time: **6 Years** Target Level: **0.001** mg/L Displayed Model: **Inst. Reaction**



Plot All Data

Plot Data > Target

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

Plume Mass if No Biodegradation	1.50E+01	*(Kg)*
- Actual Plume Mass	0.00E+00	*(Kg)*
= Plume Mass Removed by Biodeg	**1.50E+01**	*(Kg)* (100 %)

Change in Electron Acceptor/Byproduct Masses:

Oxygen	*Nitrate*	*Iron II*	*Sulfate*	*Methane*	
-12.7	-0.4	+94.5	-30.6	+0.0	*(Kg)*

Contam. Mass in Source (t=0 Years)	15.0	*(Kg)*
Contam. Mass in Source Now (t=6Years)	0.0	*(Kg)*
Current Volume of Groundwater in Plume	0.0	*(ac-ft)*
Flowrate of Water Through Source Zone	2.188	*(ac-ft/yr)*

Mass HELP

Recalculate

BIOSCREEN Natural Attenuation Decision Support System

Air Force Center for Environmental Excellence — *Version 1.4*

Alexander County
MW-26
Run Name

Data Input Instructions:

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

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

1. HYDROGEOLOGY

Seepage Velocity*	*Vs*	52.4	*(ft/yr)*
or		or	
Hydraulic Conductivity	*K*	1.2E-04	*(cm/sec)*
Hydraulic Gradient	*i*	0.0437	*(ft/ft)*
Porosity	*n*	0.1	*(-)*

2. DISPERSION

Longitudinal Dispersivity*	*alpha x*	18.8	*(ft)*
Transverse Dispersivity*	*alpha y*	1.9	*(ft)*
Vertical Dispersivity*	*alpha z*	0.0	*(ft)*
or		or	
Estimated Plume Length	*Lp*	550	*(ft)*

3. ADSORPTION

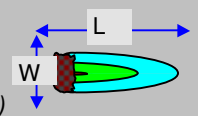
Retardation Factor*	*R*	1.0	*(-)*
or		or	
Soil Bulk Density	*rho*		*(kg/l)*
Partition Coefficient	*Koc*		*(L/kg)*
FractionOrganicCarbon	*foc*		*(-)*

4. BIODEGRADATION

1st Order Decay Coeff*	*lambda*	3.5E-1	*(per yr)*
or		or	
Solute Half-Life	*t-half*	2.00	*(year)*
or Instantaneous Reaction Model			
Delta Oxygen*	*DO*	5.6	*(mg/L)*
Delta Nitrate*	*NO3*	0.185	*(mg/L)*
Observed Ferrous Iron*	*Fe2+*	30.4	*(mg/L)*
Delta Sulfate*	*SO4*	13	*(mg/L)*
Observed Methane*	*CH4*	0.001	*(mg/L)*

5. GENERAL

Modeled Area Length*	550	*(ft)*
Modeled Area Width*	345	*(ft)*
Simulation Time*	5	*(yr)*



6. SOURCE DATA

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

Source Zones:

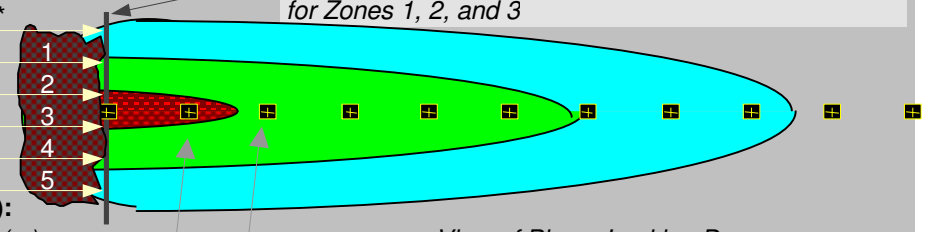
Width* (ft)	Conc. (mg/L)*
100	0.001
50	0.025
25	0.05
50	0.025
100	0.001

Source Halflife (see Help): 5 | >1000 *(yr)*

Inst. React. 1st Order

Soluble Mass In Source NAPL, Soil 20 *(Kg)*

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



View of Plume Looking Down

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

7. FIELD DATA FOR COMPARISON

Concentration (mg/L)	.054				.052			.037			
Dist. from Source (ft)	0	55	110	165	220	275	330	385	440	495	550

8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE — **View Output**

RUN ARRAY — **View Output**

Help

Recalculate This Sheet

Paste Example Dataset

Restore Formulas for Vs, Dispersivities, R, lambda, other

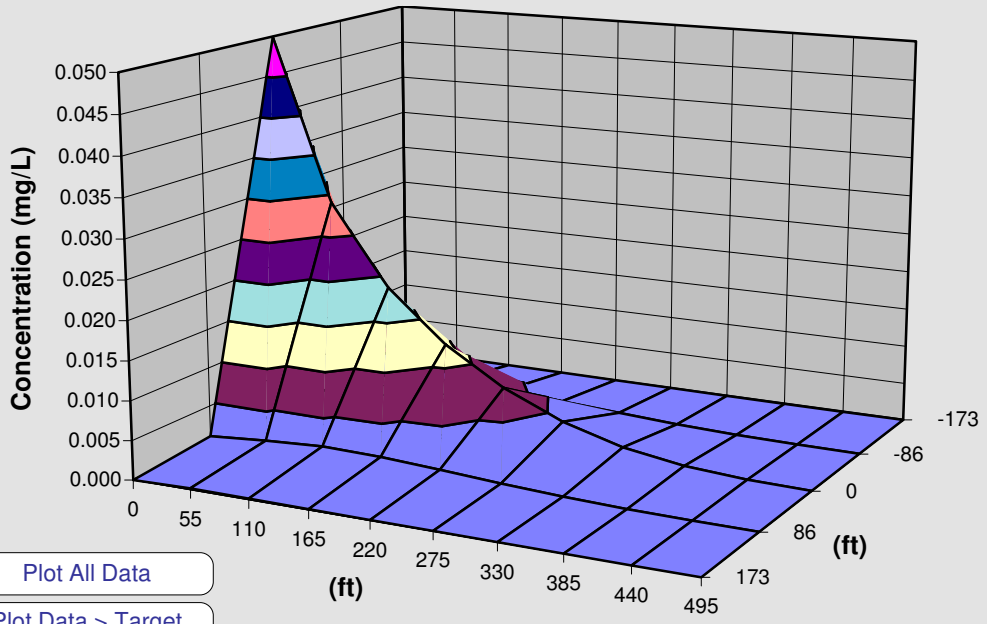
DISSOLVED HYDROCARBON CONCENTRATIONS IN PLUME (mg/L at Z=0)

Transverse Distance (ft) ↓ / Distance from Source (ft)	0	55	110	165	220	275	330	385	440	495	550
173	0.000E+00	1.745E-04	1.590E-04	1.214E-04	8.350E-05	5.090E-05	2.665E-05	1.159E-05	4.065E-06	1.121E-06	2.385E-07
86	9.985E-04	1.564E-03	1.998E-03	1.805E-03	1.375E-03	8.922E-04	4.796E-04	2.070E-04	6.999E-05	1.820E-05	3.595E-06
0	4.993E-02	2.899E-02	1.864E-02	1.212E-02	7.472E-03	4.140E-03	1.961E-03	7.614E-04	2.352E-04	5.655E-05	1.043E-05
-86	9.985E-04	1.564E-03	1.998E-03	1.805E-03	1.375E-03	8.922E-04	4.796E-04	2.070E-04	6.999E-05	1.820E-05	3.595E-06
-173	0.000E+00	1.745E-04	1.590E-04	1.214E-04	8.350E-05	5.090E-05	2.665E-05	1.159E-05	4.065E-06	1.121E-06	2.385E-07
MASS FLUX (mg/day)	1.6E+1	1.1E+1	8.1E+0	5.6E+0	3.6E+0	2.1E+0	1.0E+0	4.2E-1	1.3E-1	3.3E-2	6.3E-3

Model to Display:

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

Time: **5 Years** Target Level: **0.001** mg/L Displayed Model: **1st Order Decay**



Plot All Data

Plot Data > Target

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

Plume Mass if No Biodegradation	2.93E-02	*(Kg)*
- Actual Plume Mass	1.58E-02	*(Kg)*
= Plume Mass Removed by Biodeg	**1.35E-02**	*(Kg)*
	(46 %)	

Change in Electron Acceptor/Byproduct Masses:

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

Contam. Mass in Source (t=0 Years)	20.0	*(Kg)*
Contam. Mass in Source Now (t=5Years)	20.0	*(Kg)*
Current Volume of Groundwater in Plume	0.5	*(ac-ft)*
Flowrate of Water Through Source Zone	0.391	*(ac-ft/yr)*

Mass HELP

Recalculate

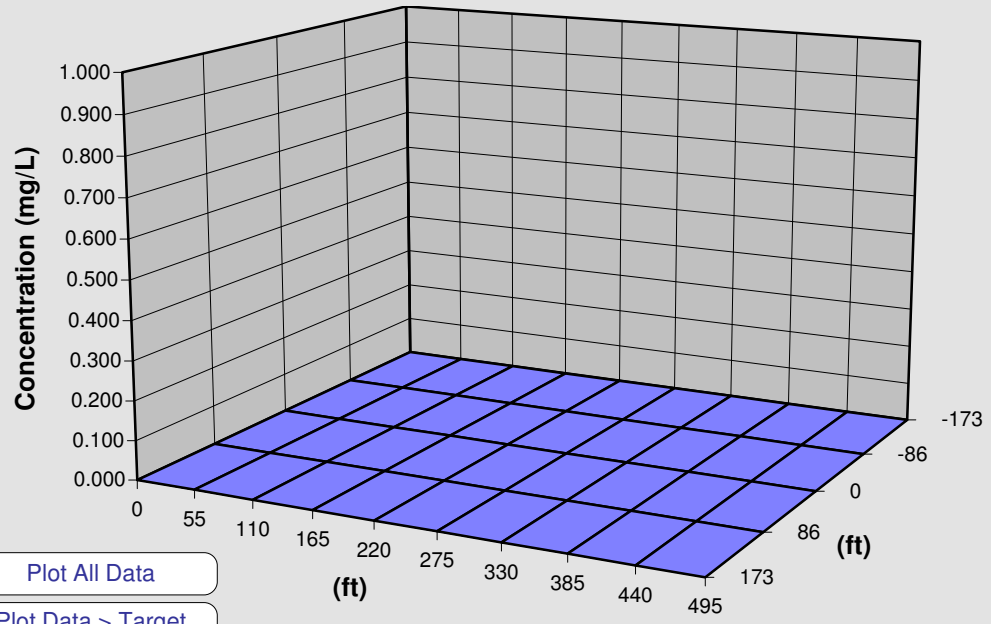
DISSOLVED HYDROCARBON CONCENTRATIONS IN PLUME (mg/L at Z=0)

Transverse Distance (ft) ↓ / Distance from Source (ft) →	0	55	110	165	220	275	330	385	440	495	550
173	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
86	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
0	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
-86	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
-173	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
MASS FLUX (mg/day)	1.6E+1	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0

Model to Display:

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

Time: **5 Years** Target Level: **0.001** mg/L Displayed Model: **Inst. Reaction**



Plot All Data

Plot Data > Target

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

Plume Mass if No Biodegradation	1.03E+01	*(Kg)*
- Actual Plume Mass	0.00E+00	*(Kg)*
= Plume Mass Removed by Biodeg	**1.03E+01**	*(Kg)* (100 %)

Change in Electron Acceptor/Byproduct Masses:

Oxygen	*Nitrate*	*Iron II*	*Sulfate*	*Methane*	
-9.6	-0.3	+52.3	-22.4	+0.0	*(Kg)*

Contam. Mass in Source (t=0 Years)	20.0	*(Kg)*
Contam. Mass in Source Now (t=5Years)	9.7	*(Kg)*
Current Volume of Groundwater in Plume	0.0	*(ac-ft)*
Flowrate of Water Through Source Zone	0.391	*(ac-ft/yr)*

Mass HELP

Recalculate

BIOSCREEN Natural Attenuation Decision Support System

Air Force Center for Environmental Excellence — *Version 1.4*

Alexander County
MW-16
Run Name

Data Input Instructions:

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

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

1. HYDROGEOLOGY

Seepage Velocity*	*Vs*	162.8	*(ft/yr)*
or		*or*	
Hydraulic Conductivity	*K*	8.7E-04	*(cm/sec)*
Hydraulic Gradient	*i*	0.0902	*(ft/ft)*
Porosity	*n*	0.5	*(-)*

2. DISPERSION

Longitudinal Dispersivity*	*alpha x*	11.0	*(ft)*
Transverse Dispersivity*	*alpha y*	1.1	*(ft)*
Vertical Dispersivity*	*alpha z*	0.0	*(ft)*
or		*or*	
Estimated Plume Length	*Lp*	200	*(ft)*

3. ADSORPTION

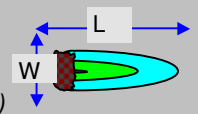
Retardation Factor*	*R*	1.1	*(-)*
or		*or*	
Soil Bulk Density	*rho*		*(kg/l)*
Partition Coefficient	*Koc*		*(L/kg)*
FractionOrganicCarbon	*foc*		*(-)*

4. BIODEGRADATION

1st Order Decay Coeff*	*lambda*	3.5E-1	*(per yr)*
or		*or*	
Solute Half-Life	*t-half*	2.00	*(year)*
or Instantaneous Reaction Model			
Delta Oxygen*	*DO*	5.6	*(mg/L)*
Delta Nitrate*	*NO3*	0.2	*(mg/L)*
Observed Ferrous Iron*	*Fe2+*	11	*(mg/L)*
Delta Sulfate*	*SO4*	15	*(mg/L)*
Observed Methane*	*CH4*	0.001	*(mg/L)*

5. GENERAL

Modeled Area Length*	700	*(ft)*
Modeled Area Width*	375	*(ft)*
Simulation Time*	5	*(yr)*



6. SOURCE DATA

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

Source Zones:

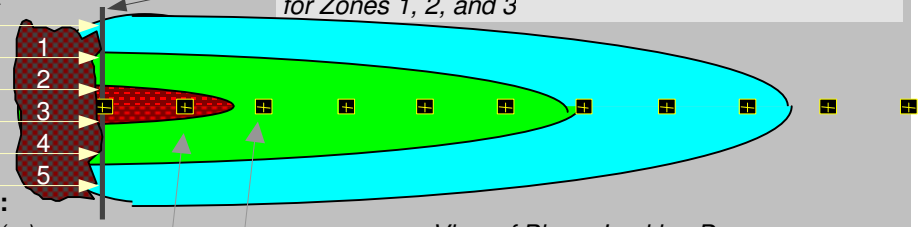
Width* (ft)	Conc. (mg/L)*
125	0.0011
20	0.055
125	0.0011
0	0

Source Halflife (see Help):

<1	400	*(yr)*
Inst. React.	1st Order	

Soluble Mass 20 *(Kg)*
In Source NAPL, Soil

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



View of Plume Looking Down

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

7. FIELD DATA FOR COMPARISON

Dist. from Source (ft)	Concentration (mg/L)
0	
70	.053
140	
210	
280	
350	
420	
490	
560	
630	
700	

8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE — **View Output**

RUN ARRAY — **View Output**

Help

Recalculate This Sheet

Paste Example Dataset

Restore Formulas for Vs, Dispersivities, R, lambda, other

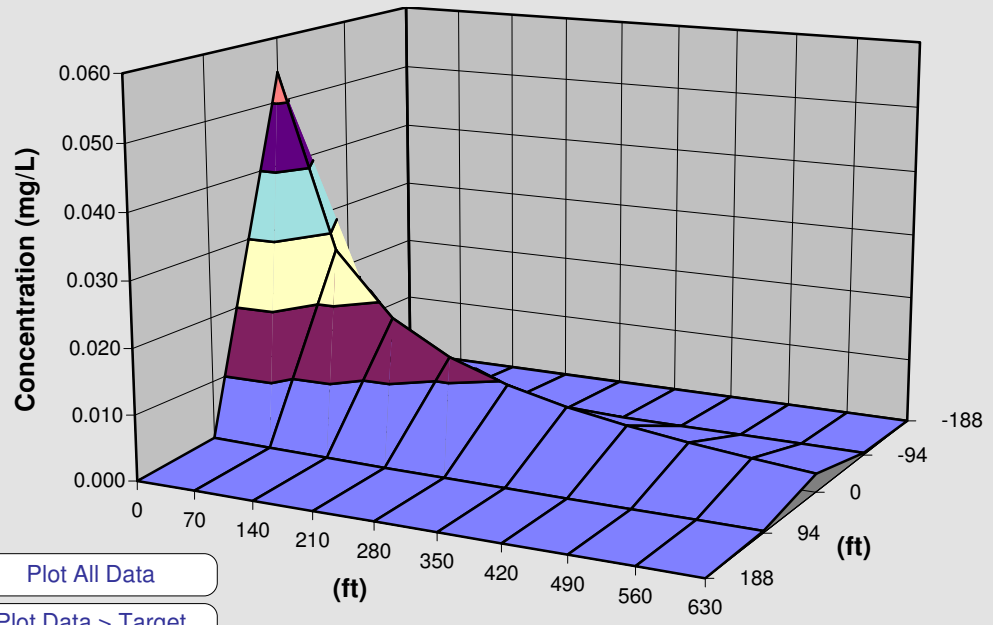
DISSOLVED HYDROCARBON CONCENTRATIONS IN PLUME (mg/L at Z=0)

Transverse Distance (ft) ↓ / Distance from Source (ft)	0	70	140	210	280	350	420	490	560	630	700
188	0.000E+00	1.116E-08	1.125E-06	5.044E-06	1.017E-05	1.479E-05	1.818E-05	2.017E-05	2.066E-05	1.943E-05	1.633E-05
94	1.091E-03	9.343E-04	7.930E-04	6.684E-04	5.692E-04	4.977E-04	4.480E-04	4.103E-04	3.737E-04	3.269E-04	2.623E-04
0	5.457E-02	2.746E-02	1.770E-02	1.271E-02	9.583E-03	7.429E-03	5.856E-03	4.650E-03	3.659E-03	2.776E-03	1.948E-03
-94	1.091E-03	9.343E-04	7.930E-04	6.684E-04	5.692E-04	4.977E-04	4.480E-04	4.103E-04	3.737E-04	3.269E-04	2.623E-04
-188	0.000E+00	1.116E-08	1.125E-06	5.044E-06	1.017E-05	1.479E-05	1.818E-05	2.017E-05	2.066E-05	1.943E-05	1.633E-05
MASS FLUX (mg/day)	8.7E+1	1.7E+2	1.1E+2	8.3E+1	6.4E+1	5.0E+1	4.0E+1	3.3E+1	2.6E+1	2.1E+1	1.5E+1

Model to Display:

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

Time: **5 Years** Target Level: **0.001** mg/L Displayed Model: **1st Order Decay**



Plot All Data

Plot Data > Target

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

Plume Mass if No Biodegradation	1.58E-01	*(Kg)*
- Actual Plume Mass	8.83E-02	*(Kg)*
= Plume Mass Removed by Biodeg	**6.94E-02**	*(Kg)* (44 %)

Change in Electron Acceptor/Byproduct Masses:

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

Contam. Mass in Source (t=0 Years)	20.0	*(Kg)*
Contam. Mass in Source Now (t=5Years)	19.8	*(Kg)*
Current Volume of Groundwater in Plume	5.3	*(ac-ft)*
Flowrate of Water Through Source Zone	5.044	*(ac-ft/yr)*

Mass HELP

Recalculate

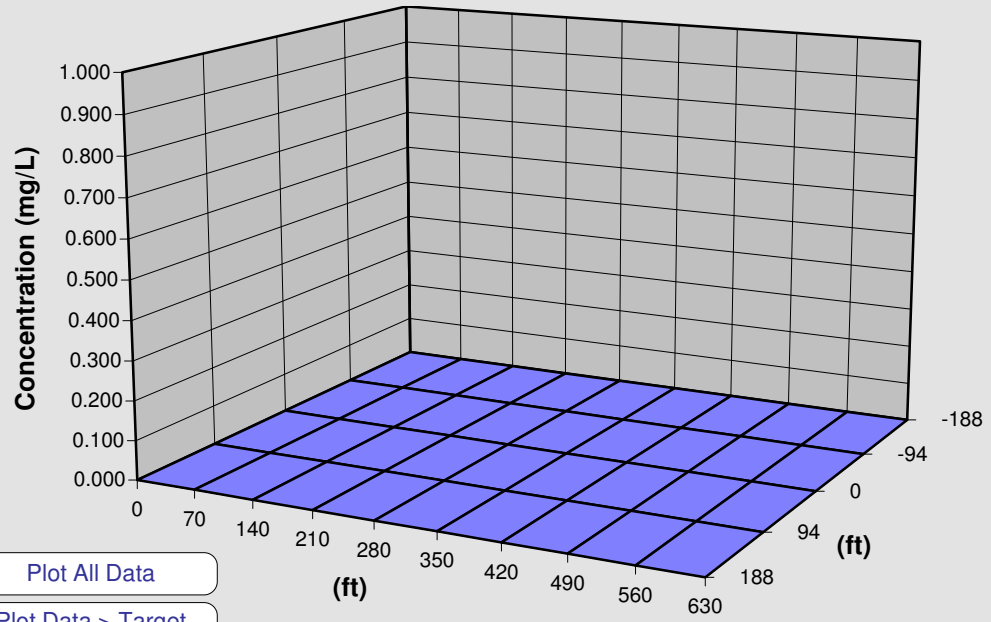
DISSOLVED HYDROCARBON CONCENTRATIONS IN PLUME (mg/L at Z=0)

Transverse Distance (ft) ↓ / Distance from Source (ft) →	0	70	140	210	280	350	420	490	560	630	700
188	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
94	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
0	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
-94	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
-188	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
MASS FLUX (mg/day)	8.7E+1	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0

Model to Display:

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

Time: **5 Years** Target Level: **0.001** mg/L Displayed Model: **Inst. Reaction**



Plot All Data

Plot Data > Target

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

Plume Mass if No Biodegradation	2.00E+01	*(Kg)*
- Actual Plume Mass	0.00E+00	*(Kg)*
= Plume Mass Removed by Biodeg	**2.00E+01**	*(Kg)* (100 %)

Change in Electron Acceptor/Byproduct Masses:

Oxygen	*Nitrate*	*Iron II*	*Sulfate*	*Methane*	
-20.3	-0.7	+39.8	-54.3	+0.0	*(Kg)*

Contam. Mass in Source (t=0 Years)	20.0	*(Kg)*
Contam. Mass in Source Now (t=5Years)	0.0	*(Kg)*
Current Volume of Groundwater in Plume	0.0	*(ac-ft)*
Flowrate of Water Through Source Zone	5.044	*(ac-ft/yr)*

Mass HELP

Recalculate

APPENDIX B

Ground and Surfacewater Sampling and Analysis Plan

Prepared for

Alexander County C&D Landfill
Taylorsville, North Carolina

MESCO Project Number: G07060.0

This report is included as Appendix B the
Corrective Action Plan completed for Alexander County.

Completed on 1/26/09

Municipal Engineering Services Company, P.A.
Garner, Boone and Morehead City, North Carolina

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1 INTRODUCTION 1

1.1 Objective 1
1.2 Water Quality Monitoring Summary 2
1.3 Sampling Equipment 3
1.4 Sampling Containers 3

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2.2 Purging 5
2.3 Groundwater Sample Collection 6
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4 CONCLUSION 8

TABLES

Table E-1 ..... Summary of Ground and Surfacewater Monitoring Points

PLATES

Plate A ..... Topographic Map
Plate B ..... Site Map with Monitoring Locations
Plate C ..... Typical Monitoring Well
Plate D ..... Graphical Plot of Standing Volumes of Water

ATTACHMENTS

Attachment 1 ..... NCDENR Solid Waste Section Sampling & Monitoring Guidance

1 INTRODUCTION

1.1 Objective

The objective of the Ground and Surfacewater Sampling and Analysis Plan (SAP) is to provide clear guidelines and procedures for field and laboratory personnel when obtaining and testing ground and surface water samples. This plan is an update, and supersedes the November 1995 SAP for the Alexander County C&D landfill on top of MSW landfill. The sampling procedures outlined in this analysis plan are guidelines by which sampling will be performed. Deviation from the procedures may be warranted depending on facility conditions or unforeseen sampling variables. Alternative sampling procedures must conform to the N.C. Water Quality Monitoring Guidance Document for Solid Waste Facilities (Guidance Document). Copies of the NCDENR Solid Waste Section technical guidelines for sampling and monitoring are presented in the **Attachments**.

All groundwater and surfacewater monitoring points shall be sampled semi-annually for the constituents listed in Appendix I. In addition to the Appendix I constituents monitoring wells MW-3, MW-6, MW-7, MW-11, MW-12, MW-12D, MW-13, MW-24, MW-25, MW-26, MW-27, MW-28, MW-29, MW-31, MW-33, and MW-34 will be sampled for the following suite of Monitored Natural Attenuation (MNA) parameters.

MNA Performance Parameters		
Parameter	**Analysis Type**	**Analytical Method**
Dissolved Oxygen (DO)	Field Reading	Multi-parameter Field Instrument w/ flow-through cell
pH	Field Reading	
Oxidation-Reduction Potential (ORP)	Field Reading	
Turbidity	Field Reading	
Conductivity	Field Reading	
Temperature	Field Reading	
Dissolved CO_2	Field Reading	Field Instrument / Hach Kit
Alkalinity (Total as $CaCO_3$)*	Laboratory/Field*	EPA 310.2
Chloride*	Laboratory/Field*	SM 4500-CLB
Iron	Laboratory	SM3111B
Nitrate*	Laboratory/Field*	EPA 353.2 / SM 2320B
Sulfate*	Laboratory/Field*	EPA 375.4 / SM 4500-SO4E
Sulfide*	Laboratory/Field*	EPA 376.1 or SM 4500SE
TOC/BOD/COD	Laboratory	EPA 415.1 / EPA 405.1 / EPA 410.1
Methane	Laboratory	RSK 175
Ethane, Ethene	Laboratory	RSK 175
Hydrogen	Laboratory	AM19GA
Volatile Fatty Acids	Laboratory	AM23G
*For budgetary considerations these analyses may be performed in the field using Hach® brand color wheel test kits. Historical iron concentrations have exceeded Hach kit quantitation limits.		

1.2 Water Quality Monitoring Summary

The nature of the groundwater flow, geology, location of creeks, and close proximity of several drainage features will require extensive monitoring for early detection of a release. The monitoring plan consists of thirty (30) monitoring wells (MW-1 through MW-3, MW-4R, MW-5 through MW-27, MW-1A, MW-1B, MW-12D) and three (3) surfacewater monitoring points (SW-3, SW-4R and SW-5). Monitoring points included in this plan are summarized in **Table E-1**. A topographic map is provided as **Plate A**. Locations of monitoring points are shown on **Plate B**.

Monitoring well MW-1 is the original background well located upgradient of the landfill. It has since been replaced with upgradient background wells MW-1A, MW-1B, and recently by MW-18. MW-5, MW-16, and MW-10 are downgradient wells utilized for the detection of a release from the northeastern portion of the landfill. MW-4R and MW-9 are downgradient wells installed on the southeastern half of the landfill. MW-3 is a downgradient monitoring well located just outside of the waste limit in the center of the landfill, selected based on the southerly flow of groundwater in the northern portion of the landfill. MW-11, MW-26, and MW-27 are also downgradient wells positioned to monitor the center of the landfill. MW-7, MW-12, MW-24, and MW-25 are southwestern, downgradient monitoring wells, positioned to intersect the more southerly flow from the northern portion of both units. Monitoring well MW-12D is utilized for monitoring the bedrock aquifer. MW-6 and MW-13 are downgradient monitoring wells located on the western side of the landfill, positioned to detect a release flowing in the direction of the tributary of the Catawba River. MW-2 and MW-14 are downgradient monitoring wells on the western portion positioned to monitor groundwater flow from the northern portion prior to reaching the property line. MW-8 is a downgradient monitoring well located in the northern portion of the landfill. MW-21, MW-22, and MW-23 are newly installed wells along the northwestern side of the landfill positioned to monitor groundwater before reaching the tributary of the Catawba River. Monitoring wells MW-8, MW-15, and MW-17 are located north of the landfill and are positioned to monitor a release flowing in the direction of the tributary of the Catawba River. MW-19 is a new well located slightly off the property north of the facility as a downgradient monitoring well. MW- 20 is a downgradient monitoring well located north of the facility.

Surfacewater sampling point SW-3 is located south of the landfill downstream on a tributary of the Catawba River. Surfacewater sampling point SW-4R is located downstream of the landfill on a tributary of the Little River where it flows past the landfill on the northwestern side. Surfacewater sampling point SW-5 is located

along another tributary of the Catawba River on the eastern side. Surfacewater sampling locations are shown in **Plate B**.

Detection Monitoring

Detection monitoring will be performed on MW-1, MW-1A, MW-1B, MW-2, MW-4R, MW-8, MW-9, MW-10, MW-14, MW-15, MW-17, MW-18, MW-19, MW-20, MW-21, MW-22 and MW-23. Detection monitoring will consist of the collection of groundwater for analysis for the complete list of Appendix I constituents. In addition field parameters including dissolved oxygen (DO), oxidation reduction potential (ORP), pH, temperature, turbidity, and conductivity will also be collected.

Assessment Monitoring

As indicated in the *Corrective Action Plan*, assessment monitoring will be performed on monitoring wells MW-3, MW-5, MW-6, MW-7, MW-11, MW-12, MW-12D, MW-13, MW-16, MW-24, MW-25, MW-26, and MW-27.

1.3 Sampling Equipment

Groundwater purging and sampling will be performed using a submersible pump and disposable polyethylene bailers. A new bailer will be used to sample each individual well. *Under no circumstance will a disposable bailer used to sample a given well be used to sample any remaining well.* The following procedure will be used decontaminate the submersible pump:

1. Phosphate-free detergent & de-ionized or distilled water rinse.
2. De-ionized or distilled water rinse.
3. Isopropyl alcohol (isopropanol) rinse.
4. De-ionized or distilled water rinse.

At least one (1) equipment blank will be collected during pump decontamination procedures to ensure that cross-contamination has not occurred as a result of the decontamination process. The standard equipment necessary to conduct sampling for each well consists of sample containers (including trip blanks and equipment blanks), one wide-mouth container, at least one 100-ft spool of nylon twine, at least one box of disposable latex/nitrile gloves, temperature/pH/ORP/conductivity indicator, water level indicator, storage coolers, and ice. All equipment subject to damage and contamination will be transported in sealed, plastic bags or storage containers. The water level indicator will be decontaminated in accordance with Steps 2 and 3 described above prior to placement in a clean plastic bag or storage container.

1.4 Sampling Containers

Ground and surfacewater monitoring will include organic (volatile organic compounds- VOCs) and inorganic (metals) analyses. Samples will be collected for the various analyses in laboratory supplied containers.

1. Each sample container will be clearly labeled providing the following information: site name, county location, sample identification number, parameters to be analyzed, preservative added, date and time of sampling, and initials of the sampler.
2. Samples to be analyzed for VOC concentrations will be collected first in three 40-ml glass vials with Teflon septa caps. The sample vials will be completely filled to create zero headspace in the vials.
3. Samples to be analyzed for inorganic contamination will be collected second in a quart/1-liter polyethylene container.

All sample containers will be obtained from an independent laboratory in a sterilized condition and with the appropriate, method-specific preservative. Care will be taken by the field technician to not allow the preservative to wash out of the sample containers during sampling.

Appendix I Sampling Containers

Samples to be analyzed for VOC concentrations will be collected into three 40-ml glass vials with Teflon septa caps. The sample vials will be completely filled with zero headspace in the vials. Samples to be analyzed for inorganic compound concentrations will be collected into 1-liter polyethylene containers, with ½ inch space for air permitted. All sample containers will be obtained from an independent laboratory in a sterilized condition. Some of the containers will have a pre-measured amount of preservative in them as necessary. In this event, care will be taken not to rinse the container or to allow the preservative to wash out during sampling.

MNA Sampling Containers

Groundwater samples to be analyzed for MNA performance parameters will be collected into the container types listed in the table below.

MNA Parameter	Volume	Bottle Type	Preservative
Alkalinity	250 mL	Plastic	none; cool to 4°C
Chloride	125 mL	Plastic	none; cool to 4°C
TOC/COD	250 mL	Glass	Sulfuric acid (H_2SO_4)
BOD	500 mL	Polyethylene	none; cool to 4°C
Iron	125 mL	Plastic	Nitric acid (HNO_3)
Nitrate	125 mL	Plastic	Sulfuric acid (H_2SO_4)

Sulfate	125 mL	Plastic	none; cool to 4°C
Sulfide	250 mL	Glass	Sodium hydroxide (NaOH)
Methane/Ethane/Ethene	125 mL	Plastic	none; cool to 4°C
Hydrogen	-	-	proprietary lab sampler
Volatile Fatty Acids	40 mL	Glass	Hydrochloric Acid (HC1)

2 SAMPLING

Wells will be sampled from upgradient to downgradient; or when previous analytical data is available, from least to greatest contamination. This procedure is required to limit the potential of cross contamination between sampling points.

2.1 Set-Up

A clean sheet of plastic will be placed around the well to provide a clean surface for sampling equipment. The total well depth read from the well tag and the measured depth to water, determined using the water level indicator, will be used to compute the depth of water in the well. The total well depth will be measured and compared to the depth indicated on the well tag as a check for silt buildup or blockage at depth.

All meters used to monitor purge parameters will be calibrated immediately prior to purging and sampling, and those readings recorded in a field logbook. Entries will always include pre- and post- calibration readings as well as the model and serial number of the equipment and the date, time, and person performing the calibration(s). Two standards, which bracket the average or suspected measurements for pH and specific conductance, will be used at the site. Since natural waters (including those impacted by environmental contaminants) tend to have pH values less than 7.0, pH buffers of 4.0 and 7.0 will typically be used for instrument calibration.

Disposable nitrile gloves will be worn by the field technician during sampling to minimize the risk of personal exposure to potentially harmful chemical substances and to minimize the risk of sample cross-contamination. Fresh pairs of nitrile gloves will be worn during each purge and sampling event. The groundwater samples will be transferred from the bailers into method-specific and appropriately preserved containers and placed into a clean cooler containing ice to chill the samples to a temperature of approximately 4°C.

Indicator parameters such as pH, temperature and specific conductance will be measured during purging as an indication that groundwater representative of the formation surrounding a given well is being sampled. Purging is considered complete when at least three well volumes have been purged and indicator parameters have stabilized such that three successive readings vary by no more than 10%. Purging may need to be continued beyond five well volumes if indicator parameters have not stabilized. All information will be

recorded on a field data sheet or in a field logbook with copies submitted to the Division of Waste Management with the analytical results.

2.2 Purging

Each well will be purged of approximately three (3) to five (5) volumes of standing water and allowed to settle prior to collection of groundwater samples. If the well should go dry and not recharge before the requisite well volumes are removed, the well will be allowed to recharge and a sample will be collected within 24 hours of the initial purging. The amount of standing water will be calculated by first subtracting the depth-to-water from total well depth. The amount of water in the well (in gallons) will then be determined by using the chart on **Plate C**. For example, a two-inch well that is 29 feet deep and contains 19 feet of standing water will have a well volume of ~3.3 gallons.

After determination of the amount of water to be purged from a given well, the equipment necessary for purging will be assembled at the well. The disposable bailer will be maintained in a stable, upright position while the upper portion of the plastic wrapping will be pulled away to expose only the eyelet used for securing twine to the bailer. After the twine has been secured to the bailer with gloved hands, the bailer will be suspended as the remaining plastic is removed. The bailer will be lowered slowly into the well until the bailer contacts groundwater. The bailer twine will then be cut to an adequate length and secured to prevent loss of the bailer in the well. At no time during purging will the bailer twine be allowed to touch the ground. In order to not allow the twine to touch the ground during purging, the twine will be collected when raising the bailer either by loops gathered in one hand or by alternating hand-to-hand as the bailer is pulled from the well. When purging deep wells (in excess of 40 feet), the ground and the well head may be covered with a clean plastic bag or sheet of plastic with a slit cut to allow the plastic to slide over the well head. This will be a separate sheet of plastic from the one used for the sampling equipment.

2.3 Groundwater Sample Collection

The bailer will be lowered slowly into the well to avoid volatilization of any dissolved-phase compounds that may be present in the groundwater. Once full, the bailer will be retrieved and containers filled by emptying the water through the hole at the bottom of the bailer. Glass 40-mL vials for VOC analyses will be filled in such a manner as to produce zero headspace in the vials. Polyethylene containers for metals analyses will be filled and sealed with the cap, leaving about ½-inch of airspace at the top. In addition to collecting the samples, water will be collected in the wide-mouth container for pH, temperature, and conductivity measurements. Upon completion of sampling, all groundwater samples, including equipment and trip blanks, will be placed in labeled and sealed plastic bags and stored in ice-filled coolers to chill the samples to 4°C

pending transport to a NCDENR-certified analytical laboratory. Contaminated nitrile gloves and twine will be discarded.

2.4 Surface Water Sample Collection

Surfacewater sampling will be taken with given consideration to minimize turbulence and aeration. As during groundwater sampling, surfacewater samples will be collected by a field technician wearing disposable gloves. Containers will be dipped at sampling location points by gently dipping the sample container into surfacewater and allowing surfacewater to flow over the mouth of container so as not to displace any preservative within the sample container. If there is little current movement, the container will be moved slowly through the water laterally. During times of low water, if the water is not deep enough to allow filling of sample containers, an appropriately decontaminated sampling cup will be used to retrieve the sample. All containers will be treated in the same manner as the groundwater samples. The samples will be sealed in labeled, plastic bags, and stored in an ice-filled cooler to chill the samples to 4°C pending transport to a NCDENR-certified analytical laboratory.

2.5 Chain of Custody

Chain-of-custody forms will be used to document the handling of all samples collected and listing all individuals who have taken possession of a given set of samples, including field personnel, laboratory couriers, and laboratory personnel. Trip blanks, equipment blanks, and sample containers will all travel and be stored together. Trip blanks will remain in the condition they are received from the laboratory and will not be opened or tampered with during the sampling. A chain-of-custody record will be completed for each day's samples, indicating the date and time, sample location, sample matrix (soil, water, etc.), and laboratory analyses to be conducted.

3 ANALYSIS

When the water samples reach the laboratory, they will be transferred to a sample custodian who will sign the chain of custody documentation as receipt of the samples. Internal control of the water samples in the laboratory will be in accordance with QA/QC procedures for the laboratory. Copies of QA/QC manuals for approved laboratories are on file at the Division of Solid Waste.

Groundwater and surface water samples will be analyzed for the Appendix I list of constituents; QA/QC procedures utilized during the testing will be in conformance with the laboratory QA/QC manual. Monitoring wells MW-3, MW-5, MW-6, MW-7, MW-11, MW-12, MW-12D, MW-13, MW-16, MW-24, MW-25, MW-26, MW-27, MW-28, MW-29, and MW-31 through MW-34 will be sampled for the Appendix I list and the aforementioned MNA performance parameters.

4 CONCLUSION

This report is included as part of the Corrective Action Plan for the Alexander County C&D Landfill. The ground and surfacewater monitoring plan is designed to be effective in the early detection of any possible release of hazardous constituents to the unconfined surficial and upper bedrock aquifers, and to provide indicator parameters of the natural degradation, HRC injection, and phytoremediation processes.

MUNICIPAL ENGINEERING SERVICES COMPANY, P.A.

Sean K. Patrick, P.G.
Professional Geologist

NORTH CAROLINA
LICENSED
SEAL
1776
GEOLOGIST
SEAN K. PATRICK

Table E-1. Summary of Ground and Surface Water Monitoring Points

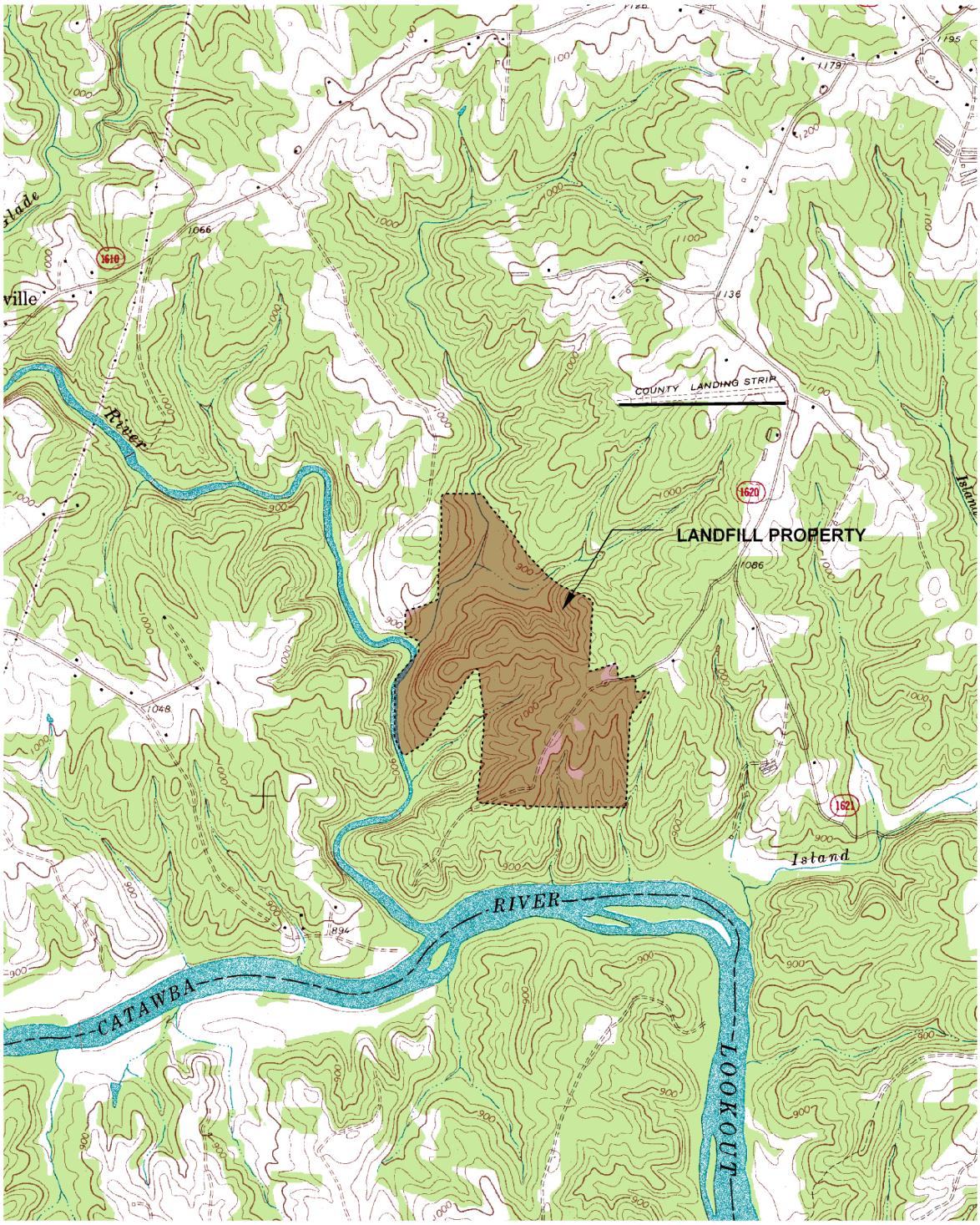
Sampling Point	Type	Gradient	Total Depth (ft)	Designation
MW-1	Monitoring Well	Down	40	Performance Well
MW-1A	Monitoring Well	Up	47.5	Monitoring Well
MW-1B	Monitoring Well	Up	61	Performance Well
MW-2	Monitoring Well	Down	30	Monitoring Well
MW-3	Monitoring Well	Down	33	Performance Well
MW-4R	Monitoring Well	Down	20.5	Monitoring Well
MW-5	Monitoring Well	Down	48.8	Monitoring Well
MW-6	Monitoring Well	Down	41	Monitoring Well
MW-7	Monitoring Well	Down	53	Monitoring Well
MW-8	Monitoring Well	Down	27.5	Background Well
MW-9	Monitoring Well	Down	31.5	Monitoring Well
MW-10	Monitoring Well	Down	91	Monitoring Well
MW-11	Monitoring Well	Down	56	Performance Well
MW-12	Monitoring Well	Down	66.5	Performance Well
MW-12D	Monitoring Well	Down	100	Performance Well
MW-13	Monitoring Well	Down	60.5	Monitoring Well
MW-14	Monitoring Well	Down	40.5	Monitoring Well
MW-15	Monitoring Well	Down	35	Monitoring Well
MW-16	Monitoring Well	Down	40.25	Performance Well
MW-17	Monitoring Well	Down	22.3	Monitoring Well
MW-18	Monitoring Well	Up	56.7	Background Well
MW-19	Monitoring Well	Down	63.92	Monitoring Well
MW-20	Monitoring Well	Down	63.55	Monitoring Well
MW-21	Monitoring Well	Down	41.05	Monitoring Well
MW-22	Monitoring Well	Down	18.12	Monitoring Well
MW-23	Monitoring Well	Down	21.54	Monitoring Well
MW-24	Monitoring Well	Down	35.35	Monitoring Well
MW-25	Monitoring Well	Down	44.48	Background Well
MW-26	Monitoring Well	Down	49.8	Monitoring Well
MW-27	Monitoring Well	Down	49.82	Monitoring Well
*MW-28**	Monitoring Well	Down	~40	Sentinel/Compliance Well
*MW-29**	Monitoring Well	Down	~40	Sentinel/Compliance Well
*MW-30**	Monitoring Well	Down	~50	Monitoring Well
*MW-31**	Monitoring Well	Down	~50	Sentinel Well
*MW-32**	Monitoring Well	Down	~50	Sentinel Well
*MW-33**	Monitoring Well	Down	~50	Sentinel Well
*MW-34**	Monitoring Well	Down	~50	Sentinel Well
SW-3	Surface Water	Down Stream		Tributary
SW-4R	Surface Water	Down Stream		Tributary
SW-5	Surface Water	Down Stream		Tributary

**Proposed monitoring well to be installed May-June 2009.*

Topographic Map with Landfill Location

PLATE A

Alexander County Landfill



QUADRANGLE LEGEND

ROAD CLASSIFICATION

Primary highway, hard surface

Light-duty road, hard or improved surface

Secondary highway, hard surface

Unimproved road

Interstate Route

U. S. Route

State Route

NOTE: Topographical map assembled from corresponding USGS 7.5-min. quadrangles of the subject region.

Date Completed	08/04/2008
Created By	M. German
Project Name	Sampling and Analysis Plan
Site Name	Alexander County Landfill
Project Number	G07060.0

Municipal Engineering Services Company, PA

0 1/2 1 MILE

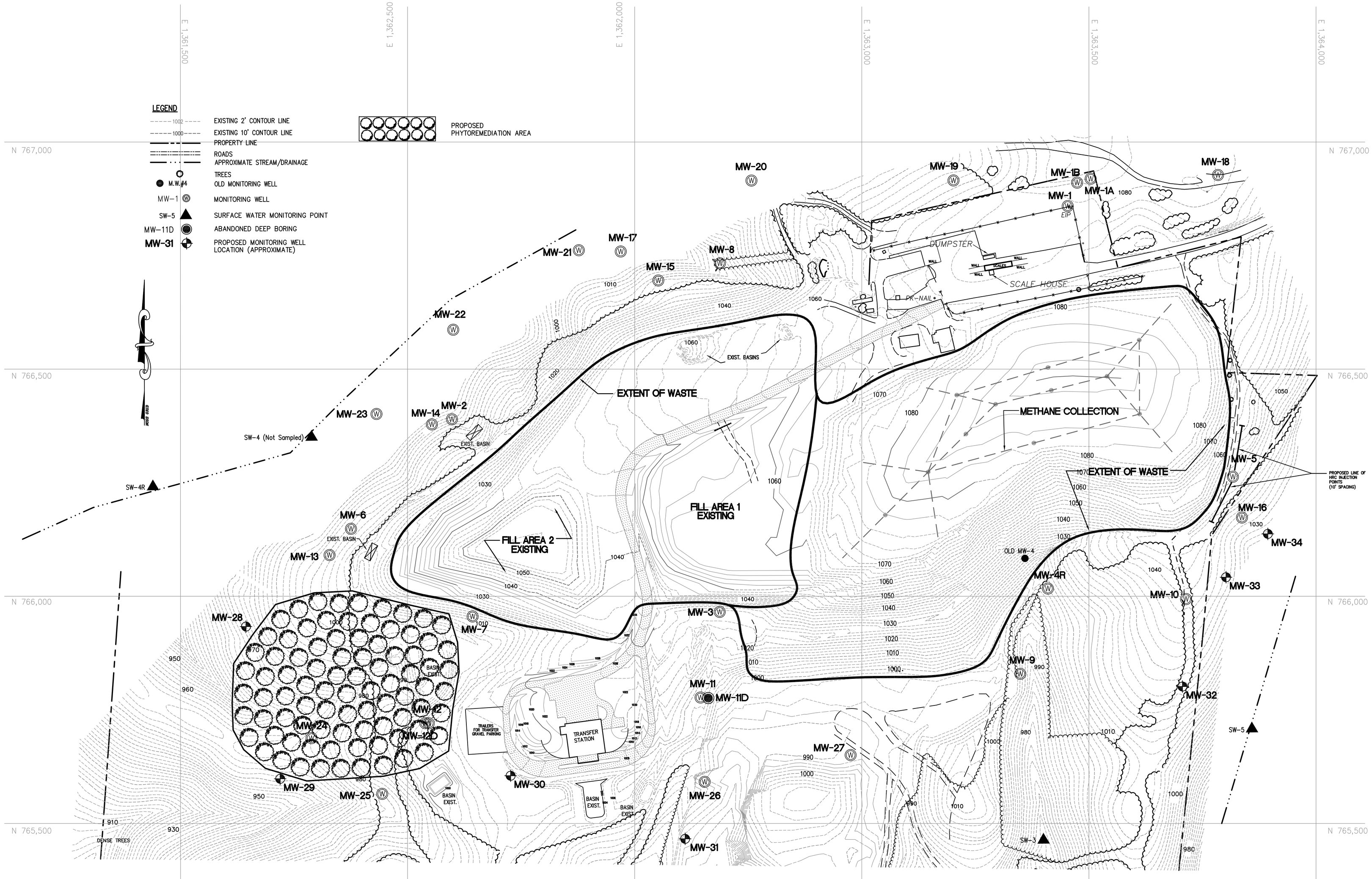


PLATE B

Municipal Services Engineering Company, P.A.

P.O. BOX 348 BOONE, N.C. 28607 (828) 262-1767

P.O. BOX 97 GARNER, N.C. 27529 (919) 772-5393

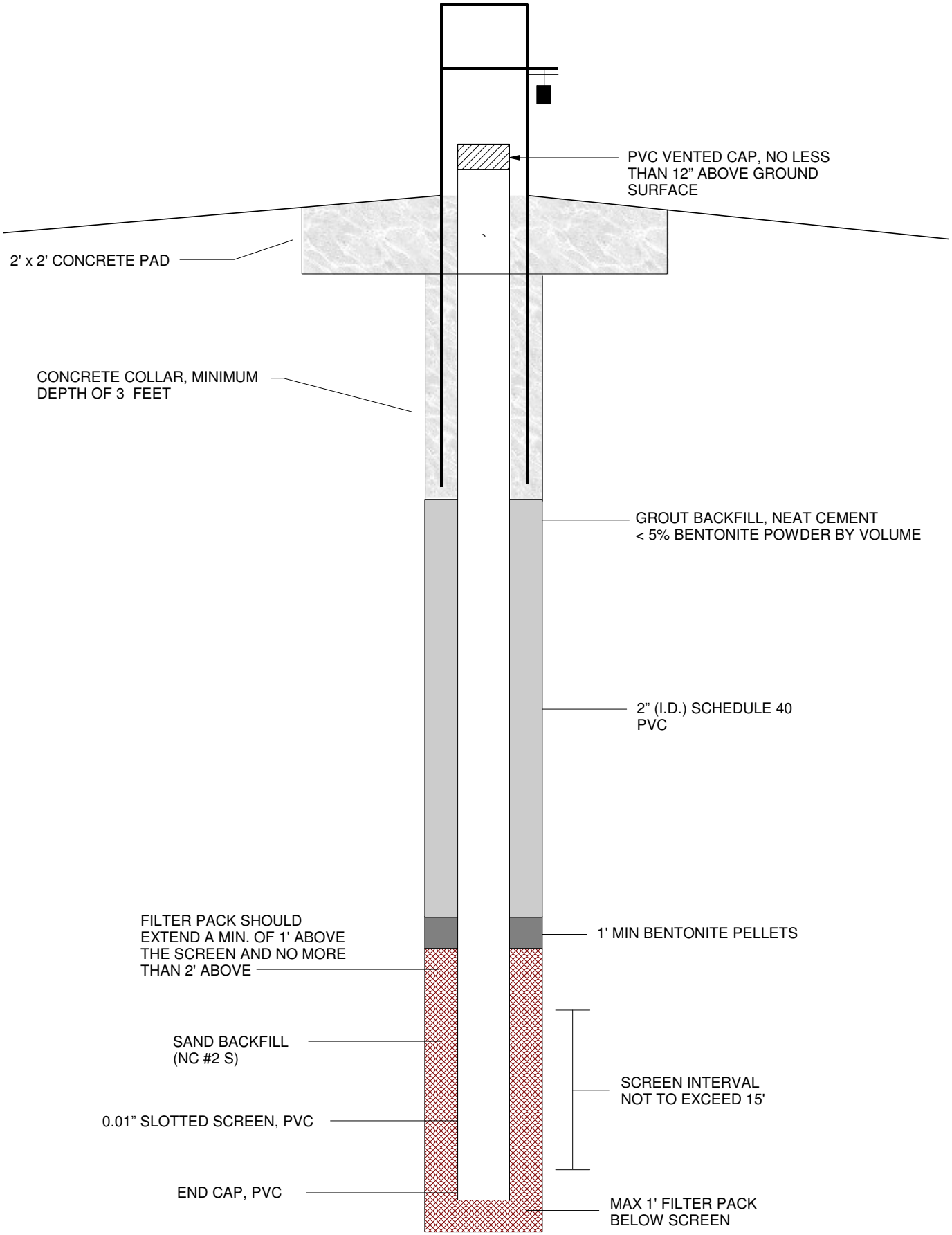
CONSTRUCTION AND DEMOLITION LANDFILL FACILITY
ALEXANDER COUNTY NORTH CAROLINA

DATE	BY	REV.	DESCRIPTION

SITE MAP W/ MONITORING LOCATIONS

SCALE:	1" = 100'
DATE:	01/19/09
DRWN. BY:	M. GERMAN
CHKD. BY:	S. PATRICK
PROJECT NUMBER	G07060.0
DRAWING NO.	PLATE B
SHEET NO.	1 OF 1

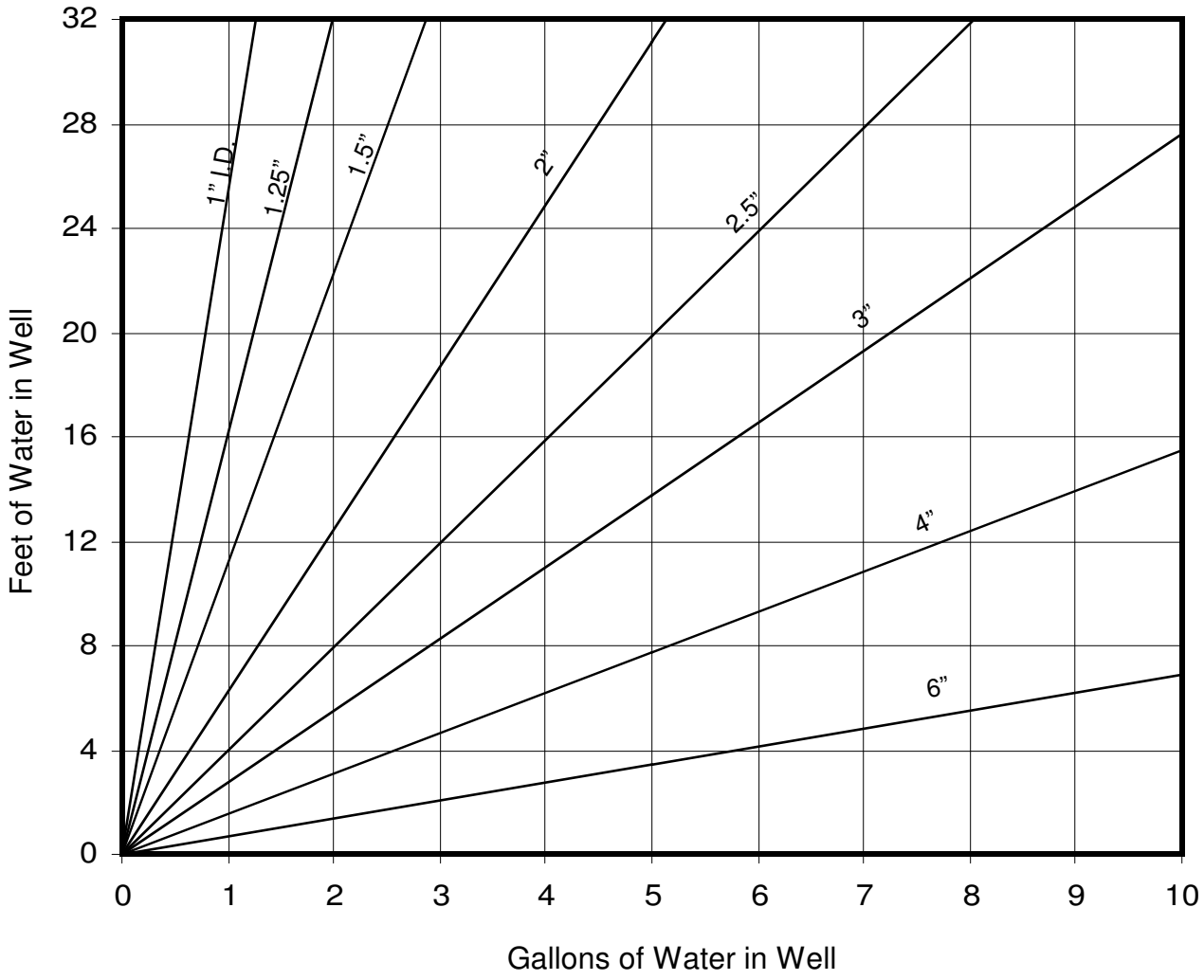
H:\C&D CAP\Alexander\AlexanderC&CAP - REVISED\CADPlates\Plate B- SAP Site Plan.dwg, PLATE 7, 1/26/2009 9:31:41 AM, spatrick, SKP



NOTE: SHALLOW WELLS REQUIRE A MINIMUM OF 5' COMBINED THICKNESS OF GROUT AND BENTONITE.

TYPICAL MONITORING WELL

PLATE C



GRAPHICAL PLOT OF STANDING VOLUMES OF WATER

PLATE D

APPENDIX C

3-D MicroEmulsion™ HRC ADVANCED®

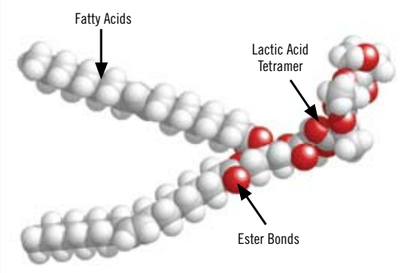
Achieve wide-area, rapid and sustai ned reductive dechlorination with continuous distribution and staged hydrogen release

3-D MicroEmulsion™ HRC ADVANCED®

PRODUCT FEATURES

- **Three Stage Electron Donor Release – Immediate, Mid-Range and Long-Term Hydrogen Production**
  - Provides free lactic acid, controlled-release lactic acid and long release fatty acids for effective hydrogen production for periods of up to 3 to 5 years.
- **Low-Cost**
  - 3-D Microemulsion is 25¢ to 42¢ per pound as applied
- **Maximum and Continuous Distribution via Micellar Transport**
  - Unlike oil products, 3DMe forms micelles which are mobile in groundwater and significantly enhance electron donor distribution after injection.
- **Wide-Area/High Volume Microemulsion Application**
  - High volume application increases contact with contaminants and reduces number of injection points required for treatment – minimizes overall project cost.

FIGURE 1: THE 3-D MICROEMULSION MOLECULAR STRUCTURE



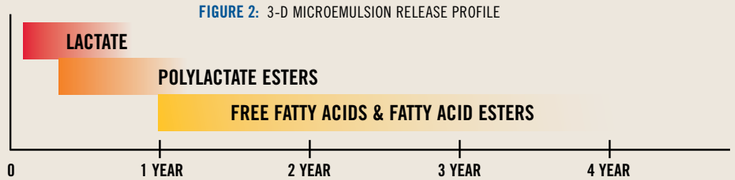
PRODUCT COMPOSITION

3-D Microemulsion (3DMe)™ is a form of HRC Advanced® and has a molecular structure specifically designed to maximize the cost-effective anaerobic treatment of contaminants in subsurface soils and groundwater. This structure (patent pending) is composed of free lactic acid, controlled-release lactic acid (polylactate) and certain fatty acid components which are esterified to a carbon backbone molecule of glycerin (Figure 1).

3DMe produces a sequential, staged release of its electron donor components. The immediately available free lactic acid is fermented rapidly while the controlled-release lactic acid is metabolized at a more controlled rate. The fatty acids are converted to hydrogen over a mid to long-range timeline giving 3DMe an exceptionally long electron donor release profile (Figure 2). This staged fermentation provides an immediate, mid-range and very long-term, controlled-release supply of hydrogen (electron donor) to fuel the reductive dechlorination process.

Typical 3DMe single application longevity is rated at periods of up to 3 to 5 years. With 5 years occurring under optimal conditions, e.g. low permeability, low consumption environments.

FIGURE 2: 3-D MICROEMULSION RELEASE PROFILE



APPLICATION AND DISTRIBUTION

3DMe applications can be configured in several different ways including: **grids, barriers** and **excavations**. The material itself can be applied to the subsurface through the use of **direct-push injection, hollow-stem auger, existing wells or re-injection wells**.

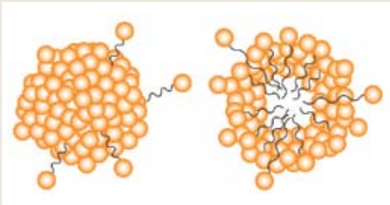
3DMe is typically applied in high-volumes as an emulsified, micellar suspension (microemulsion). The microemulsion is easily pumped into the subsurface and is produced on-site by mixing specified volumes of water and delivered 3DMe concentrate. Detailed preparation and installation instructions are available at www.regenesis.com.

3DMe is usually applied throughout the entire vertical thickness of the determined treatment area. Once injected, the emulsified material moves out into the subsurface pore spaces via micellar transport, eventually coating most all available surfaces. Over time the released soluble components of 3-D Microemulsion are distributed within the aquifer via the physical process of advection and the concentration driven forces of diffusion.

MORE ON MICELLES

Micelles (Figure 3) are groups (spheres) of molecules with the hydrophilic group facing out to the water and the "tails" or lipophilic moiety facing in. They are formed during the 3-D Microemulsion emulsification process and provide the added benefit of increased distribution via migration to areas of lower concentration.

FIGURE 3: MICELLE REPRESENTATION



MORE ON APPLICATIONS

3-D Microemulsion is delivered in 55 gallon drums, 300 gallon totes, tankers or buckets.

The microemulsion is easily prepared on-site and applied in high-volumes for maximum subsurface distribution.

3-D Microemulsion is typically applied through permanent wells or by using direct-push injection.

PERFORMANCE

Case Study #1

A site in Massachusetts showed high levels of PCE and its daughter products TCE and cis-DCE which had been consistently present for more than two years. 3DMe was applied in a grid configuration around monitoring well #16. In Figure 4, the contaminant concentration results indicate a rapid decrease in the parent product PCE and evidence of reductive dechlorination as demonstrated by the relative increases in daughter products TCE and cis-DCE.

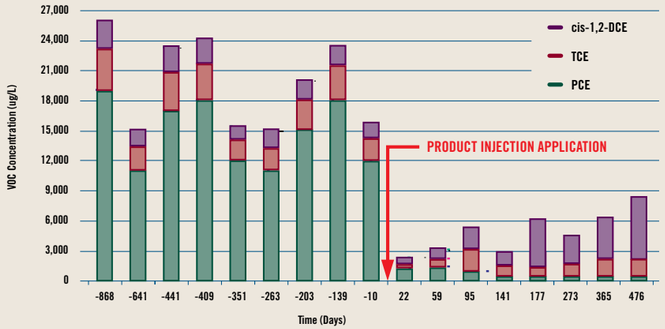


FIGURE 4: MW-16 CONTAMINANT CONCENTRATION DATA

Case Study #2

A site in Florida was characterized with PCE contamination approaching 225 ug/L A total of 1,080 pounds of 3DMe was applied via 16 direct-push injection points to reduce PCE concentrations. Monitoring results in well MW-103 indicated a PCE reduction of approximately 67% within 75 days of the 3DMe application. PCE concentrations continued to decline by 96% one year after application and daughter products remained at low levels. Total Organic Carbon (TOC) levels remained elevated at 17-19 mg/L after 275 days demonstrating the longevity of 3DMe (Figure 5).

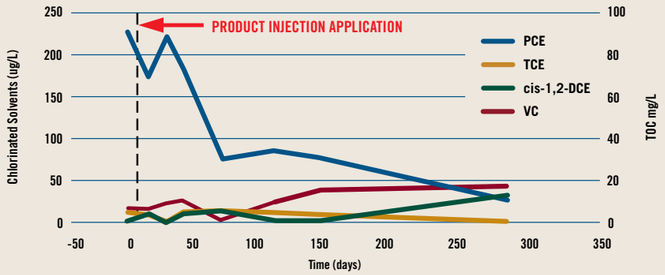


FIGURE 5: MW-103 CONTAMINANT CONCENTRATION DATA

3-D Microemulsion (3DMe)™
MATERIALS SAFETY DATA SHEET

Last Revised: March 26, 2007

Section 1 – Material Identification

Supplier:

REGENESIS

1011 Calle Sombra
San Clemente, CA 92673

Phone: **949.366.8000**

Fax: **949.366.8090**

E-mail: **info@regenesis.com**

Chemical Name(s):	• Glycerides, di-, mono [2-[2-[2-(2-hydroxy-1-oxopropoxy)-1-oxopropoxyl]-1-oxopropoxy]propanoates] • Propanoic acid, 2-[2-[2-(2-hydroxy-1-oxopropoxy)-1-oxopropoxy]-1-oxopropoxy]-1,2,3-propanetriyl ester • Glycerol
Chemical Family:	**Organic Chemical**
Trade Name:	**3-D Microemulsion (3DMe)™**
Synonyms:	**HRC Advanced™ HRC-PED (Hydrogen Release Compound – Partitioning Electron Donor)**
Product Use:	**Used to remediate contaminated groundwater (environmental applications)**

Section 2 – Chemical Identification

CAS#	Chemical
823190-10-9	**HRC-PED**
61790-12-3 or 112-80-1	**Fatty Acids (neutralized)**
201167-72-8	**Glycerol Tripolylactate**
56-81-5	**Glycerol**

Section 3 – Physical Data

Melting Point:	**Not Available (NA)**
Boiling Point:	**Not determined (ND)**
Flash Point:	**> 200 ºF using the Closed Cup method**
Density:	**0.9 -1.1 g/cc**
Solubility:	**Slightly soluble in acetone. Insoluble in water.**
Appearance:	**Amber semi-solid.**
Odor:	**Not detectable**
Vapor Pressure:	**None**

Section 4 – Fire and Explosion Hazard Data

Extinguishing Media:	**Use water spray, carbon dioxide, dry chemical powder or appropriate foam to extinguish fires.**

Water May be used to keep exposed containers cool.

For large quantities involved in a fire, one should wear full protective clothing and a NIOSH approved self contained breathing apparatus with full face piece operated in the pressure demand or positive pressure mode as for a situation where lack of oxygen and excess heat are present.

Section 5 – Toxicological Information

Acute Effects:	**May be harmful by inhalation, ingestion, or skin absorption. May cause irritation. To the best of our knowledge, the chemical, physical, and toxicological properties of the 3-D Microemulsion have not been investigated. Listed below are the toxicological information for glycerol, lactic acid and fatty acid.**	
RTECS#	**MA8050000**	
	Glycerol	
Irritation Data:	**SKN-RBT 500 MG/24H MLD**	**85JCAE-,207,1986**
	EYE-RBT 126 MG MLD	**BIOFX* 9-4/1970**
	EYE-RBT 500 MG/24H MLD	**85JCAE-,207,1986**

Section 5 – Toxicological Information (cont)

Toxicity Data:	**ORL-MUS LD50:4090 MG/KG**	**FRZKAP (6),56,1977**
	SCU-RBT LD50:100 MG/KG	**NIIRDN 6,215,1982**
	ORL-RAT LD50:12,600 MG/KG	**FEPRA7 4,142,1945**
	IHL-RAT LC50: >570 MG/M3/1H	**BIOFX* 9-4/1970**
	IPR-RAT LD50: 4,420 MG/KG	**RCOCB8 56,125,1987**
	IVN-RAT LD50:5,566 MG/KG	**ARZNAD 26,1581,1976**
	IPR-MUS LD50: 8,700 MG/KG	**ARZNAD 26,1579,1978**
	SCU-MUS LD50:91 MG/KG	**NIIRDN 6,215,1982**
	IVN-MUS LD50:4,250 MG/KG	**JAPMA8 39,583,1950**
	ORL-RBT LD50: 27 MG/KG	**DMDJAP 31,276,1959**
	SKN-RBT LD50: >10 MG/KG	**BIOFX* 9-4/1970**
	IVN-RBT LD50: 53 MG/KG	**NIIRDN 6,215,1982**
	ORL-GPG LD50: 7,750 MG/KG	**JIHTAB 23,259,1941**

Target Organ Data: **Behavioral (headache), gastrointestinal (nausea or vomiting), Paternal effects (spermatogenesis, testes, epididymis, sperm duct), effects of fertility (male fertility index, post-implantation mortality).**

Only selected registry of toxic effects of chemical substances (RTECS) data is presented here. See actual entry in RTECS for complete information on lactic acid and glycerol.

Fatty Acids

Acute oral (rat) LD50 value for fatty acids is 10000 mg/kg. Aspiration of liquid may cause pneumonitis. Repeated dermal contact may cause skin sensitization.

Section 6 – Health Hazard Data

One should anticipate the potential for eye irritation and skin irritation with large scale exposure or in sensitive individuals. Product is not considered to be combustible. However, after prolonged contact with highly porous materials in the presence of excess heat, this product may spontaneously combust.

Handling: **Avoid continued contact with skin. Avoid contact with eyes.**

In any case of any exposure which elicits a response, a physician should be consulted immediately.

First Aid Procedures

Inhalation: **Remove to fresh air. If not breathing give artificial respiration. In case of labored breathing give oxygen. Call a physician.**

Ingestion: **No effects expected. Do not give anything to an unconscious person. Call a**

physician immediately. DO NOT induce vomiting.

Section 6 – Health Hazard Data (cont)

Skin Contact:	**Flush with plenty of water. Contaminated clothing may be washed or dry cleaned normally.**
Eye Contact:	**Wash eyes with plenty of water for at least 15 minutes lifting both upper and lower lids. Call a physician.**

Section 7 – Reactivity Data

Conditions to Avoid:	**Strong oxidizing agents, bases and acids**
Hazardous Polymerization:	**Will not occur.**
Further Information:	**Hydrolyses in water to form lactic acid, glycerol and fatty acids.**
Hazardous Decomposition Products:	**Thermal decomposition or combustion may produce carbon monoxide and/or carbon dioxide.**

Section 8 – Spill, Leak or Accident Procedures

After Spillage or Leakage:	**Neutralization is not required. The material is very slippery. Spills should be covered with an inert absorbent and then be placed in a container. Wash area thoroughly with water. Repeat these steps if slipperiness remains.**
Disposal:	**Laws and regulations for disposal vary widely by locality. Observe all applicable regulations and laws. This material may be disposed of in solid waste. Material is readily degradable and hydrolyses in several hours.**

No requirement for a reportable quantity (CERCLA) of a spill is known.

Section 9 – Special Protection or Handling

Should be stored in plastic lined steel, plastic, glass, aluminum, stainless steel, or reinforced fiberglass containers.

Protective Gloves:	**Vinyl or Rubber**
Eyes:	**Splash Goggles or Full Face Shield. Area should have approved means of washing eyes.**
Ventilation:	**General exhaust.**
Storage:	**Store in cool, dry, ventilated area. Protect from incompatible materials.**

Section 10 – Other Information

This material will degrade in the environment by hydrolysis to lactic acid, glycerol and fatty acids. Materials containing reactive chemicals should be used only by personnel with appropriate chemical training.

The information contained in this document is the best available to the supplier as of the time of writing. Some possible hazards have been determined by analogy to similar classes of material. No separate tests have been performed on the toxicity of this material. The items in this document are subject to change and clarification as more information becomes available.

REGENESIS

Hydrogen Release Compound (HRC®) Installation Instructions

(HELPFUL HINTS)

Application in Cold Weather Settings:

The viscosity of HRC is directly related to the ambient temperature. As discussed in the Material Overview, Handling, and Safety section, cold weather tends to increase HRC viscosity and decrease ease of pumping. To maintain HRC at a temperature/viscosity at which it is easy to apply:

1. Raise and maintain HRC's temperature to at least 95°F (35°C) prior to pouring it into the pump hopper

2. Insulate the delivery hose and keep the pump and hot water bath inside an enclosed structure such as a cargo van or trailer

3. Periodically check the HRC temperature in the hopper

4. Occasionally re-circulate HRC through the pump and hose to maintain temperature and viscosity

5. The volume of HRC recirculated should not exceed the volume of HRC in the hopper

6. Do not constantly recirculate HRC through the pump and hoses, as this may adversely affect HRC's longevity.

HRC Bedrock Applications:

When contaminants are present in competent bedrock aquifers, the use of direct push technology as a delivery method is not possible. *Regenesis is in the process of developing methods for applying HRC via boreholes drilled using conventional rotary techniques.* To develop the best installation strategy for a particular bedrock site, it is critical that our customers call the technical support department at Regenesis early in the design process.

HRC can be applied into a bedrock aquifer in cased and uncased boreholes. HRC can be delivered by simply filling the borehole without pressure or by using a single or straddle packer system to inject HRC under pressure. Selection of the appropriate

delivery method is predicated on site-specific conditions. The following issues should be considered in developing an HRC delivery strategy:

Is the aquifers transmissivity controlled by fractures?

Backfilling may be the better delivery method in massive, un-fractured bedrock, this is particularly true in an aquifer setting with high permeability and little fracturing

Intervals greater than 10 feet will require a straddle packer system).

- such as found in massive sandstone

- Down-hole packer systems may be more advantageous in fractured bedrock aquifers

- In this case the fracture type, trends, and interconnections should be evaluated and identified

Is the injection and monitoring wells connected by the same fractures?

Determine if it is likely that the HRC injection zone is connected to the proposed monitoring points

If pressure injection via straddle packers is desired, consideration should be given to the well construction. Specific issues to be considered are:

- Diameter of the uncased borehole (*will casing diameter allow a packer system to be used*?)

- Diameter of the casing (same as above)

- Strength of the casing (can it withstand the delivery pressures?)

- Length of screened interval (screened intervals greater than 10 feet will require a straddle packer system).

For direct assistance or answers to any questions you may have regarding these instructions, contact Regenesis Technical Services at 949-366-8000.

REGENESIS, 2003
www.regenesis.com

HRC TECHNICAL BULLETIN #2.5.1

Plume Area Treatment Example

HRC injection grids are commonly employed at project sites where a localized plume of chlorinated solvent contamination exists. HRC injection grids are often applied to affect a very cost-effective remediation. The design process for this treatment strategy is described below for a hypothetical site. After the example, a description of the various spreadsheet input parameters is provided for reference.

Step 1: Gather Relevant Site Assessment Data

As with any remediation design, the first step is to gather the relevant site assessment data. For example, consider the following site:

Lithologic data: Groundwater is located 10 feet below the ground surface (bgs) and extends to a depth of 40 feet bgs at which point a clay aquitard is encountered. Aquifer sediments consist primarily of silty sands.

Contaminant concentrations: PCE concentration ranges from 0.1 to 5 mg/L. Daughter products of the biological degradation of PCE are identified at the following concentrations: TCE at 0.5 mg/L and cis-1,2-DCE at 0.5 mg/L.

Extent of impacted groundwater:

The aerial extent of the contaminant plume is estimated to be 50 feet wide by 100 feet long.

Most groundwater monitoring wells contain screen intervals that extend to a depth of 20 feet bgs. Vertical profiling of the contaminants is accomplished by (1) installing several groundwater wells with screened intervals located from 25 to 30 feet bgs and (2) by collecting groundwater samples using direct push equipment. This results in the conclusion that the contaminants are limited to the upper 15 feet of the aquifer.

Aquifer redox conditions: ORP = 100 mV, DO = 2 mg/L, nitrate = 1 mg/L, dissolved iron = 10 mg/L, sulfate = 50 mg/L

Additional aquifer parameters: The following parameters were collected through soil and groundwater investigations or estimated or calculated using industry standard procedures: fraction of organic carbon (0.005), porosity (0.3), hydraulic gradient (0.005 ft/ft), hydraulic conductivity (10 ft/day or 3.5x10-3 cm/sec), groundwater velocity (60 ft/yr).

Step 2: Evaluate Site Data and Specify HRC Grid Design and Cost

The next step is to determine the scope of the remediation. After evaluating health risks and groundwater quality thresholds, the designer specifies a cleanup goal and the extent of the contaminant plume requiring remediation. For this example, assume that the following decisions are made concerning the remediation design:

Aerial and vertical extent of aquifer requiring remediation: 50 feet x 100 feet x 15 feet

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Conservative estimate of contaminant concentrations to be bioremediated: 5 mg/L PCE, 0.5 mg/L TCE, and 0.5 mg/L cis-1,2-DCE

The presence of daughter products from the reductive dechlorination of PCE indicates that the biodegradation of PCE is occurring to a limited extent. Geochemical parameters (ORP, DO, etc.) indicate that the aquifer redox conditions are not yet in the optimum range for the reductive dechlorination of chlorinated hydrocarbons. Furthermore, there is no apparent electron donor (or hydrogen source) to stimulate further dechlorination. The remediation designer decides that HRC can be used to provide the aquifer with a consistent low level of hydrogen accelerating the reductive dechlorination of PCE and its daughter products.

The quantity of HRC needed to fuel the reductive dechlorination process is estimated using the site assessment data and general design guidelines. The HRC grid design process is simplified by using the HRC Grid Design worksheet found on the HRC Application Software (available from Regenesis) and consists of specifying the following design variables:

Site information: Plume dimensions, aquifer transport parameters, and contaminant and CEA concentrations are entered into the worksheet.

Demand factors: A microbial demand factor of 3x is used, and an additional demand factor of 3x is chosen since the entire source of the contaminant plume is targeted for remediation with one application of HRC.

HRC delivery point spacing: A delivery point spacing of 10 feet on center is selected to provide a reasonable distribution of HRC into the contaminant plume. This results in an HRC grid of 10 rows of 5 points per row, for a total of 50 delivery points.

HRC injection amounts: The contaminant and competing electron acceptor concentrations, adsorbed phase concentrations, and demand factors are used to estimate the required amount of hydrogen and corresponding HRC required for the reductive dechlorination reactions. For a 10 feet-on-center spacing (and 50 total injection points as determined above), a vertical HRC application rate of 6.8 lbs/ft is calculated by the software. Therefore, a total of 5,107 pounds of HRC are required (50 points with 15 feet of injection per point at 6.8 pounds of HRC per vertical foot).

Cost estimate: The HRC material cost for this example is $6/lb for a total of approximately $30,640. Costs of HRC product, shipping and applicable taxes vary from site to site and should be requested from Regenesis' sales or technical support staff if a detailed cost estimate is needed. HRC installation costs can be estimated using a daily rate for the injection subcontractor and an estimate of the production rate for the site. For this example, it is assumed that two injection points can be completed per hour and that a Geoprobe rig costs $2,000 per day and is mobilized for $1,000. The installation cost for 50 injection points to a depth of 25 feet is then $9,000, resulting in a total installation and HRC material cost of approximately $40,700.

To summarize, the following issues should be considered during the HRC grid design and cost estimation process:

Injection point spacing typically ranges from 5 to 15 feet-on-center, and its specification depends on groundwater velocity, sediment permeability, required HRC injection amounts, and HRC grid size.

The HRC injection rate for each point typically ranges from 4 to 10 lb/ft, and its specification depends on the contaminant concentrations, competing electron acceptor concentrations,

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competing microbial demand, and soil type. It should be noted that using fewer points and higher doses might not provide sufficient distribution of HRC and lactic acid throughout the contaminant plume.

For larger plumes and/or large ranges of contaminant concentrations, the HRC dose rate should be adjusted as appropriate (i.e., the plume can be divided into high-, medium-, and low-contaminant concentration areas, each with a specific HRC dose rate).

- The need for reapplication of HRC will depend on achievable biodegradation rates, remedial goals for the site, proximity of downgradient receptors, and other technical/regulatory issues. Some sites will require only one application of HRC, while others may require multiple reapplications (the reapplications typically will be done at lower HRC doses and in a smaller grid area).

Input and Output Parameters for HRC Applications Software

1) General Information on Software Use

User input parameters are shown in blue, whereas cells containing the results of calculations are shown in black. Red warnings or guiding comments may be generated in response to the spreadsheet calculations. Dialog boxes and point and click buttons are available to assist with data entry and to navigate the software.

2) Basic Site Characteristics

Basic site characteristic parameters are needed to specify the physical site characteristics. The width and depth of the contaminant plume refer to the planned treatment area, which can vary depending on remedial goals and cleanup strategy.

Thickness of the Contaminated Saturated Zone specifies the vertical thickness across which HRC will be delivered. The vertical thickness is dictated by the estimated thickness of the contaminant plume. For instance, if a site has a contaminant plume spanning the saturated zone above an aquitard, then the design should treat the aquifer down to the aquitard. If the contaminant plume is limited to a localized depth interval or lithologic layer, then HRC injection can be limited to the contaminated depth interval.

The HRC material cost is proportional to the thickness specification. Therefore, it is important to determine the vertical contaminant distribution as accurately as possible. If only moderate concentrations of contaminant are present, and no vertical profile of the plume has been done, Regenesis suggests that the user assume a thickness of approximately 20 feet. Porosity refers to the total porosity of the aquifer soil matrix. Using the above input parameters, the software will calculate the treatment zone pore volume.

Next, information regarding aquifer transport properties are requested. The hydraulic gradient and conductivity are used to calculate the groundwater seepage velocity, which can be used to select delivery point spacing and evaluate flow dynamics within the grid.

3) Dissolved-phase Groundwater Concentrations

Under this category of input parameters, representative contaminant concentrations are specified for the area where HRC will be delivered. Specifically, dissolved-phase concentrations that are determined by groundwater well sampling and analysis are entered here. While it is important to consider the most recent data available, the input values should represent the concentration that the user judges to be indicative of actual subsurface conditions over the course of an entire hydrogeologic cycle.

Regenesis has included input spaces for the most commonly encountered chlorinated solvents;

however, HRC will stimulate the degradation of a myriad of pollutants. If the contaminant the user is concerned with is not listed for input, please contact Regenesis directly. We will be glad to assist in determining the amount of HRC required to treat other less common contaminants.

4) Sorbed Phase Contaminant Mass

For HRC grid designs, there is usually a multiple of the total dissolved contaminant mass that is bound to the saturated soil zone matrix. This is called hydrophobically sorbed contamination and can be visualized as a thin layer of contaminant that is retained by clean aquifer materials when they come into contact with a dissolved contaminant flow. The mass of contaminant sorbed to the aquifer matrix is a function of the bulk density of the aquifer matrix, the fraction of organic carbon in the matrix (foc), and the contaminant-partitioning coefficient (Koc). An estimate of the mass of sorbed contamination is calculated in this section by entering the factors mentioned above. Input values for the soil, the bulk density, and the fraction of organic carbon (foc) can be measured or estimated based on soil type. The Koc value can be obtained for each contaminant from any number of published references.

5) Competing Electron Acceptor Concentrations

The concentrations of competing electron acceptors (CEAs) such as dissolved oxygen, nitrate, ferric iron, and sulfate have an effect on the amount of HRC required for enhancing in-situ bioremediation. Hydrogen from the HRC is used to reduce these CEAs to create redox conditions that are conducive to reductive dechlorination processes. As a result, the CEA demand for hydrogen (and consequently HRC) must be considered in the specification of the amount of HRC required for a project. Groundwater data indicating the actual site values for these parameters are important in determining an accurate final design for HRC application. However, in the absence of these data, reasonable estimates of these values can be made to generate a preliminary design and cost estimate.

6) Microbial Demand Factor

In addition to contaminant and CEA demand for HRC, subsurface microbes will use some of the lactic acid as a source of energy or structural carbon. Therefore, in designing an HRC application, these competing microbial processes must be taken into account. Regenesis' experience indicates that a value of 3 suffices under most conditions. However, if site-specific laboratory microcosm data are available, the designer can input the appropriate value directly.

7) Additional Demand Factor

Additional Demand Factor is used to account for uncertainty about the potential sinks for electron donor. This factor can be thought of as a contingency or safety factor, which is used to account for the many uncertainties inherent in a subsurface investigation and in situ remediation project. Potential sources of additional HRC demand include higher than expected contaminant mass (in the form of residual phase DNAPL and/or high concentration hot spots), microbial demand in excess of the estimated 3x, and uncertainty about the quantity of HRC required for the reduction of iron and manganese. The simple measurement of the concentrations of these competing electron acceptors in groundwater samples does not give an accurate representation of the iron and manganese reduction demand since these species may be present either as colloids or attached to the soil matrix. Regenesis recommends an additional demand factor of 2 to 3 for a first application at a site.

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8) Life Span for One Application (for barrier designs)

For HRC barrier designs, the life span for one application should be input in this field.

This value is used with the groundwater seepage velocity to estimate the flow of contaminant mass into the barrier during this period of time.

9) HRC Delivery Point Spacing and HRC Dosing Rate

For grid designs, the recommended spacing for HRC delivery points ranges from 5 feet-on-center to 15 feet-on-center. Spacing is a function of soil type, groundwater velocity, and necessary HRC dosing. Generally, the lower the hydraulic conductivity of the soil matrix, the closer the spacing. For sites with silts and clay, delivery point spacing should be 5 to 8 feet-on-center, while a site with sands and gravels may have a spacing up to 15 feet-on-center. The Delivery Point Spacing section of the Grid Design worksheet allows the designer to calculate the required number of points and HRC dose rate for a given plume size and spacing.

For barrier designs, a series of staggered HRC injection point rows are typically constructed. The effective spacing of delivery points perpendicular to the groundwater flow should be no more than 10 feet-on-center. The Delivery Point Spacing section of the Barrier Design worksheet allows the designer to estimate the required number of points and HRC dose rate for a given barrier length and contaminant flow rate.

10) Proposed HRC Grid Specifications

In this section of the worksheet, the designer may adjust the total number of injection points and the HRC dosing rate or leave it as calculated. The software will then calculate the cost of HRC material and estimate the cost of shipping and taxes for the given scope of the project (i.e., number of points, treatment thickness, and HRC dosing rate).

11) HRC Installation Cost Estimate and Total Project Cost

Although Regenesis does not perform installation services, our experience on many applications has given us an understanding of the costs associated with installing the HRC. This section offers the designer an opportunity to estimate how much the HRC grid or barrier application will cost. The suggested input parameters required are based on Regenesis' experience. The result of this section is an estimated subcontractor installation cost. This estimate should be adjusted based on local contractor costs. The Total Project Cost provided represents the sum of the HRC Installation Cost Estimate and the HRC Material Costs. It does not include the costs associated with groundwater monitoring, reporting, or consulting oversight.

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Hydrogen Release Compound HRC®

HRC Performance Characteristics - Longevity

General Background

Since Hydrogen Release Compound (HRC®) is a time-release product, one of the central issues in site design and one of the most frequently asked questions is "How long does it last"? The short answer is that the basic HRC now sold, specifically defined as a formulation of Glycerol Polylactate (GPL), diluted with glycerol to a viscosity of 20,000 centipoise (cP), is estimated to stimulate reductive dechlorination within the aquifer for about 12 months. The longevity is a function of basic product chemistry and certain biological and geochemical features of the aquifer. HRC has been shown to have a direct effect on contaminants resulting from the lactic acid release and other secondary effects, related to the formation of other organic acids that "borrow hydrogen" and recycled biomass, that have a more prolonged effect on aquifer conditions.

Theoretical Considerations

Longevity as a Function of HRC Chemical Characteristics

Hydrogen Release Compound is a specific article of commerce as described. The "active ingredient", Glycerol (tri) Polylactate (GPL), is one of a family of polylactate esters, defined by our patent, that upon hydration break down to release lactic acid. The exact chemical nature of a specific polylactate ester, such as GPL, is a major factor in product longevity. In essence, the structure and degree of esterification determine viscosity and viscosity is a critical factor in longevity.

Structurally, an ester is the product of a reaction between an organic acid (COOH group) and an alcohol (OH group). In this reaction as shown in Figure 1, the two groups react and water drops out forming the ester linkage, noting that the amount of water removed in esterification can affect viscosity. The example used shows methyl alcohol reacting with lactic acid to form a simple lactate ester (methyl lactate).

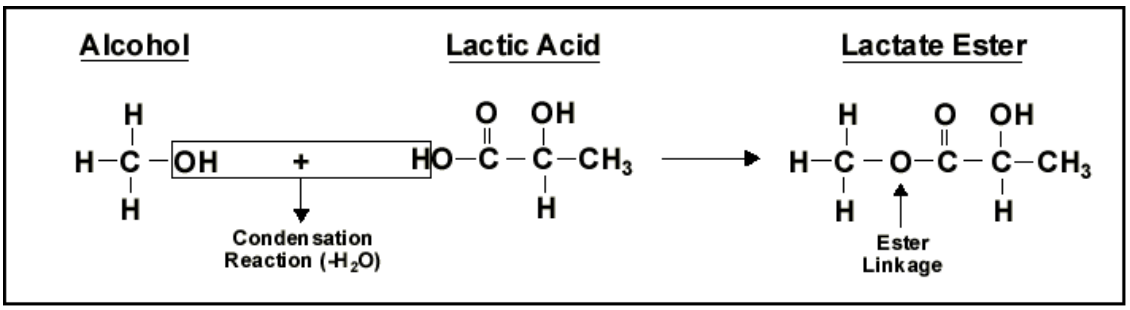

Figure 1. Formation of an Ester.

Polylactate esters are formed from the combination of certain alcohols with a unique lactic acid complex serving as the organic acid group. The alcohols used are compounds such as glycerol (3 OH groups), xylitol (5 OH groups) and sorbitol (6 OH groups). These "foundation" molecules are then esterified with a polylactic acid complex as illustrated in Figure 2.

One of the unique features of the polylactic acid complex is that lactic acid is esterified to itself. This is possible because lactic acid, as shown in Figure 1, has both an OH and a COOH group. As a result we can typically produce trimers or tetramers of lactic acid and create a "polylactic acid complex" or "polylactate complex", which is in turn esterified to the foundation OH donor as described.

The Glycerol (tri) Polylactate (GPL) component of the HRC in commerce is specifically the molecule in Figure 2. However, GPL itself can vary as a function of how many OH positions are actually esterified, so that one could have glycerol (tri) polylactate if all 3 are filled or glycerol (di)polylactate if just 2 are filled. The GPL in HRC is the Glycerol (tri) polylactate ester

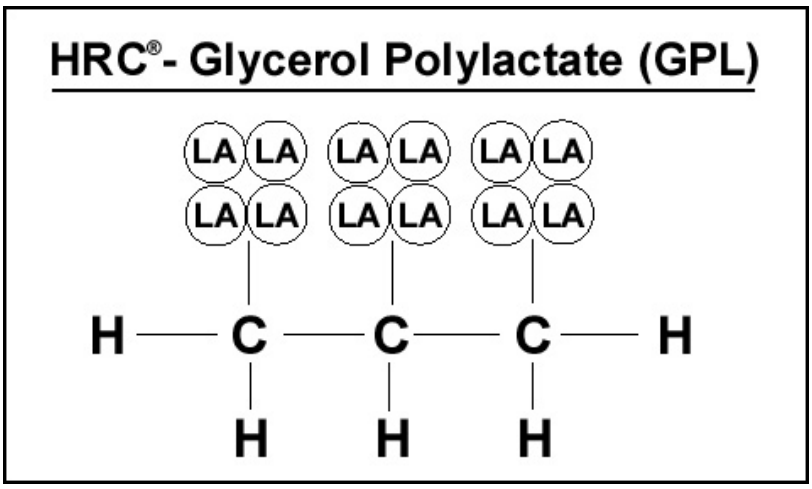

Figure 2. Structure of Glycerol (tri) Polylactate (GPL)

The point of this is to emphasize that the degree of complexity and esterification of the molecule control its viscosity and hence a major component of its reactivity. This in turn controls product longevity under a uniform set of conditions. For example, the (tri)polylactate form of GPL would be more viscous that the (di)polylactate form. Further, a molecule built with tetramers of lactic acid would be more viscous than one made with trimers. As a final example a sorbitol polylactate ester is more viscous than a glycerol polylactate ester, because it is based on 6 carbons rather than 3 carbons.

Viscosity becomes a dominant issue in longevity because it is a measurement of resistance to flow. As a result, viscosity controls the evolution of surface area over time and the speed at which HRC becomes soluble in water. Therefore, if a polylactate formulation becomes less viscous it will spread more, thus exposing more sites to chemical and biological attack. The latter case, involving the enzymatic action of microorganisms, is a particularly powerful mechanism and this will be expanded on later. In essence, "thicker lasts longer", which one would intuitively gather for the reaction of any solute with a solvent.

Returning to viscosity for a moment, we said that it is a measure of resistance to flow and can be measured in a viscometer. In a viscometer, the substance being tested is placed between two plates, one being stationary and one being movable. The amount of force applied to overcome resistance to the movement of the moveable plate is the key variable. Consequently, the units of viscosity in SI units are force-based, e.g., dyne-sec/cm^2 or Poise (P). Typically we measure the viscosity of HRC in centipoise (cP).

To be pumpable for push-point injection, HRC has to be about 20,000 cP (like honey). This is achieved by cutting raw GPL, which is about 200,000 cP (gel-like), with glycerol - by a factor of about 2, noting that the relationship between dilution and viscosity is non-linear. Therefore, we produce a form of HRC at 200,000 cP, as a function of the specific chemical structure, such that when it is cut about 50:50 with glycerol we achieve a pumpable 20,000 cP material.

Longevity as a Function of Aquifer Characteristics

The viscosity of the HRC is still only one side of the equation. The other important feature concerns the environment the HRC is placed into. An experimental model for the dynamics of HRC utilization in the bioremediation of TCE is published in Farone, Koenigsberg and Hughes (1999). Copies of this and other papers cited herein are available on request from Regenesis and it is convenient to use our web site at www.regenesis.com.

The model, which was calibrated with laboratory microcosm tests, clearly demonstrates that the nature and extent of microbial populations has a significant effect on the longevity of HRC. Simply put, most microbes - not just the kinds that ferment lactic acid into hydrogen or those that promote reductive dechlorination - will produce esterases and lipases that degrade HRC and release lactic acid.

Therefore, if an aquifer has a high microbial population it will metabolize a given mass of HRC at a faster rate than if the microbial counts are moderate to low. An example of this is presented in Figure 3 that shows a difference in lactic acid release rates at three different microbial concentrations. Note that this lab test represents a highly accelerated condition relative to field results, because everything is optimized and reacted in close proximity in the test tube environment.

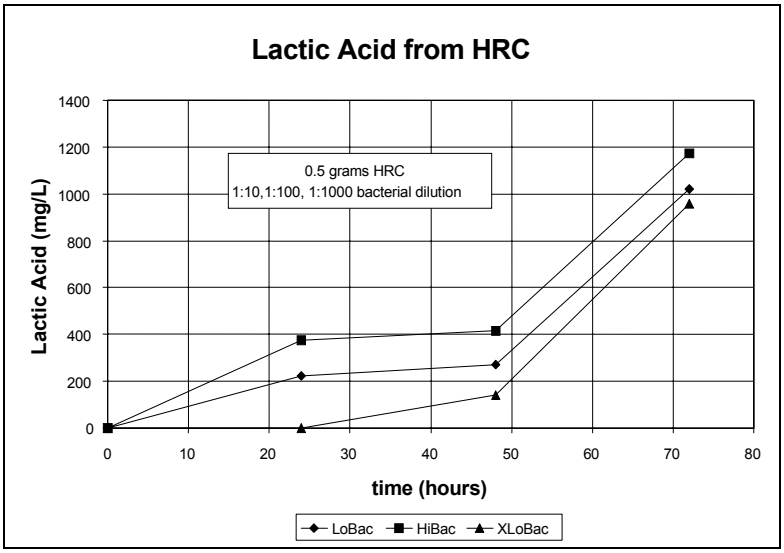

Figure 3. Lactic Acid Release Rates as a Function of Microbial Population.

Early Laboratory Work

Table 1 presents data that reflect a set of minimum times that standard HRC has lasted in the laboratory. Again, note that laboratory tests generally have high rates of activity relative to the field. The tests summarized below, were conducted to test the efficacy of HRC in remediating TCE and were not longevity tests per se. For economic reasons they were only run for about three months to collect the remediation rate data. Still, the tests supply some useful minimums for longevity. The tests were macrocosm studies conducted in Aquifer Simulation Vessels (ASVs) with a flow rate of about 1 ft/day. For a further discussion of the ASV type studies, please refer to TB 2.4.3.

Table 1. Macrocosm (ASV) Tests.

Product	Duration of Test	Presence of Product at Conclusion
GPL 52%/Glycerol 48%	84 days	Yes
GPL 52%/Glycerol 48%	80 days	Yes
GPL 52%/Glycerol 48%	80 days	Yes
GPL 52%/Glycerol 48%	94 days	Yes

Recent Laboratory Work

Recently an ASV study was established to specifically look at both longevity and diffusion issues regarding 20,000 cP HRC and 200,000 cP GPL. 15 g of each formulation was placed in the influent end of the ASV; there was no flow so that diffusion alone would be measured. While the main purpose of the test is covered in TB 2.4.3, it can be noted that, after 66 days, there is still considerable material left in the system of both products. The experiment will be continued until the product is exhausted. This is expected to be about one year for the 20,000 cP HRC and several years for the 200,000 GPL.

Field Results

<u>Data from the Oldest Trials</u>

The most powerful evidence for product longevity is of course the observations made in the field. As presented in Table 2 and graphically in Figure 4, the 20,000 cP HRC will last from 119 days to 580 days. It is important to note that this is a "living table" such that some of the applications are still in progress and the average longevity figures is getting larger. However, based on the range of this field experience and the fact that some tests are still in progress, we claim that 20,000 cP HRC degrades slowly, on average, for nine months (as modulated by certain features in the contaminated aquifer). However, just because the organic acids are gone does not mean the effects are over. Residual hydrogen will still be present and biomass accumulates which will later be available as fermentable carbon. The stimulated biomass is also more able to utilize native carbon as well. Therefore, ~20,000 cP HRC now sold is estimated to stimulate reductive dechlorination within the aquifer for at least 12 months.

Also, some work during the early phase of product development (not cited here) looked at the properties of a 1,000,000 cP sorbitol polylactate hard gel. In one test, the material physically lasted for at least two years at the point of application. In this experiment, which is presented in Dooley, Murray and Koenigsberg (1999), the SPL hard gel was placed in a canister with sufficient holes to allow it to ooze out slowly. It was placed in an injection well and the exposed surface was in contact with a fairly vigorous flow (relative to an aquifer velocity) of 0.25 gal/min. The active recirculation period ended at about 330 days, however, and the canister was retrieved after two years significant HRC was still present.

Regenesis is working on ways of delivering higher viscosity materials directly as "implants" using warmed GPL to lower the viscosity during application and special push-point injection and hollow stem auger techniques. These implants can be used as barriers or source treatments and can be expected to last for several years for very long-term plume management.

Table 2. Longevity Profile of GPL-HRC at 20,000 cP.

Site	Last Field Observation of Organic Acids- Lactic, Butyric, Propionic (in days)	Duration of Data Collection (in days)	Status
Site 1	150	364	Product exhausted before monitoring completed
Site 2	173	173	Product still present at conclusion of monitoring
Site 3	181	181	Product still present at conclusion of monitoring
Site 4	197	197	Product still present at conclusion of monitoring
Site 5	321	321	Product still present at conclusion of monitoring
Site 6	119	119	Product still present; monitoring on-going
Site 7	240	240	Product still present; monitoring on-going
Site 8	243	243	Product still present; monitoring on-going
Site 9	399	399	Product still present; monitoring on-going
Site 10	580	580	Product still present; monitoring on-going

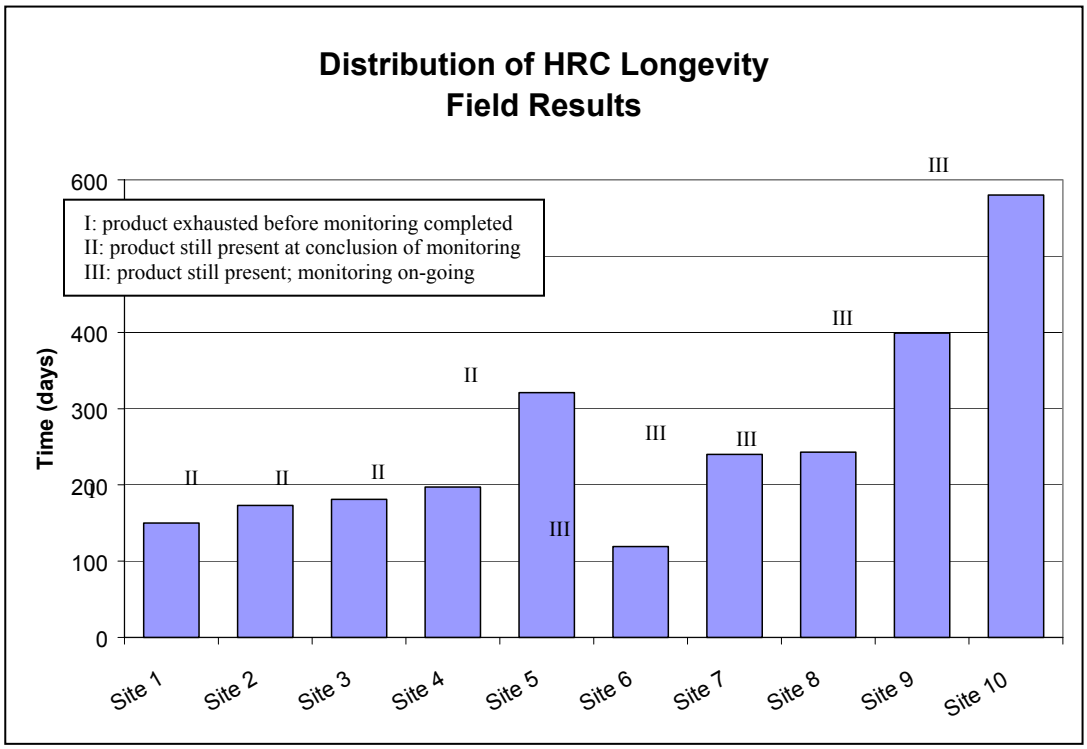

Figure 4.

Secondary Effects

Often we see remediation continuing after HRC breakdown products are no longer in the system. This observation led us to postulate that there may be more than one phase in the effect of adding HRC to the aquifer. Generally, we use the presence of elevated levels of organic acids as the metric, although we can also look at TOC data as well. However, sometimes after the footprint of the HRC is gone we can still see elevated rates of remediation. On further consideration we believe that the organic load to the aquifer that is provided by HRC is not a uni-directional event and that the biomass of microorganisms constructed from HRC can be recycled. This can cause an after effect as could native carbon in the system that might be more responsive to the elevated microbial population levels. While this is clearly not a dominant driver for reductive dechlorination relative to HRC, it apparently can have an impact. Lastly, at the formal exhaustion of the organic acids there is still hydrogen available.

To support this hypothesis we can look at an HRC injection as described in Sheldon, (1999). This experiment was a pilot test with a monitoring well (MW-8) that was clearly in the center of the HRC injection zone. Another well (MW-1) was in the experimental grid but was outside the migration zone for the HRC and its breakdown products during the course of the experiment. Figure 5 shows the nature of the organic acid profile over time and it should be noted that propionic acid is formed from lactic acid and then breaks down to release hydrogen. Acetic acid is generally considered to be a non-hydrogen evolving end point.

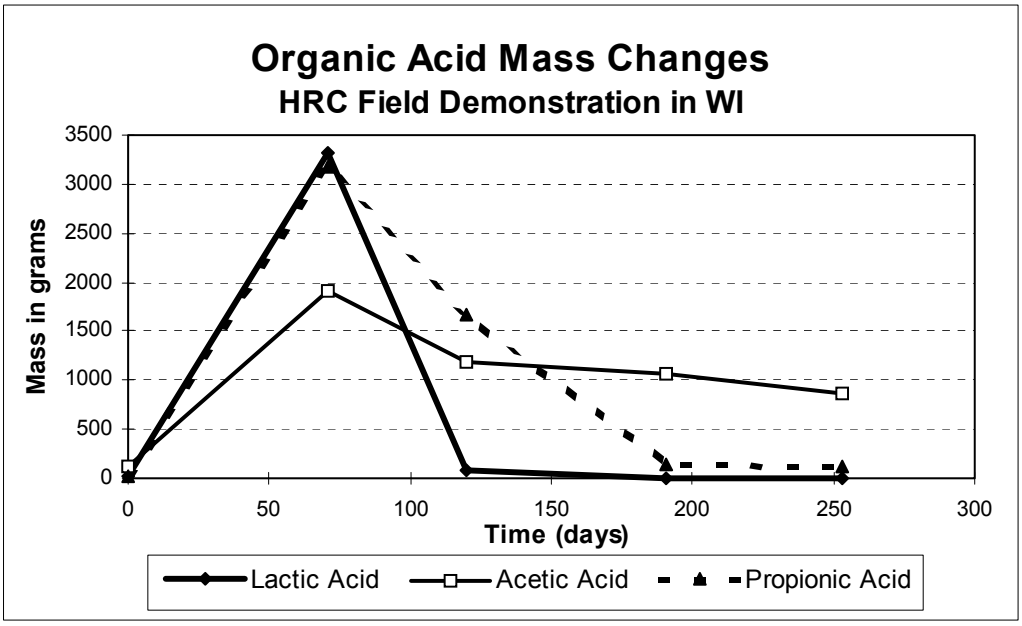

Figure 5.

The total mass of organic acids is calculated from a contouring exercise and the last appearance of lactic acid per se is between 70 and 120 days (the formulation was only about 10,000 cP in this early work). The disappearance of propionic acid between 120 and 190 days is further noted. With this background information we can now examine Table 3 and evaluate the remediation rate differences between the impacted and non-impacted wells (MW8 vs. MW1). It is clear that even after the organic acids are "gone" that there are still rate differences to be accounted for. At least two hypotheses can be presented.

- The HRC is still releasing slowly and is being consumed as fast as it is produced which would still allow remediation to proceed and cause a rate difference.

- The HRC is exhausted, but the organic material is being recycled and or native organic material is being mobilized by growing microbial populations - such that remediation continues.

Flow rates at this site are on the order of 0.5 ft/day and that is not sufficient to flush the system of HRC in the period involved in the study.

Table 3. TCE Degradation Rate Differentials at WI Site

Day	Half Life (d) Well TW01	Half Life (d) Well TW08	Ratio TW01/TW08
0-70	338	29	11.50
70-120	211	43	4.94
120-149	256	53	4.84
149-191	309	45	6.80
191-253	205	38	5.41

Summary

The main active ingredient in Hydrogen Release Compound is a polylactate ester called Glycerol (tri)Polylactate or GPL. Abiotic and microbially mediated hydrolysis of the ester linkage, between glycerol and the polylactate complex, releases the polylactate complex. The polylactate complex is a tetramer of lactic acid (4 lactic acid molecules esterified to themselves) and its degradation results in the release of individual lactic acid molecules which undergo fermentation to release hydrogen. These chemical features and the resultant viscosities, are an important component of longevity.

GPL is manufactured as a highly esterified thick gel and can be subsequently cut to a syrup-like consistency for injection. All other conditions being equal, product viscosity combined with the nature of microbial activity in the aquifer are the key determinants of product longevity. This is essentially a surface area argument. The thinner the material the more it will spread out and be exposed to chemical and biological degradation.

Based on the evidence presented in the laboratory and field, we can claim that ~20,000 cP HRC is estimated to stimulate reductive dechlorination within the aquifer for about 12 months. The longevity of this effect is a function of certain biological and geochemical features of the aquifer. HRC has been shown to promote reductive dechlorination resulting from the lactic acid release and possibly other indirect effects related in part to the formation of a nominal amount of recycling organic material that has a more prolonged effect on aquifer conditions. An “after effect” in the aquifer involving the recycling of carbon may extend the positive remediation effects beyond the formal longevity based on lactic acid release.

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Hydrogen Release Compound (HRC®) Installation Instructions

GENERAL GUIDELINES

The best method to deliver HRC into the subsurface is to inject the material through direct push rods using hydraulic equipment. This approach increases the spreading and mixing of HRC into the aquifer. This set of instructions is specific to direct push equipment.

Regenesis has found that very few pumps can adequately deliver HRC to the subsurface. Although other pumps may inject HRC, we have developed the following instructions specifically for use with an R.E. RUPE Company Model ORC/HRC 9-1500 mixing and pumping machine.

Note: We have strong evidence that the recently developed Geoprobe GS-2000 pump can effectively deliver HRC to the subsurface.

The installation of HRC should span the entire vertical contaminated saturated thickness. If the vertical extent of HRC application is confined to a limited interval, then the HRC material should be placed across a vertical zone extending a minimum of 2 feet above and below the screened Interval of monitoring wells to be used to evaluate the performance of the bioremediation project.

MATERIAL OVERVIEW, HANDLING, AND SAFETY

HRC is shipped in 4.25-gallon buckets and each bucket has a gross weight of approximately 32 pounds (net weight of HRC is 30 pounds). At room temperature HRC is a sticky gel with a viscosity of approximately 20,000 centipoise (roughly equivalent to cold honey). The HRC material has a nominal density of 1.3 grams/cubic centimeter or approximately 10.8 pounds per gallon. The viscosity of HRC is temperature sensitive, significant changes in HRC's viscosity are observed with large changes in product temperature. It should be noted that the temperature/viscosity relationship is not linear.

For ease of installation, HRC should be stored in a warm, dry place that is protected from direct sunlight. It is common for stored HRC to settle somewhat in a container. Care should be taken to mix the HRC into a relatively uniform fluid prior to installation. Product uniformity is most easily achieved by pre-heating HRC before pouring it into the pump hopper. Care should be taken to scrape any separated material from the bottom of each bucket. Do not use any "rocky material" in the bottom of the bucket because it could potentially clog the check valves in the machine. Use the Rupe pump's mixing and recirculation features to homogenize the HRC. Pre-heating HRC makes it easier to pour and remix the separated material. Although HRC is manufactured as a food-grade

material that is safe to ingest, field personnel should take precautions while handling and applying HRC. Field personnel should use appropriate safety equipment, including eye protection. The low pH when dissolved in water and the products viscosity make eye protection mandatory. Gloves should be used as appropriate based on the exposure duration and field conditions. A Material Safety Data Sheet is provided with each shipment. Personnel who operate field equipment during the installation process should have appropriate training, supervision, and experience

For direct assistance or answers to any questions you may have regarding these instructions, contact Regenesis Technical Services at 949-366-8000.

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Hydrogen Release Compound (HRC®) Installation Instructions

(Pump Information)

Regenesis has evaluated a number of pumps that are capable of delivering 20,000 centipoise HRC to the subsurface at a sufficient pressure and volumetric rate. Although a number of pumps may be capable of delivering the HRC to the subsurface at adequate pressures and volume, each pump has a set of practical issues that make it difficult to manage in a field setting. As a result of this evaluation, Regenesis has determined that the R.E. RUPE Company Model ORC/HRC 9-1500 meets the pressure and volume requirements needed to successfully inject HRC in the field. When applying measured volumes of HRC via probe boreholes, it is useful to know the volume of a single pump stroke and the associated delivery system lines. The following additional information is provided for reference

HRC Physical Characteristics:

Density	1.3 g/cc or 10.8 lbs./gal.
Viscosity	Approx. 20,000 centipoise

Equipment Volume and HRC Weight per length

Equipment	Volume	HRC weight
1 inch OD; 0.625 ID hose (10 feet long)	0.2 gallon	1.8 lbs.
1.25 inch OD; 0625 inch ID drive rod (3 feet length):	0.05 gallon	0.5 lbs.
1.25 inch OD; .625 inch ID drive rod (4 feet length):	0.06 gallon	0.7 lbs.

Before using the Rupe Pump, check the following:

- Fuel level prior to engaging in pumping activities (it's best to start with a full tank)

- Remote control/pump stroke counter LCD display; if no display is present, the electronic counter will need to be replaced (Grainger Stock No. 2A540)

- Monitor pump strokes by observing the proximity switches (these are located on the top of the piston)

Pump Cleaning after HRC Use:

For best results use a hot water (150-170 °F or 66-77 °C) pressure washer to clean equipment and rods periodically throughout the day. Internal pump mechanisms and hoses can be easily cleaned by circulating hot water and a biodegradable cleaner such as Simple Green through the pump and delivery hose. In order to maintain optimal pumping conditions, it is desirable to circulate pure glycerin through the pump after the pump has been thoroughly cleaned. A small volume of glycerin should be left in the pump works and hopper during storage or shipping. Further cleaning and decontamination (if necessary due to subsurface conditions) should be performed according to the equipment supplier's standard procedures and local regulatory requirements.

NOTE: The remote control/pump counter should be kept dry at all times, if it gets wet it will short-circuit and ill need to be replaced.

For direct assistance or answers to any questions you may have regarding these instructions, contact Regenesis Technical Services at 949-366-8000.

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REGENESIS

Hydrogen Release Compound (HRCâ)

INSTALLATION INSTRUCTIONS
Direct-Push Injection

GENERAL GUIDELINES

The best method to deliver HRC into the subsurface is to inject the material through direct push rods using hydraulic equipment. This approach increases the spreading and mixing of HRC into the aquifer. This set of instructions is specific to direct push equipment.

Regenesis has found that very few pumps can adequately deliver HRC to the subsurface. Although other pumps may be capable of injecting HRC, we have developed the following instructions specifically for use with an R.E. RUPE Company Model ORC/HRC 9-1500 mixing and pumping machine. There is also strong evidence that the Geoprobe GS-2000 pump can effectively deliver HRC to the subsurface. In general, Regenesis strongly recommends using a pump with a minimum pressure rating of 1,500 pounds per square inch (psi) and a minimum delivery rate of 3 gallons per minute.

The installation of HRC should span the entire vertical contaminated saturated thickness. If the vertical extent of HRC application is confined to a limited interval, then the HRC material should be placed across a vertical zone extending a minimum of 2 feet above and below the screened Interval of monitoring wells to be used to evaluate the performance of the bioremediation project.

MATERIAL OVERVIEW, HANDLING, AND SAFETY

HRC is shipped in 4.25-gallon buckets and each bucket has a gross weight of approximately 32 pounds (net weight of HRC is 30 pounds). At room temperature, HRC is a sticky gel with a viscosity of approximately 20,000 centipoise (roughly equivalent to cold honey). The HRC material has a nominal density of 1.3 grams/cubic centimeter or approximately 10.8 pounds per gallon. The viscosity of HRC is temperature sensitive. Significant changes in viscosity are observed with large changes in product temperature. It should be noted that the temperature/viscosity relationship is not linear. For ease of installation, HRC should be stored in a warm, dry place that is protected from direct sunlight. It is common for stored HRC to settle somewhat in a container. Pre-heating HRC makes it easier to work with the material. Although HRC is manufactured as a food-grade material that is safe to ingest, field personnel should take precautions while handling and applying HRC. Field personnel should use appropriate safety equipment, including eye protection. The low pH when dissolved in water and the viscosity of the product make eye protection mandatory. Gloves should be used as appropriate based on the exposure duration and field conditions. A Material Safety Data Sheet is provided with each shipment. Personnel who operate field equipment during the installation process should have appropriate training, supervision, and experience.

SPECIFIC INSTALLATION PROCEDURES

1) Prior to the installation of HRC, any surface or overhead impediments should be identified as well as the location of all underground structures. Underground structures include but are not limited to: utility lines, tanks, distribution piping, sewers, drains, and landscape irrigation systems.

2) The planned installation locations should be adjusted to account for all impediments and obstacles.

3) Regenesis recommends pre-heating HRC in a hot water bath. Place unopened buckets of HRC into an empty water tank. A Rubbermaid fiberglass Farm Trough Stock Tank (Model 4242-00-GRAY) is typically used for this application and can hold up to 16 buckets of HRC. Hot water (approximately 130-170°F or 54-77°C) should be added to the tank after the buckets of HRC have been placed inside. When the HRC reaches a minimum temperature of 95°F or 35°C (approximately 20-30 minutes) it is ready to be poured into the pump hopper.

4) Pre-mark the installation locations, noting any points that may have different vertical application requirements or total depth.

5) Set up the direct push unit over each specific point and follow the manufacturer standard operating procedures (SOP) for the direct push equipment. Care should be taken to assure that probe holes remain in the vertical.

6) For most applications, Regenesis suggests using 1.25-inch O.D./0.625-inch I.D Geoprobe brand drive rods. However, some applications may require the use of 2.125-inch O.D./1.5-inch I.D. drive rods.

7) The HRC delivery sub-assemblies that Regenesis currently uses are designed for 1.25-inch Geoprobe rods. Other brands of drive rods can also be used but require the fabrication of a sub-assembly (see Regenesis Website).

8) Advance drive rods through the surface pavement, as necessary, following SOP.

9) Push the drive rod assembly with an expendable tip to the desired maximum depth. Regenesis suggests pre-counting the number of drive rods needed to reach depth prior to starting injection activities.

10) After the drive rods have been pushed to the desired depth, the rod assembly should be withdrawn three to six inches. Then the expendable tip can be dropped from the drive rods, following SOP.

    a) If an injection tool was used instead of an expendable tip, the application of material can take place without any preliminary withdrawal of the rods.

11) In some cases, introduction of a large column of air may be problematic. This is particularly the case in deep injections (>50 ft) with large diameter rods (>1.5-inch O.D.). To prevent the injection of air into the aquifer during HRC application, fill the drive rods with water.

12) Pour the pre-heated HRC into the pump hopper (up to 40 gallons). Remove the separated HRC from the bucket bottom by tipping the bucket into the hopper and scraping out the smooth residual material. Use the pumps mixing and recirculation features to create a uniform consistency. This typically requires recirculation of approximately one hopper volume. NOTE: Do not attempt to mix HRC with water or other liquids to thin or decrease the viscosity of the material. This may adversely affect HRC longevity.

13) A volume check should be performed prior to injecting HRC. Determining the volume displaced per pump stroke can be accomplished in two easy steps.

    a) Determine the number of pump strokes needed to deliver 3 gallons of HRC (use a graduated bucket for this)

    b) Divide 3 gallons by the results from the first step to determine the number of gallons of HRC delivered by each pump stroke.

    c) Level indicators present in the hopper are in 3 gallon increments.

    d) The volume of HRC displaced should be confirmed using the HRC level indicators located inside the pump hopper.

14) Connect the 1.25-inch O.D., 1-inch I.D. delivery hose to the pump outlet and the provided HRC delivery sub-assembly. Circulate HRC though the hose and the delivery sub-assembly to displace air in the hose.

15) Connect the HRC sub-assembly to the drive rod. After confirming that all of the connections are secure, pump the HRC through the delivery system to displace the water/fluid in the rods. **NOTE:** Prior to pumping HRC into the aquifer, close the pump recirculation valve; failure to do so will allow material to short-circuit into the hopper and change the volume of HRC delivered per pump stroke.

16) The pump engine RPM and hydraulic settings should remain constant throughout the day. However, if the hydraulic system starts to “squeal”, the pump speed should be decreased until the noise is mitigated.

17) Use the pump’s stroke counter and the provided volume/weight conversions to apply the appropriate HRC volume per injection location (and per vertical foot of contaminated saturated zone). Table 1 shows typical HRC delivery information followed by an example calculation.

Table 1: Pump Volume Calculation

Example: For each injection location, install 60 pounds of HRC across 10 vertical feet of aquifer (an application rate of 6 pounds per vertical foot).

Solution:

- 60 pounds/10.8 pounds per gallon ≈ 5.6 gallons for the injection location
- 5.6 gallons/0.2 gallons per stroke ≈ 28 pump strokes for the injection location
- 28 pump strokes/10 vertical feet = 2.8 strokes per vertical foot
- 2.8 strokes per vertical foot = 8.4 strokes per 3 foot drive rod
- 2.8 strokes per vertical foot = 11.2 strokes per 4 foot drive rod

18) Slowly withdraw the drive rods using Geoprobe Rod Grip or Pull Plate Assembly (Part AT1222-For 1.25-inch drive rods). While slowly withdrawing single lengths of drive rod (3 or 4 feet), pump the pre-determined volume of HRC into the aquifer across the desired treatment interval (Step 13). Use the stroke counter and pump on/off switch to control volume of injection. See Helpful Hints at the end of this section.

19) Remove one section of the drive rod. The drive rod may contain some residual HRC. Place the HRC-filled rod in a clean, empty bucket and allow the HRC to drain. Eventually, the HRC should be returned to the HRC pump hopper for reuse.

20) Observe any indications of aquifer refusal. This is typically indicated by a high-pitched squeal in the pump's hydraulic system or (in the case of shallow applications) HRC "surfacing" around the injection rods or previously installed injection points. If aquifer acceptance appears to be low, allow enough time for the aquifer to equilibrate prior to removing the drive rod.

21) Repeat steps 15 through 20 until treatment of the entire contaminated vertical zone has been achieved.

22) Install an appropriate seal, such as bentonite, above the HRC material through the entire vadose zone. Depending on soil conditions and local regulations, use a bentonite seal via chips or pellets after the probe rods have been removed. This assures that the HRC remains properly placed and prevents contaminant migration from the surface. If HRC continues to "surface" up the direct push borehole, an appropriately sized (oversized) disposable drive tip or wood plug/stake can be used to plug the hole until the aquifer equilibrates and the HRC stops surfacing.

23) Remove and clean the drive rods as necessary.

24) Finish the borehole at the surface as appropriate (concrete or asphalt cap, if necessary).

25) Periodically compare the pre- and post-injection volumes of HRC in the pump hopper using the pre-marked volume levels. Volume level indicators are not on all pump hoppers. In this

case, volume level markings can be temporarily added using known amounts of water and a carpenter's grease pencil (Kiel crayon). We suggest marking the water levels in 3-gallon increments.

26) Move to the next probe point, repeating steps 8 through 25.

HELPFUL HINTS

1) *Application in Cold Weather Settings*

The viscosity of HRC is directly related to the ambient temperature. As discussed in the Material Overview, Handling, and Safety section, cold weather tends to increase HRC viscosity and decrease ease of pumping. To maintain HRC at a temperature/viscosity at which it is easy to apply:

Raise and maintain the temperature of the HRC to at least 95°F (35°C) prior to pouring it into the pump hopper.

Insulate the delivery hose and keep the pump and hot water bath inside an enclosed structure such as a cargo van or trailer.

Periodically check the HRC temperature in the hopper.

Occasionally re-circulate HRC through the pump and hose to maintain temperature and viscosity.

The volume of HRC recirculated should not exceed the volume of HRC in the hopper.

Do not constantly recirculate HRC through the pump and hoses, as this may adversely affect the longevity of HRC.

2) *HRC Pump Information*

Regenesis has evaluated a number of pumps that are capable of delivering 20,000 centipoise HRC to the subsurface at a sufficient pressure and volumetric rate. Although a number of pumps may be capable of delivering the HRC to the subsurface at adequate pressures and volume, each pump has a set of practical issues that make it difficult to manage in a field setting. As a result of this evaluation, Regenesis has determined that the R.E. RUPE Company Model ORC/HRC 9-1500 meets the pressure and volume requirements needed to successfully inject HRC in the field. In general, Regenesis strongly recommends using a pump with a minimum pressure rating of 1,500 pounds per square inch (psi) and a minimum delivery rate of 3 gallons per minute. When applying measured volumes of HRC via probe boreholes, it is useful to know the volume of a single pump stroke (Table 1 above) and the associated delivery system lines. The following additional information is provided for reference:

Table 2: HRC Physical Characteristics

Density	1.3 g/cc or 10.8 lbs/gal
Viscosity	Approx. 20,000 centipoise

Table 3: Equipment Volume and HRC Weight per length

Equipment	Volume	HRC weight
1-inch OD; 0.625-inch ID hose (10 feet long)	0.2 gallon	1.8 lbs.
1.25-inch OD; 0.625-inch ID drive rod (3 feet length):	0.05 gallon	0.5 lbs.
1.25-inch OD; 0.625-inch ID drive rod (4 feet length):	0.06 gallon	0.7 lbs.

3) *Pump Cleaning*

For best results, use a hot water pressure washer (150 - 170 °F or 66 - 77 °C) to clean equipment and rods periodically throughout the day. Internal pump mechanisms and hoses can be easily cleaned by circulating hot water and a biodegradable cleaner such as Simple Green through the pump and delivery hose. Further cleaning and decontamination (if necessary due to subsurface conditions) should be performed according to the equipment supplier's standard procedures and local regulatory requirements.

NOTE: The remote control/pump counter should be kept dry at all times. If it gets wet, it will short-circuit and will need to be replaced.

Before using the Rupe Pump, check the following:

- Fuel level prior to engaging in pumping activities (it would be best to start with a full tank)
- Remote control/pump stroke counter LCD display (if no display is present, the electronic counter will need to be replaced (Grainger Stock No. 2A540))

Monitor pump strokes by observing the proximity switches (these are located on the top of the piston).

4) *HRC Bedrock Applications*

When contaminants are present in competent bedrock aquifers, the use of direct push technology as a delivery method is not possible. *Regenesis is in the process of developing methods for applying HRC via boreholes drilled using conventional rotary techniques.* To develop the best installation strategy for a particular bedrock site, it is critical that our customers call the technical support department at Regenesis early in the design process.

HRC can be applied into a bedrock aquifer in cased and uncased boreholes. HRC can be delivered by simply filling the borehole without pressure or by using a single or straddle packer system to inject HRC under pressure. Selection of the appropriate delivery

method is predicated on site-specific conditions. The following issues should be considered in developing an HRC delivery strategy:

- Is the aquifer's transmissivity controlled by fractures?
- Backfilling may be the better delivery method in massive, unfractured bedrock. This is particularly true in an aquifer setting with high permeability and little fracturing (such as that found in massive sandstone).
- Down-hole packer systems may be more advantageous in fractured bedrock aquifers.
    - In this case the fracture type, trends, and interconnections should be evaluated and identified.
- Are the injection wells and monitoring wells connected by the same fractures?
- Determine if it is likely that the HRC injection zone is connected to the proposed monitoring points.
- If pressure injection via straddle packers is desired, consideration should be given to the well construction. Specific issues to be considered are:
    - Diameter of the uncased borehole (*will casing diameter allow a packer system to be used*?).
    - Diameter of the casing (*same as above*).
    - Strength of the casing (*can it withstand the delivery pressures?*).
    - Length of screened interval (*screened intervals greater than 10 feet will require a straddle packer system*).