Groundwater Remedial Investigation Work Plan for the Former Operation of the Bramlette MGP Facility

Greenville, South Carolina

Duke Energy Carolinas

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Executive Summary

Duke Energy Carolinas, LLC (Duke Energy) entered into a Responsible Party Voluntary Cleanup Contract (VCC 16-5857-RP) with the South Carolina Department of Health and Environment (DHEC) on July 29, 2016. As a condition of the VCC, Duke Energy has prepared this focused groundwater Remedial Investigation Work Plan (RIWP) to refine the understanding of current groundwater conditions at the former Bramlette manufactured gas plant (MGP) facility. Duke Energy has performed numerous investigations at the former MGP facility. Additionally, Duke Energy prepared a Remedial Action Plan (RAP) dated September 14, 2000 which was approved by DHEC in correspondence dated April 25, 2001. RAP approval was reiterated in a letter dated August, 21, 2001 from the DHEC Bureau of Water, Groundwater Quality Section. With that approval, Duke Energy had more than 61,000 tons of source area soil and debris excavated between 2000 and 2002.

A groundwater monitoring program has been ongoing since June 1999. Overall, constituents of interest (COIs) in groundwater have exhibited stable to declining concentrations, with few exceptions. In a letter dated February 26, 2001 DHEC acknowledged that the following conditions are known: 1) coal tar is relatively non-mobile, 2) there is no consumption or use of groundwater or surface water on the property or in the surrounding area, 3) the plume has not significantly enlarged, and 4) flora and fauna in the wetland are not being significantly impacted by COIs; therefore, continued monitoring is the only action required. Further, our review of the historical groundwater monitoring and natural attenuation data support a Monitored Natural Attenuation (MNA) remedial strategy.

This groundwater RIWP is focused on the assessment of COIs in groundwater related to the operation of the former MGP facility. Subsurface assessment activities will be performed at the former MGP facility. The property associated with the former MGP facility is currently owned by the CSX Corporation (CSX). Duke Energy has access to the property subject to conditions stipulated in an agreement with CSX.

The RIWP includes provisions to collect information relative to the movement of groundwater and the fate and transport of COIs in the study area. A summary of the proposed remedial investigation (RI) field activities is as follows:

- Re-install two groundwater monitoring well clusters of three wells each at the former MGP facility.
- Collect groundwater samples using direct push technology to delineate the horizontal distribution of dissolved COIs.
- Collect samples for testing and analysis and perform testing in-situ to better define COI fate and transport conditions.
- Survey newly installed wells and various features in the study area.

Based on a review of groundwater data collected from more than 20 groundwater monitoring events between 1999 and 2015, natural attenuation processes associated with MGP-related COIs appear to be active in groundwater. The results from the implementation of this RIWP will be presented in a Groundwater Remedial Investigation Report (RIR). In addition, historical information and data collected during the implementation of this RIWP will be evaluated to augment the current conceptual site model (CSM).

1.0 Introduction and Purpose

Duke Energy entered a Responsible Party VCC 16-5857-RP with the DHEC on July 29, 2016. Per the VCC, Duke Energy has prepared this focused groundwater RIWP to refine the source, nature, and extent of COIs in groundwater resulting from the operation of the former Bramlette MGP facility. Figure 1 depicts the location of the former Bramlette MGP facility in Greenville, South Carolina. In the VCC, DHEC defined the property as comprising a total of five property parcels, which are described further below and are depicted on Figure 2. COIs in groundwater have been documented at the former MGP facility (Parcel 1) and on the former Vaughn Landfill (Parcel 3). The former Vaughn Landfill is unrelated to the former Bramlette MGP facility but the two were concurrently assessed during previous work. Both Parcel 1 and 2 are currently owned by the CSX. CSX and Duke Energy have entered an access agreement for Duke Energy to perform predefined investigation activities on the CSX-owned property. The agreement terminates at the end of February 2017.

The focus of this RIWP is on groundwater. Extensive soil assessment and remediation were completed at the MGP facility between July 2001 and December 2002 (Duke 2003). More than 61,000 tons of soil over 3.8 acres was excavated under a DHEC-approved work plan. The approximate extent of the excavation activities is shown on Figure 2. Duke Energy extended the remedial soil excavation activities to off-site areas that include Ditch 1 and portions of Parcel 2 where the former Texas Oil Company operated. This work is described further in Subsections 2.1.2 and 2.1.3.

As stated previously, the Vaughn Landfill and the former Bramlette MGP facility are unrelated. However, COIs are in the groundwater beneath the landfill and landfill is located within a wetland. Excavation and removal of affected soils and sediments at the Vaughn Landfill would likely result in severe damage to the wetland environment (Duke 2003) and mobilization of COIs (DHEC 2001). Previous biological assessments have indicated that COIs in soils and sediments within the wetlands have no adverse impact to the flora and fauna (ECA 1996, Duke 2000, DHEC 2001). In DHEC's February 26, 2001 letter DHEC agreed with previous assessments that (1) coal tar is relatively non-mobile, (2) there is no consumption or use of groundwater or surface water, (3) the plume has not significantly enlarged, and (4) flora and fauna are not adversely affected by COIs; therefore, continued groundwater monitoring is the only action required. A copy of the February 26, 2001 DHEC letter is provided in Appendix A. Further, our review of the historical groundwater monitoring and natural attenuation data appear to support a Monitored Natural Attenuation (MNA) remedial strategy.

The purpose of this RIWP is to assess the current conditions of groundwater at the former Bramlette MGP facility. The RIWP provides a description of the re-installation of previously existing groundwater monitoring wells on Parcel 1, and samples to be collected during the regularly scheduled November 2016 groundwater sampling event. Additional shallow grab groundwater samples will be collected along the groundwater flow path immediately downgradient of the former Bramlette MGP facility, and orthogonally to groundwater flow along the western property boundary of Parcel 1. The results from the implementation of this RIWP will be presented in a Groundwater Remedial Investigation Report (RIR).

2.0 Background

The former MGP facility is located at 400 East Bramlette Road, just outside of the city limits of Greenville, South Carolina. The property subject to the VCC is identified by County of Greenville as Tax Map Serial Numbers 0140000300300 (Parcel 1), 0140000300200 (Parcel 2), 0138000100100 (Parcel 3), 0054000300100 (Parcel 4), and 0054000600100 (Parcel 5). The property is approximately 30 acres in size and is bounded by the CSX Transportation railroad corridor to the north and west, the Reedy River to the west, Willard Street to the south, and West Washington Street, private residences, the Legacy Charter School, and the City of Greenville Sanitation Department to the east. As stated above, none of the Property is currently owned by Duke Energy. The groundwater flow direction is to the west-southwest and the Legacy Charter School is hydraulically crossgradient, and the private residences upgradient of groundwater under the former MGP facility. Therefore, these properties have not been affected by historical MGP activities.

2.1 MGP Property History and Distribution of COIs in Groundwater

The Vaughn Landfill was never owned or operated by Duke Energy and is unrelated to the former Bramlette MGP facility. The Vaughn Landfill and the former Bramlette MGP facility differ in operational timeframes, but presently overlap with respect to groundwater COIs and subsurface conditions. The following sections summarize the portions of the property that were assessed and remediated by Duke Energy between 2000 and 2002 and the MGP-affected groundwater conditions that exist following that remediation.

2.1.1 Parcel 1

Located on Parcel 1, the former MGP facility had a retort house, three gas holders, a water gas plant, tar and ammonia washer tanks, purifiers, a tar extractor and holder, tar chambers, and underground heating oil tank. A 1951 plat of Parcel 1, which shows the MGP facility configuration at that time, is included as Appendix B, and aerial photographs are presented in Appendix C. Historical features are also presented in Figure 3. Below is a summary of the history of the former MGP facility:

- The facility was built by Southern Public Utilities in 1917.
- The facility was transferred to Duke Energy in 1935.
- The facility was sold to Piedmont Natural Gas in 1951.
- The facility ceased operations in 1952.
- The facility was mostly demolished by 1958.
- The property was sold to the Piedmont & Northern Railway Company in 1963.
- In the 1970s and 1980s, Parcel 1 was used as a trucking facility (Applied Engineering and Science [AES] 1997).
- Field notes from a 1996 AES investigation report an "Associated Petroleum Carriers, Spartanburg, SC" tanker and three petroleum storage tanks on-site.
- Soil remediation and additional source removal occurred between 2000 and 2002 (Duke 2003); specifically:
    - The soil remediation was conducted with DHEC approval per a letter dated August 21, 2001, also provided in Appendix A.
    - Remnant infrastructure, including surficial tar chambers and a subsurface heating oil tank (each of which contained tar-like material at the time), were removed.
    - 9 groundwater monitoring wells on Parcel 1 were abandoned to facilitate soil remediation activities.
    - 5,073.5 tons of solid waste (concrete, bricks, metal, old tanks, etc.) and vegetation were removed from Parcel 1.
    - 1.4 acres of soil was excavated to a depth between 3 and 6 feet below ground surface (ft-bgs), and 2.4 acres to a depth between 6 and 12 ft-bgs (Duke 2003).
    - 27,144 tons of solid waste were screened from excavated subsurface material and disposed of Off-Site at the Palmetto Landfill Facility in Wellford, South Carolina.

  - 33,944 tons of soil were thermally treated at Southeastern Soil Recovery in Laurens County, South Carolina.
  - 33,962 tons of thermally treated soils were returned to the Site as backfill.
  - 38,112 tons of clean fill were imported from three local borrow pits.
- A Remedial Action Plan Final Report was prepared by Duke and submitted to DHEC in June 2003.
- Groundwater monitoring wells on Parcel 1 continue to be sampled as part of the ongoing semi-annual groundwater monitoring program.

The February 26, 2001 DHEC letter stated coal tar is relatively non-mobile, groundwater in the area is not a utilized resource, the plume is stable, and flora and fauna are not affected by COIs.

2.1.2 **Parcel 2**

Adjacent to, and north of the former MGP facility, the Texas Oil Company operated a bulk petroleum facility at approximately the same time as the MGP facility was in operation (Duke Engineering & Services 2000). The former Texas Oil Company operated on a small portion of Parcel 2. Soil impacts on Parcel 2, formerly operated by Texas Oil Company, were observed during remediation of the former MGP facility in 2002; Duke Energy also excavated and remediated these soils. Petroleum contaminated soils uncharacteristic of typical MGP related contamination were encountered on the former Texas Oil Company property (Duke 2002). During assessment and remediation activities performed by Duke Energy in 2002, Suburban Propane operated on the property.

2.1.3 **Stormwater Drainage Ditch 1**

The stormwater drainage Ditch 1 is north of Bramlette Road, and directly leading from the MGP Facility. Ditch 1 flows under Bramlette Road through a 24-inch pipe culvert. In 1996, AES advanced 9 borings in the Ditch 1 area, the pipe culvert, and the area west of the MGP facility. Based upon the results, Duke Energy remediated Ditch 1 between 2000 and 2002.

2.1.4 **Groundwater**

The first groundwater monitoring wells were installed in 1995 by AES on behalf of CSX primarily on Parcel 3. Seven groundwater monitoring wells (MW-1 through MW-6, and MW-3D) were installed at the Vaughn Landfill. Table 1 presents groundwater monitoring well construction data. Additional wells were installed at the Vaughn Landfill and the former MGP facility as subsequent investigations were conducted. Impacted groundwater was reported to extend from the former Bramlette MGP facility toward the west-southwest.

Figure 4 presents the groundwater elevation contours and the benzene and naphthalene concentrations from the June 1999 groundwater sampling event; similarly Figure 5 provides data from the November 2015 groundwater sampling event. Table 2 provides a summary of analytical groundwater montoring data collected between 2008 and 2015. In general, the groundwater monitoring well network bounds the groundwater plume, and the groundwater plume has a generally consistent aerial extent since the 1999 groundwater sampling event reporting.

Benzene and naphthalene groundwater concentration trend plots for shallow and relatively deeper wells are provided in Figures 6A through 6D. Concentrations of COIs are decreasing in samples collected over time from several groundwater monitoring wells. Not all groundwater monitoring wells are plotted in these figures. Monitoring wells with groundwater samples that lack COI detections are not plotted.

Figure 7 provides a depiction of the 2015 groundwater sampling MNA parameters; tabulated data is presented in Table 3. MNA parameters depicted are: alkalinity, ogygen reduction-potential (ORP), manganese, and a terminal electron acceptor (TEA) value. The TEA value ranks progress of the sequential use of terminal electron acceptors (dissolved oxygen, nitrate, then sulfate) as microorganisms consume hydrocarbons. Overlapping areas of alkalinity and ORP suggest biodegradation, manganese (Mn^{2+}) and TEA reduction is a byproduct of bioactivity; therefore, based on Figure 6, natural attenuation processes are occurring in groundwater.

2.2 Potential Receptors to COIs

2.2.1 Human Health

A water supply well survey was performed in 1996 (AES 1996) and found no drinking water wells within 1/2 mile of the property. Further, in AES's 1996 report, AES states that there were no downstream users of the water from Reedy River. Altamont contacted the City of Greenville Engineering department, which confirmed that City water is supplied to the area and to specific neighboring properties we inquired about (Appendix D).

On-Site exposure to COIs through ingestion and dermal contact could occur only if construction work disturbed COI-affected soil or groundwater. This is unlikely on Parcel 1 given that near-surface soils were excavated between 200 and 2002 at the former MGP facility and along Ditch 1. In addition, COIs associated with former MGP sites are typically not associated with vapor intrusion therefore the inhalation pathway is unlikely.

2.2.2 Environment

Environmental receptors include flora and fauna that could be exposed to site-specific COIs. Several biological assessments have been conducted at the Vaughn Landfill (ASE 1996, Duke 1999). The 1996 study was performed to determine if there was a statistically significant correlation between the presence of volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs) in the floodplain and wetland soils and the presence of vascular plant species. The 1996 assessment concluded that there was no significant correlation between the presence of organic COIs and adverse effects to plants. A 1999 biological study assessed the impacts of COIs in the wetland on invertebrates, amphibians, and zooplankton (Aquatic Ecology Group 1999). Samples were collected during the theoretical “worst case scenario” of seasonal variation where COIs would be at the highest concentrations in the environment. The study concluded that the faunal populations in the study areas were self-sustaining and likely unaffected by organic COIs present.

Based on a review of the historical data, there are no obvious data gaps related to potential impacts to environmental exposure pathways.

3.0 Preliminary Conceptual Site Model

3.1 General

The purpose of the CSM is to present the current understanding of the hydrologic, geologic, and hydrogeologic characteristics that affect the fate and transport of COIs related to the former Bramlette MGP facility. This CSM includes findings based on data collected during previous environmental assessments performed at the Vaughn Landfill and the former Bramlette MPG facility. Further, this CSM was developed based on the hydrogeology of the Piedmont/Blue Ridge Region (LeGrand, 1988, and Daneil, et. Al., 1989). The general hydrogeologic framework for local drainage basins with perennial streams, in the Blue Ridge/Piedmont, can be generally characterized based on their similarities. These concepts have been applied to the hydrogeologic conditions in the study area.

3.2 Surface Water and Wetlands

The western portion of the study area is composed of Parcels 3, 4 and 5, and is located in a flood plain. Parcel 4 and Parcel 5 are shown to be classified as wetlands on the United Stated Fish and Wildlife Services, National Wetlands Inventory. Parcels 1 and 2 are located to the north of the wetland area and north of Bramlette Road. The Swamp Rabbit Trail (a linear greenway park) and the Reedy River are located just west of the CSX Transportation railroad corridor bordering the western side of Parcels 3, 4, and 5. Stormwater conveyance ditches were constructed through the wetlands. The stormwater ditches are labeled Ditch 1 through Ditch 5 and the current location of the ditches are shown in Figure 2.

Ditch 1 originates at the former Bramlette MGP facility then crosses Bramlette Road via a 24-inch pipe to the eastern area of the wetlands. Ditch 4 drains the eastern wetland area to the western wetland area. The floodplain wetland area contains varying amounts of standing water throughout the year. During wet periods, standing water is present in both the western and eastern wetland areas. Standing water directly entering the Reedy River from the wetland areas is constrained by an elevated CSX rail line and railyard embankment to the west. Ditch 5 directs floodplain and wetland overflow waters southward toward Willard Street and runs beneath a railroad trestle before discharging into the Reedy River.

3.3 Geology and Hydrogeology

3.3.1 Site Scale Geology

Borings advanced to refusal within the former MGP facility indicate a refusal depth between 30 and 60 ft-bgs. Borings advanced to refusal within the Vaughn Landfill area indicate refusal depth of approximately 18 and 25.2 feet below the top of the Vaughn Landfill. According to a report entitled *Groundwater Resources of Greenville County South Carolina* (Koch 1996), seven former industrial wells located within a 1/4-mile radius, were installed with casings varying in length from 10 to 41 feet. Since production well casings typically extended from the ground surface into fractured rock, these casing lengths are an indicator of weathered/competent bedrock depths in the vicinity of the study area.

In general, the types of material encountered with depth in the study area are as follows:

- Reworked surface sediments, alluvium, colluvium, and fill
- Residuum, a highly weathered material that does not retain parent rock texture
- Saprolite, a weathered material that retains the parent rock texture
- Partially weathered rock (not documented to have been encountered)
- Bedrock (not encountered)

3.3.2 Hydrogeology

3.3.2.1 Site-Scale Hydrogeologic Units

Changes in the sediment grain size, texture, and color of relatively deeper soils has been described as gradual; therefore, it is likely difficult to discern particular hydrostratigraphic units at depth. The existing groundwater monitoring wells installed in the study area were generally constructed as nested wells with screened intervals designated as: Shallow, Mid-Depth, Combined, or Deep. These designations attempt to describe the approximate screen placement vertically and there is often overlap in screen depths. The diagram below relates the depth and general boring log descriptions with the historical well screen designations, and the approximate hydrostratigraphic units.

<table>
<tr><th>Depth, ft-bgs</th><th>Boring Log Descriptions</th><th colspan="4">Historical Well Screen Depth Designations</th><th>Hydrostratigraphic Units</th></tr>
<tr><td>0 to 8</td><td>C&D Waste, Remedial Backfill, Historic Fill</td><td></td><td></td><td></td><td></td><td>Fill</td></tr>
<tr><td>8 to 13</td><td>Clayey Silts, Silty Clay, Clay</td><td rowspan="2">Shallow</td><td></td><td rowspan="3">Combined</td><td></td><td>Alluvium and Colluvium Deposits</td></tr>
<tr><td>13 to 16</td><td>Silty Sands</td><td rowspan="2">Mid-Depth</td><td></td><td>Residuum</td></tr>
<tr><td>16 to 25</td><td>Fine to Medium Sands</td><td></td><td></td><td rowspan="2">Residuum to Saprolite</td></tr>
<tr><td>25 to 50</td><td>Silty Sands/Refusal</td><td></td><td></td><td></td><td rowspan="2">Deep</td></tr>
<tr><td>50+</td><td>Refusal</td><td></td><td></td><td></td><td>Weathered Bedrock</td></tr>
</table>

3.3.2.2 Groundwater Flow Regime

The groundwater flow regime basically describes the aquifer components that affect groundwater flow, such as potentiometric surface, hydraulic gradients, areas of groundwater discharge/recharge. Based on historical groundwater data and contour maps, the general groundwater flow path is toward the Reedy River. Based on conditions of the Reedy River (e.g., stage height), the volume of standing water in the wetlands, and/or the volume of groundwater base flow, the groundwater potentiometric surface contours could be relatively parallel or be more oblique to the direction of flow in the Reedy River.

Regarding vertical gradients, seasonal variations will change the magnitude of vertical gradients. This affect would be more prominent in the wetland areas. Based on the current CSM, during a wet season one would expect the wetlands to increase the downward hydraulic gradient in the alluvium and colluvium deposits and recharge oxygenated water into the shallow groundwater system. Discharge to the Reedy River is constrained by the elevated railroad and this constraint could also be contributing to the oxygenated water recharge affect.

3.4 Distribution of COIs

3.4.1 Groundwater

The 1995 AES Phase I investigation encountered groundwater in soil boings and test pits conducted at the Vaughn Landfill. Water sampled on the west side of the landfill had detections of benzene, ethylbenzene, toluene, and xylenes (BTEX). Benzene was detected at concentrations above the maximum concentration limit (MCL) of 5 µg/L. Groundwater wells were installed in 1995 by AES on behalf of CSX. As additional investigations were performed, additional wells were installed at the Vaughn Landfill, at the former Bramlette MGP facility, and in the wetlands. Impacted groundwater was reported to extend from the former Bramlette MGP facility toward the Reedy River. However, groundwater has been only partially assessed between the former Bramlette MGP facility and the Vaughn Landfill.

A comparison of the 1999 and 2015 groundwater elevation data shows that water levels can fluctuate over 2 feet in elevation in study area wells. The groundwater monitoring well network appears to bound the groundwater plumes, which have a generally consistent aerial extent.

3.4.2 Wetlands

Coal tar is suspected to have been released from the former MGP facility into the stormwater drainage system and to have traveled along the stormwater ditch system into pools and depressions within the wetlands. Although the affected soils in the stormwater drainage system between the former MGP facility and the wetlands were excavated (Ditch 1 excavation), non-aqueous phase liquid (NAPL) fractions associated with the coal tar may have been retained in the wetlands and encapsulated in debris when the wetlands were landfilled. NAPL, if retained within the wetlands, may have been retained due to factors including, but not limited to, historical water or stage height in the floodplain, flow velocity, density contrasts, and the presence of vegetation. The suspected retention and subsequent encapsulation of NAPL in the landfilled wetland is supported by visual observations made by AES during their 1995 investigation (AES 1995). Although the suspected NAPL described in the preceding sentence may be contributing COIs to groundwater, a 1999 study performed by the Aquatic Ecology Group concluded that the faunal populations in the wetlands were self-sustaining and likely unaffected by the COIs.

3.5 Monitored Natural Attenuation

Natural attenuation processes affect the fate and transport of COIs in hydrogeologic systems. Natural attenuation is defined as the reduction in mass or concentration of a COI over time, or distance from the source, due to naturally occurring physical, chemical and biological processes such as: biodegradation, dispersion, dilution, adsorption, and volatilization.

MNA is defined as the use of natural attenuation as a remedial strategy to achieve protective concentration levels at the point of exposure. COI levels need to be monitored at regular intervals to ensure the viability of MNA as a remedial alternative.

Considering human health exposure pathways across the study area either do not exist, have been eliminated through soil excavation, or are limited based upon the characteristics of the COIs, the remedial investigation should focus on potential impact to environmental receptors. The most prominent environmental receptor is the wetlands. Since the wetlands are likely unaffected by the COIs, but would be greatly affected by an active remediation technology, MNA may be the preferred remedy for groundwater.

Demonstrations that MNA is an effective remedy can be made using a lines of evidence (LOE) approach. There are three lines of evidence (TCEQ, 2010) that may be used:

1. Primary lines of evidence (PLOE) rely on use of historical groundwater data to demonstrate a clear trend of stable or decreasing COI concentrations over time and with distance away from the source at appropriate monitoring or sampling points.
2. Secondary lines of evidence (SLOE) use geochemical indicators to document certain geochemical signatures in the groundwater that indirectly demonstrate the type of natural attenuation processes occurring, or use distance-based or time-based biodegradation rate calculations to demonstrate attenuation.
3. Other lines of evidence (OLOE) may consist of predictive modeling, laboratory testing, bio assays, or field studies that demonstrate a further understanding of the natural attenuation processes occurring and their effectiveness in controlling migration and decreasing COI concentrations in groundwater.

3.5.1 Primary Lines of Evidence (PLOE)

Although the groundwater gradient may increase or decrease seasonally, historical groundwater elevation data indicate that the groundwater flow direction is relatively stable. The data indicates that the contaminant plume is relatively stable, as depicted on Figures 4 and 5. Further, chemical trend plots of benzene and naphthalene in shallow and relatively deeper wells (Figures 6A through 6D) also support MNA PLOE. Thus, results meet the intent of the reviewed guidance (EPA, 1999; EPRI, 2002; TCEQ, 2010) regarding MNA with respect to the PLOE.

3.5.2 Secondary Lines of Evidence (SLOE)

The geochemical indicator parameters, included in Table 3, were reviewed to evaluate the potential occurrence and effectiveness of natural attenuation processes in the study area. Geochemical indicators of natural attenuation can indicate the presence of appropriate site conditions for natural attenuation of COIs and provide evidence of subsurface biological activity. The geochemical parameters selected for monitoring are based upon the sequential use of terminal electron acceptors as microorganisms consume hydrocarbon contaminants. Terminal electron acceptors (TEA) and the sequence (WDNR, 2014; EPRI, 2002) of use are:

dissolved oxygen (DO)→ nitrate (NO_3^-)→ manganese (Mn^{4+})→ ferric iron (Fe^{3+})→ sulfate (SO_4^{2+})→ carbon

Byproducts of metabolized TEA include:

manganese (Mn^{2+}), ferrous iron (Fe^{2+}), and methane

Select MNA parameters have been collected from the study area during previous investigations, and during more recent groundwater monitoring events. Our review of the available data suggest that TEAs are being consumed, and that byproducts may be increasing. Figure 7 presents three different indirect measures of potential bio-activity: (1) the field measurements of oxygen-reduction potential and an overlay of the laboratory alkalinity measurements, (2) TEA values used to rank the maturity of the reduction pathway, and (3) the isoconcentration of manganese (Mn^{2+}). Based on Figure 7, there appears to be some evidence of bio-activity. Table 3 provides recent and historical MNA field and laboratory measurements.

3.5.3 Other Lines of Evidence (OLOE)

Additional information will be collected during the RI to support the lines of biodegradation evidence and to provide information that may be needed to evaluate remedial alternatives. Currently, there is evidence that native bacteria are performing respiration and degrading site-specific COIs. Additional data, such as dissolved gasses, not only would increase the strength of secondary evidence but may also provide information relative to the respiration and degradation processes taking place. More directly, an assay of the microbiological community (WDNR, 2014: EPA 2012) would determine if the functional genes known to degrade site-specific COIs are present.

4.0 Proposed Field Work and Data Analysis

4.1 Project Data Quality Objectives

The Data Quality Objectives (DQOs) for data collection during the RI activities have two intended purposes: (1) to ensure that the laboratory analytical data generated are of sufficient quality to support the intended uses, and (2) to meet the data quantification requirements for comparison to the applicable standards.

Groundwater standards are based on the following:

- DHEC regulation document R.61-58, *State Primary Drinking Water Standards* (Drinking Water Standards), effective October, 2014, Appendix B maximum contaminant level (MCL) based on the United States Environmental Protection Agency (EPA) *National Recommended Water Quality Criteria*, dated 2006
- DHEC regulation document R.61-68, *Water Classifications & Standards*, effective June 27, 2014, groundwater classification as GB, Human Health MCLs provided in the Appendix of R.61-58
- EPA Residential Tap Water Regional Screening Level (RSL) will be used to establish data quantification requirements for COIs if no MCL exists

The following field methodology quality assurance/quality control (QA/QC) samples will be collected during the RI activities:

- Laboratory trip blanks will be submitted and analyzed at a frequency of one per VOC shipment cooler; if VOCs are not included in the cooler, a trip blank will not be included in the cooler.
- Equipment rinsate blanks will be collected at a frequency of one per day from reusable sample contacting equipment (if used), including: acetate liners, bowls used for sediment sampling, and hand augers.

The following laboratory samples will be evaluated for QA/QC purposes during the RI activities:

- Field duplicate samples will be collected at a frequency of one duplicate sample for every 20 samples during the RI and submitted to the laboratory as blind duplicates.
- To assess potential matrix interference with the accuracy of the laboratory analysis, matrix spike (MS)/matrix spike duplicate (MSD) samples will be analyzed for organic COI sample analysis (e.g., VOCs and SVOCs). MS/MSD samples will be analyzed at a rate of one per 20 samples collected.
- In addition to instrument calibration and internal laboratory QA/QC procedures, laboratory control samples (LCS), also known as blank spikes, and method blank analysis will be performed by the laboratory.

EPA Contract Laboratory Program DQO Level III reporting packages will be performed for the laboratory analytical data submitted for analysis. DQO Level II and DQO Level I data may be used to support remedial investigation conclusions.

4.2 Boring Advancement and Soil Sampling

Six soil borings, three at each of two groundwater monitoring well clusters (shallow, intermediate, and deep wells), will be advanced on the MGP facility parcel. These wells will be installed to replace monitoring wells abandoned to accommodate historical soil remediation at the former MGP facility. The boreholes will be extended to a target depth ranging between 15 and 50 ft-bgs depending on the groundwater monitoring well type. The deepest well at each location will be extended to the apparent top of competent bedrock (assumed to be approximately 50 ft-bgs) and soils will be retrieved for description and field screening. The deepest proposed boring at each groundwater monitoring well cluster will be drilled first to determine the placement depths of the shallow and intermediate wells in the cluster. The well depths will be adjusted based on field conditions.

Soil borings will be advanced by using sonic drilling methods to obtain sufficient recovery and volumes for soil sampling. Soil cuttings will be containerized in 55-gallon drums and securely staged for later disposal. Soils in the boring profile will be field screened with a flame-ionization detector (FID) for the presence of possible VOCs. Field observations, including the color, composition, and presence of visible staining and/or odors will be noted on boring logs. Figure 8 depicts the locations of the proposed soil borings to be advanced for the installation of the replacement groundwater monitoring wells.

Analytical laboratory samples will be collected from the boreholes based on field observations. Soil samples will be collected from the vadose zone and the saturated zone below the fill in native soils. Soil sample intervals will be selected from the deepest borehole advanced (MW-13R and MW-9R) at both groundwater monitoring well clusters. Soil samples will be placed in laboratory-approved containers and kept on ice during transport to a certified laboratory under chain-of-custody-protocol. Undisturbed native soil samples will be collected using Shelby tubes as needed. Soil samples will be collected and analyzed for parameters based on the following schedule:

Total Number of Soil Samples	Analytes	EPA/ASTM Methodology	Zone	Rationale
up to 6	VOCs	8260 Select Ion Method	Vadose, Saturated	Vertical Delineation of VOCs and SVOCs
up to 6	SVOCs	8270	Vadose, Saturated	
Up to 4	Soil pH	ASTM D4972	Saturated	COI Fate and Transport Parameters
up to 5	Bulk and Dry Density	ASTM D7263, Calculated	Saturated	
up to 5	Moisture Content	ASTM D2216	Vadose	
up to 5	Porosity	Calculated (ASTM 7236)	Saturated	
up to 5	Grain Size Analysis and Soil Classification	ASTM D6913/D422 and D2487	Saturated	
up to 5	Permeability Tests	ASTM D5084/D2434	Saturated	
up to 5	Fraction Organic Content (FOC)	ASTM D2974	Saturated	

* - Not including duplicates

To understand vertical distribution of VOCs and SVOCs at the former MGP facility, up to three VOC and SVOC soil samples will be collected from each of the monitoring well cluster locations. The soil sample analytical results will be used to assess current COI concentrations that could affect groundwater quality.

To provide estimates of the fate-and-transport-related parameters, samples will be collected from the saturated zone to test for the following geotechnical parameters: bulk density and moisture content, porosity, grain size, permeability, and the fraction of organic content. Both the grain size analysis and permeability testing will provide measures of the potential for fluid flow in the subsurface. Grain size analysis and porosity will also be useful in designing delivery methods for substrates, nutrients and/or reagents if required in the future. Bulk density, porosity, and fraction of organic content will be useful for determining the relative sorption and transport retardation of COIs. Please note that the fraction of organic content may be biased by the presence of COIs, therefore, laboratory results will be evaluated with respect to the presence of COIs.

4.3 Groundwater Monitoring Well Installation

A total of six groundwater wells (three permanent groundwater monitoring wells at each of two well clusters) will be installed using a sonic drilling rig. Each monitoring well will be completed as two-inch-diameter polychlorinated vinyl (PVC) wells with stick-up protective well casings. The wells are considered to be replacement groundwater monitoring wells for some of the wells abandoned during soil excavation and remediation on Parcel 1. Each well will be constructed with 0.010-inch slotted PVC screen and solid riser. The sand filter pack will consist of 1C (16x40) washed and kiln-dried clean quartz sand. Actual well construction characteristics will be based on field conditions. The proposed well details are as follows:

Well Cluster	Designation	Total Depth, ft-bgs	Screen Length, ft	Screen Depth, ft-bgs
MW-14R	Shallow	15	10	5-15
MW-13R	Mid-Depth	30	10	20-30
MW-26	Deep	50	10	40-50
MW-7R	Shallow	15	10	5-15
MW-8R	Mid-Depth	30	10	20-30
MW-9R	Deep	50	10	40-50

Approximately 72 hours after well installation, the wells will be developed by pumping and surging techniques. Purge water and sediment will be containerized in 55-gallon drums and securely staged to await disposal (see Section 5.0).

4.4 Groundwater Well Sampling

All groundwater monitoring wells will be gauged and sampled approximately 1 week following the development of the newly installed wells. Groundwater wells will be gauged for the depth to groundwater and total depth. Monitoring wells will be purged and sampled with a peristaltic pump or bladder pump depending on the depth to water. The pump or tubing inlet will be placed at the approximate center of the monitoring well screen, and the well will be purged and sampled via low-flow sampling techniques. Groundwater will be pumped through a flow-through cell equipped with a multi-parameter water-quality meter; water quality parameters will include: temperature, pH, turbidity, specific conductance, dissolved oxygen (DO), and ORP and/or Eh. Once parameter stabilization has been reached, or 1 hour of continuous pumping has occurred, samples will be collected for laboratory analysis.

Groundwater monitoring wells in the study area will be sampled, in addition to the newly installed wells, to have a temporal snapshot of groundwater conditions. Groundwater monitoring wells will be sampled for the same parameters as in the annual sampling events including VOCs. SVOCs have been historically detected in soils in the study area, therefore groundwater will also be sampled for SVOCs to further evaluate the soil to groundwater pathway. Samples will be sent to Pace Analytical Services, Inc. in Huntersville, North Carolina (DHEC certifications 99006-01 and 99006.03) for analysis.

Total Number of Groundwater Samples*	Analytes	EPA Methodology	Rationale
19	VOCs	8260	Current Semiannual Groundwater Sampling
19	SVOCs	8270	Soil to Groundwater Pathway

* - Not including duplicates

4.4.1 Monitored Natural Attenuation Sampling

Groundwater samples are collected and analyzed for the flowing parameters as part of the routine groundwater sampling of MNA parameters:

Total Number of Groundwater Samples*	Analytes	EPA/ASTM Methodology	Rationale
16	Nitrate	353.2	Current MNA Parameters
16	Sulfate	300	
16	Ferrous Iron	SM 4500FE	
16	Alkalinity	SM 2320B	
16	Manganese	6010C	

To augment the parameters currently being collected, samples will also be analyzed for additional parameters which would further evaluate MNA processes and occurrence in the study area. Once oxygen is removed from groundwater, the primary anaerobic biodegradation process is denitrification. Ammonia, as nitrogen, is commonly associated with landfill leachate and decomposing organic (plant) material, and could be oxidized by bacteria into nitrate (NO_3^-) or nitrite (NO_2^-). Nitrate is collected during semi-annual groundwater sampling events. Ammonia and nitrite will also be sampled and analyzed for as part of this RIWP to further evaluate the potential denitrification processes relative to biodegradation.

Laboratory bioassay samples (QuantArray) will be collected to determine if petroleum-reducing bacterium are present in the study area. A biotrap sampler will be placed into select wells for approximately 30-days to allow bacterium to accumulate on the surface. Samplers will then be analyzed for the specific functional genes responsible for both aerobic and anaerobic biodegradation of BTEX, PAHs, and a variety of short- and long-chain alkanes. Biotrap samplers will be deployed following the purging and sampling of groundwater monitoring wells.

Biological Activity Reaction Tests (BART™) are field kits that can be used to assess the presence or absence of bacteria in the subsurface. There are bacteria type-specific BART samples which may help field screen changes, or confirm bacteria activity, during future performance monitoring events. As a correlation to the QuantArray, BART sample kits will be collected to assess the presence of denitrifying bacteria (DN-BART), nitrifying bacteria (N-BART), iron reducing bacteria (IRB-BART), and sulfate reducing bacteria (SRB-BART). BART samplers will be filled following the purging and sampling of groundwater monitoring wells. BART samplers will be monitored daily during the incubation period.

Dissolved gasses (methane and carbon dioxide) will also be analyzed at specific locations to assess microbial byproduct production. The total and dissolved organic content can provide a measure of the carbon available as an electron donor; both natural and inorganic carbon can be utilized by bacteria. These additional MNA parameters will also be collected to provide support for a potential MNA remedy.

Groundwater samples will be collected for the following additional MNA analytes:

Total Number of Groundwater Samples*	Analytes	EPA/ASTM Methodology	Rationale
16	Total Iron	200.7/6010C	One Time Additional MNA Parameters
16	Ammonia-Nitrogen/Nitrite	350.1/300	
7	Dissolved Carbon Dioxide and Methane	AM 20 GAX/RSK 175	
7	Total and Dissolved Organic Carbon	SM 5310 B	
7	QuantArray-Petroleum	Proprietary	Biological Assay and Field Correlation
7	BART™	Proprietary	

* - Not including duplicates

4.5 Direct Push Groundwater Sampling

Shallow groundwater samples will be collected using direct push technology at the locations indicated on Figure 8. Sampling locations parallel to Bramlette Road are oriented with the general groundwater flow direction, whereas sampling locations along the western property boundary of Parcel 1 are orthogonal to the general groundwater flow direction. Groundwater samples collected at the water table in the groundwater flow direction will provide an evaluation of the lateral distribution of COIs between the former MGP facility and the Vaughn Landfill.

To collect shallow groundwater samples, soil borings will be advanced into the water table and a 1-inch diameter temporary well screen and riser will be installed. A sand filter pack will be placed to one foot above the screen interval; a minimum one-foot thick layer of bentonite chips will be placed on top of the sand pack to create a seal if left overnight. The temporary wells will be purged with a peristaltic pump until purged groundwater appears relatively clear, colorless, or generally devoid of sediment. After which, grab groundwater samples will be collected from the peristaltic pump tubing, in clean laboratory supplied glassware, and placed on ice. Grab groundwater samples will be submitted to a laboratory under proper chain of custody forms, for the following analysis:

Total Number of Grab Groundwater Samples*	Analytes	EPA Methodology	Rationale
13	VOCs	8260	COI distribution.
13	SVOCs	8270	

* - Not including duplicates

4.6 Updated Receptor Survey

Altamont will perform a modified receptor survey and will include the following features:

- Public water supply wells within 1 mile of the property
- Private water supply wells within a 1/2 mile of the property
- Irrigation supply wells within a 1/2 mile of the property
- Monitoring wells within 1,500 feet of the property
- Adjacent properties with structures not connected to city supplied water

Altamont will provide the results of the receptor survey in the Groundwater RIR.

4.7 Surveying

Following the completion of the monitoring well installation, the groundwater monitoring wells will be surveyed by a licensed surveyor in the State of South Carolina. The well-pad/ground-surface and top-of-casing elevations will be measured, to 1/100 of a foot, relative to the NAVD88, per the Access Agreement; the survey will also provide conversion factors to relate the data to other datum references (e.g., NNGVD29 and WGS84).

The position of the wells will also be surveyed relative to northings and eastings and longitude and latitude (decimal degrees). Please note that the historical records reviewed did not indicate the elevation datum, but was referred to as mean sea level. Several wells have been repaired due to damage, or ground settlement; therefore, the wells were replaced or repaired. As quality control measure, the surveyor will also survey the elevation of existing Site wells while surveying the newly installed wells.

4.8 Aquifer Testing

Estimates of the hydraulic conductivity are essential when estimating the travel times of COIs. A common method used without generating large quantities of investigation-derived waste is to perform a slug test (creating a known volume of displacement in a groundwater well and monitor the response of the aquifer to reach equilibrium). In contrast to a pumping test, a slug test provides estimates of hydraulic conductivity in the immediate vicinity of the groundwater well.

Altamont will use two methods to initiate the slug tests: (1) solid slugs and (2) pneumatics. The solid slugs will be lowered into shallow wells, which have screens extending above the water table and into the vadose zone. Pneumatic slug tests will be used for wells, which are screened sufficiently below the water table to allow for depression of the water surface in the well with air. The water pressure response of the slug tests will be monitored and recorded using pressure transducers with data logging capabilities. Data collected will be exported into a third-party parameter estimation software package, such as AQTESOLV, to provide estimates of hydraulic conductivity.

4.9 Data Trend Analysis

The data collected during the implementation of the RIWP will be added to the historical data and analyzed for both in-well trends (e.g., concentration over time) and flow line trends (e.g., concentration over distance). These analyses will be performed to evaluate the stability of the plume and to determine attenuation rates that can be used to support the evaluation of remedial options.

5.0 Investigation-Derived Waste Management

Investigation-derived waste will include personal protection equipment (PPE), drilling spoils, development purge water, and sampling purge water. Soils and water will be containerized in 55-gallon drums and staged at a central location at the respective property Parcel from which they were derived. Every effort will be made to coordinate a timely container collection by a third-party disposal company for off-site disposal at an appropriate facility.

6.0 Reporting

Following the investigation, an RIR will be prepared presenting the field methods and results of the RI. The RI will include a discussion of deviations from the work plan, tabular data summaries, and sample location figures. Data collected during the RI will be interpreted in the text of the report and accompanying cross-sections will be presented, along with updates to the CSM. The report will include or reference the supporting data, information, and publications used in preparing the report. Groundwater sampling logs, boring logs, well construction records, and laboratory reports and data analysis sheets will be presented in appendices.

7.0 References

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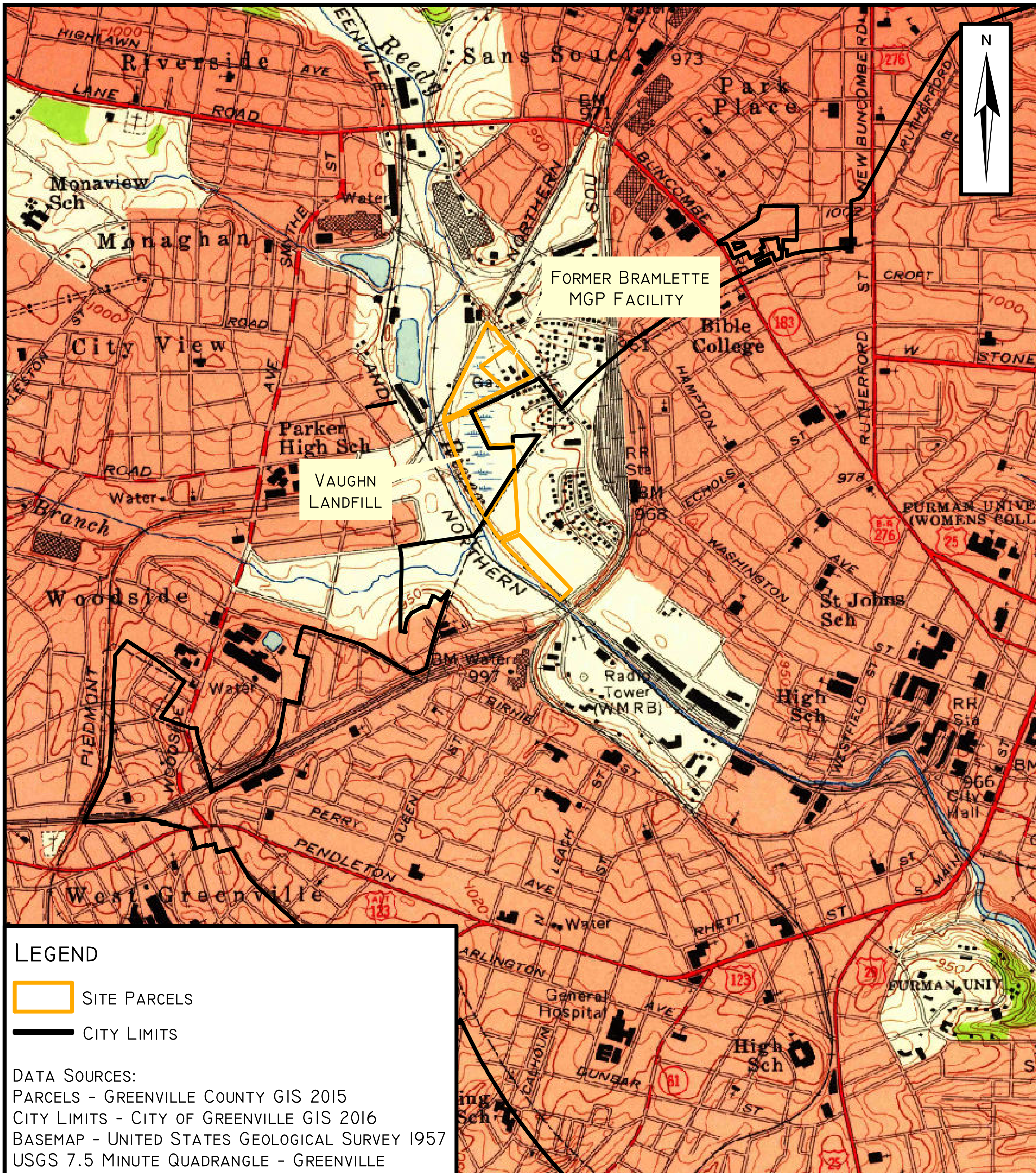
FIGURES



Legend

Site Parcels

City Limits

Data Sources:
Parcels - Greenville County GIS 2015
City Limits - City of Greenville GIS 2016
Basemap - United States Geological Survey 1957
USGS 7.5 Minute Quadrangle - Greenville

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Drawn By: Jackson Bogach
Project Manager: Jennifer Verde
Client: Duke Energy
Date: 11/1/2016

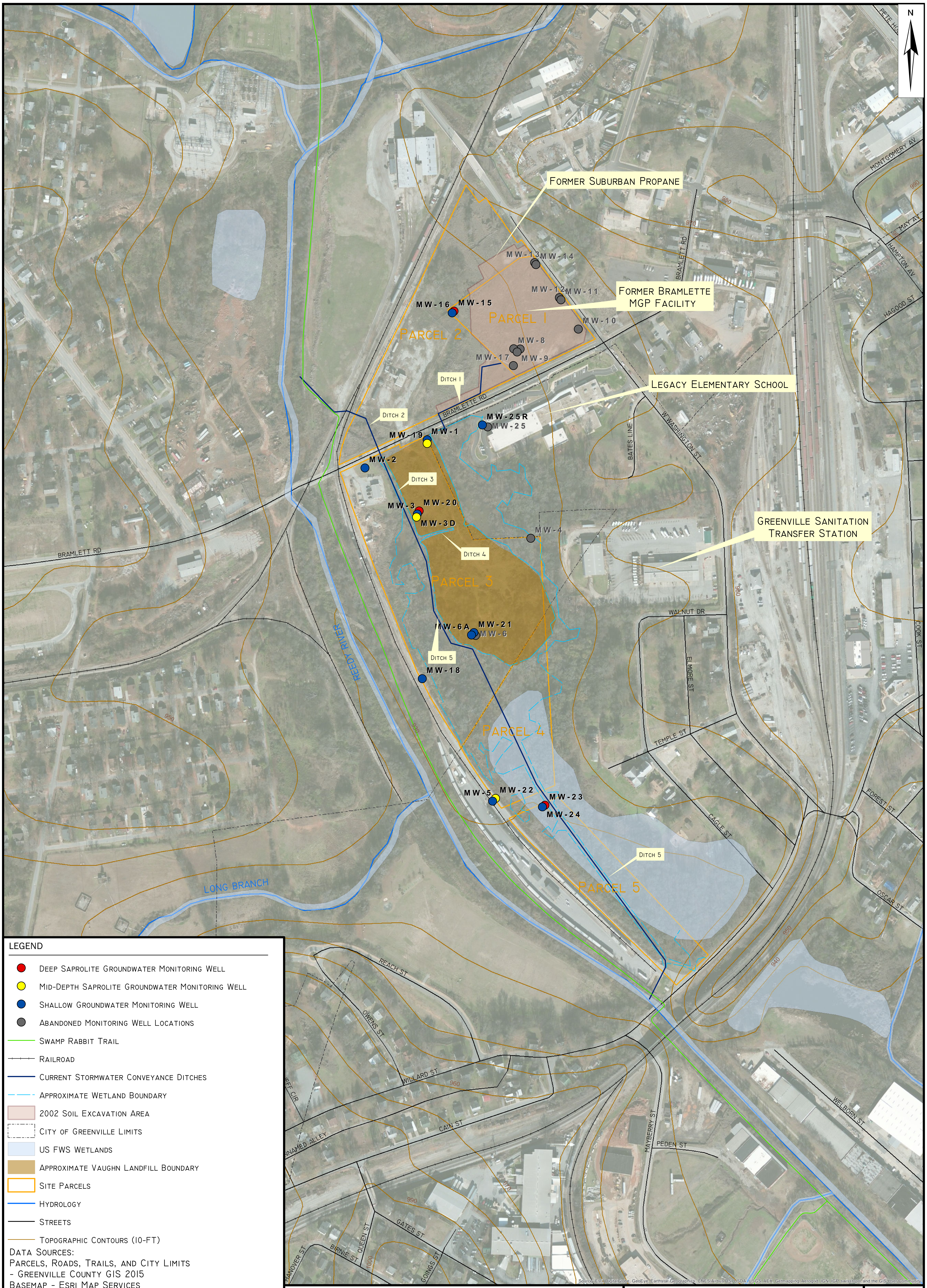
Scale
0 1,000 2,000 Feet

Study Area Location Map

Former Bramlette MGP Facility
Greenville, Greenville County,
South Carolina

Figure
1

P:\Duke Energy\Bramlette Road\Figures\Figure 1 - Site Location Map_.mxd



LEGEND

- Deep Saprolite Groundwater Monitoring Well
- Mid-Depth Saprolite Groundwater Monitoring Well
- Shallow Groundwater Monitoring Well
- Abandoned Monitoring Well Locations
- Swamp Rabbit Trail
- Railroad
- Current Stormwater Conveyance Ditches
- Approximate Wetland Boundary
- 2002 Soil Excavation Area
- City of Greenville Limits
- US FWS Wetlands
- Approximate Vaughn Landfill Boundary
- Site Parcels
- Hydrology
- Streets
- Topographic Contours (10-FT)

Data Sources:
Parcels, Roads, Trails, and City Limits - Greenville County GIS 2015
Basemap - Esri Map Services
Hydrology - SCDNR 2013
Wetlands - United States Fish & Wildlife Service 2016 (US FWS)

Notes:
1. Wetland and Landfill Boundaries are Based on Duke Energy CADD Drawing.
2. Stormwater Conveyance Ditch is Based on Historical Aerials.
3 Wetland, Landfill, Ditches, and Monitoring Well Locations are Approximate.

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

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Existing Study Area Layout Map

Former Bramlette MGP Facility
Greenville, Greenville County,
South Carolina

FIGURE 2

Drawn By: Jackson Bogach
Project Manager: Jennifer Verde
Client: Duke Energy
Date 11/1/2016

Scale
0 100 200 400 Feet
1 inch = 200 feet
If scale different than indicated, then drawing has been altered from its original size.

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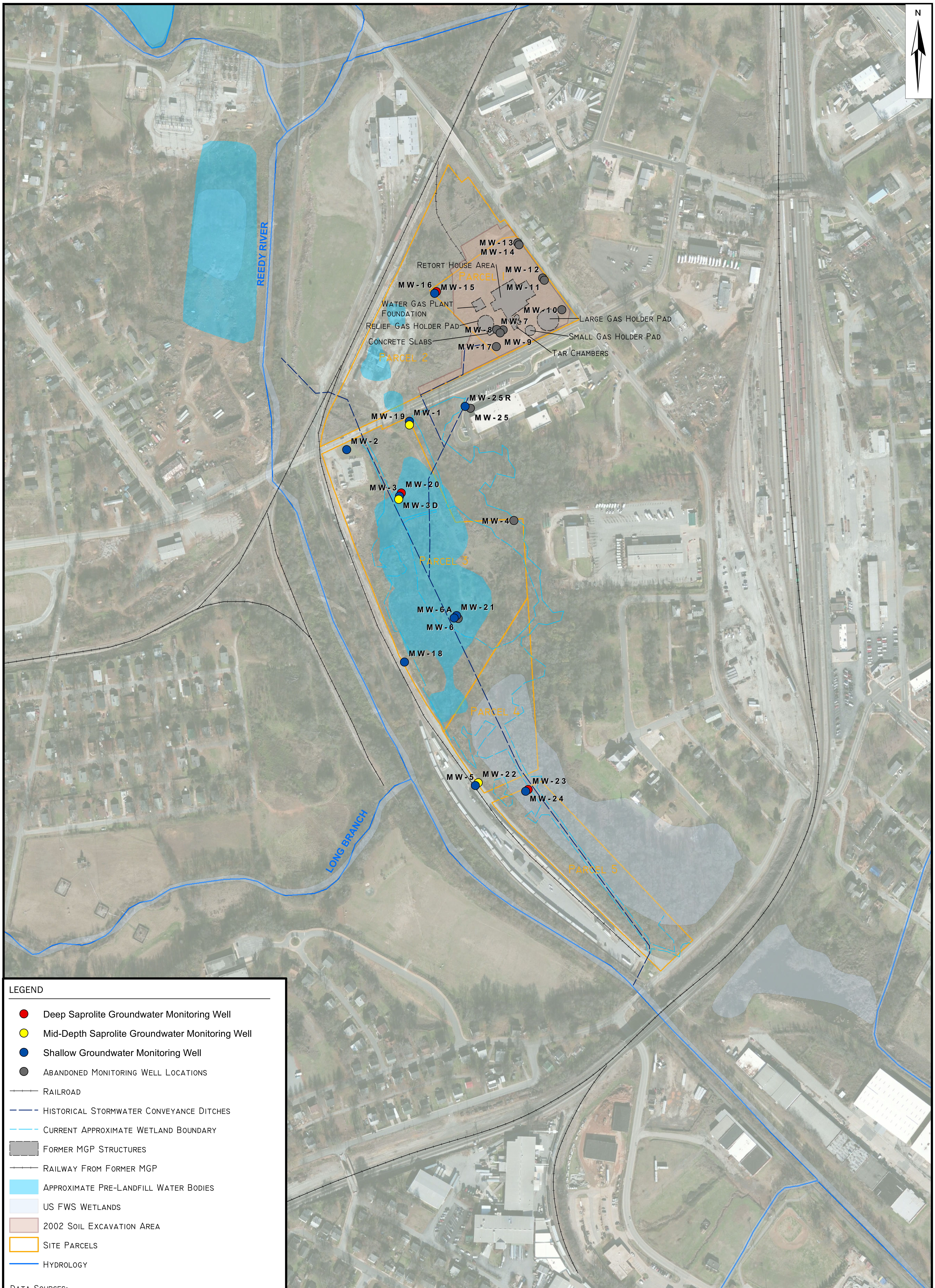

LEGEND

- Deep Saprolite Groundwater Monitoring Well
- Mid-Depth Saprolite Groundwater Monitoring Well
- Shallow Groundwater Monitoring Well
- Abandoned Monitoring Well Locations
- Railroad
- Historical Stormwater Conveyance Ditches
- Current Approximate Wetland Boundary
- Former MGP Structures
- Railway From Former MGP
- Approximate Pre-Landfill Water Bodies
- US FWS Wetlands
- 2002 Soil Excavation Area
- Site Parcels
- Hydrology

Data Sources:
Parcels - Greenville County GIS 2015
Aerial - Esri Map Services
Hydrology - SCDNR 2013

Notes:
1. Stormwater Conveyance Ditches, Water Body Locations, Railway, and MGP Structures are Based on Historical Aerials.
2. Wetland Boundary Based on Duke Energy CADD Drawing.
3. Stormwater Conveyance Ditches, Water Bodies, Railway, MGP Structure Locations, Excavation Area, and Wetland Boundary are Approximate.

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Drawn By: Jackson Bogach
Project Manager: Jennifer Verde
Client: Duke Energy
Date 11/3/2016

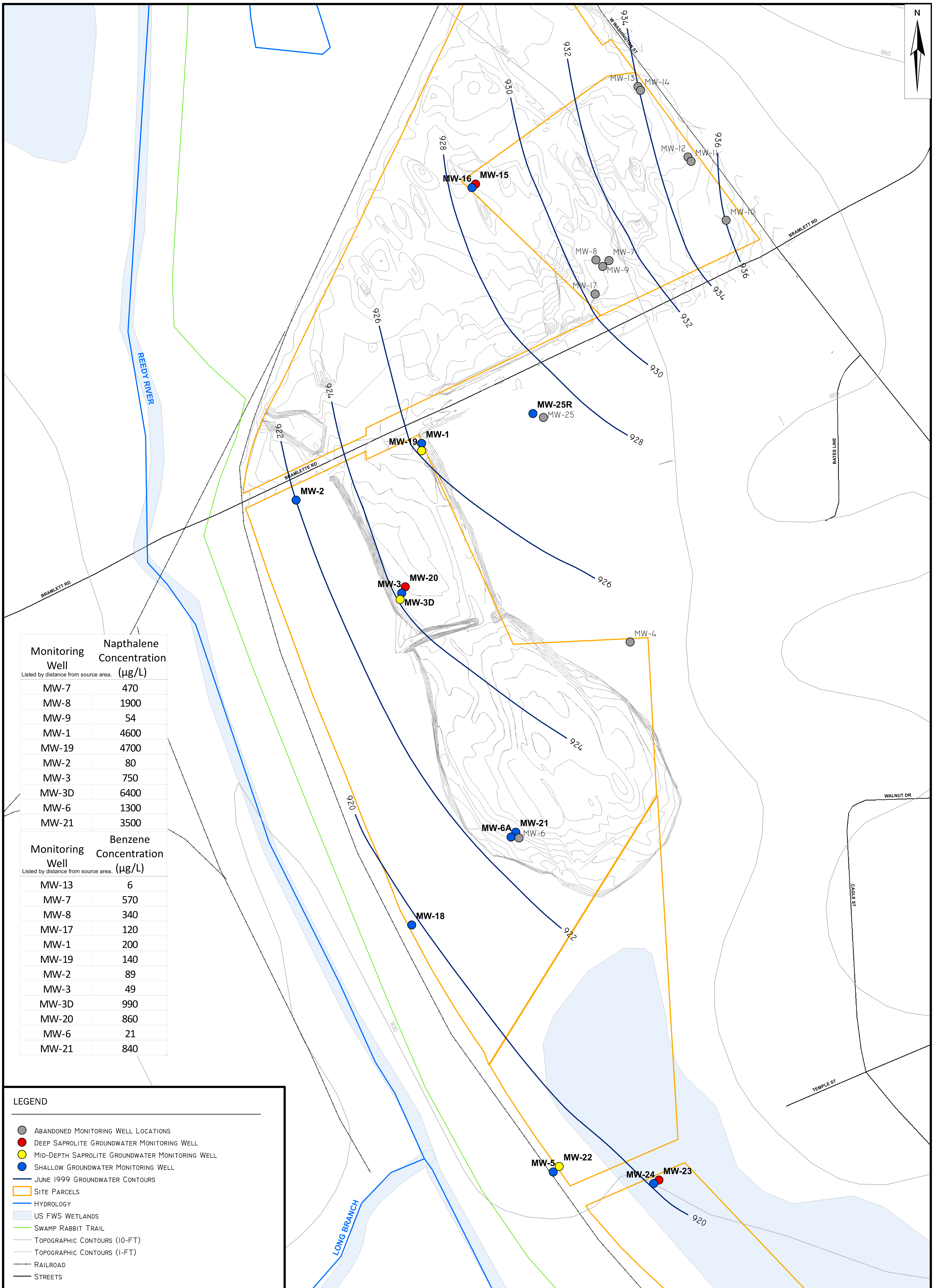
SCALE
0 100 200 400
Feet
1 inch = 200 feet
If scale different than indicated, then drawing has been altered from its original size.

Historical Study Area Layout

Former Bramlette MGP Facility
Greenville, Greenville County,
South Carolina

P:\Duke Energy\Bramlette Road\Figures\Figure 3 - Pre-Landfill Study Area Layout.mxd

FIGURE
3



Monitoring Well Listed by distance from source area.	Napthalene Concentration (µg/L)
MW-7	470
MW-8	1900
MW-9	54
MW-1	4600
MW-19	4700
MW-2	80
MW-3	750
MW-3D	6400
MW-6	1300
MW-21	3500

Monitoring Well Listed by distance from source area.	Benzene Concentration (µg/L)
MW-13	6
MW-7	570
MW-8	340
MW-17	120
MW-1	200
MW-19	140
MW-2	89
MW-3	49
MW-3D	990
MW-20	860
MW-6	21
MW-21	840

LEGEND

- Abandoned Monitoring Well Locations
- Deep Saprolite Groundwater Monitoring Well
- Mid-Depth Saprolite Groundwater Monitoring Well
- Shallow Groundwater Monitoring Well
- June 1999 Groundwater Contours
- Site Parcels
- Hydrology
- US FWS Wetlands
- Swamp Rabbit Trail
- Topographic Contours (10-FT)
- Topographic Contours (1-FT)
- Railroad
- Streets

Data Sources:
Parcels - Greenville County GIS 2015
Hydrology - SCDNR 2013
Topographic Contours (10-FT) - USGS 2016

Notes:
1. Groundwater Elevation Contour Lines are sourced from 1999 Duke Energy data.
2. Wetland Boundary and Landfill are Approximate.
3. Wetland Boundary, Landfill, and Elevation Contours (1-FT) are based on CADD drawing by Duke Energy.
4. Groundwater Contours have inferences due to data gaps.
5. Contour labels are in feet above sea level.

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Date: 11/1/2016

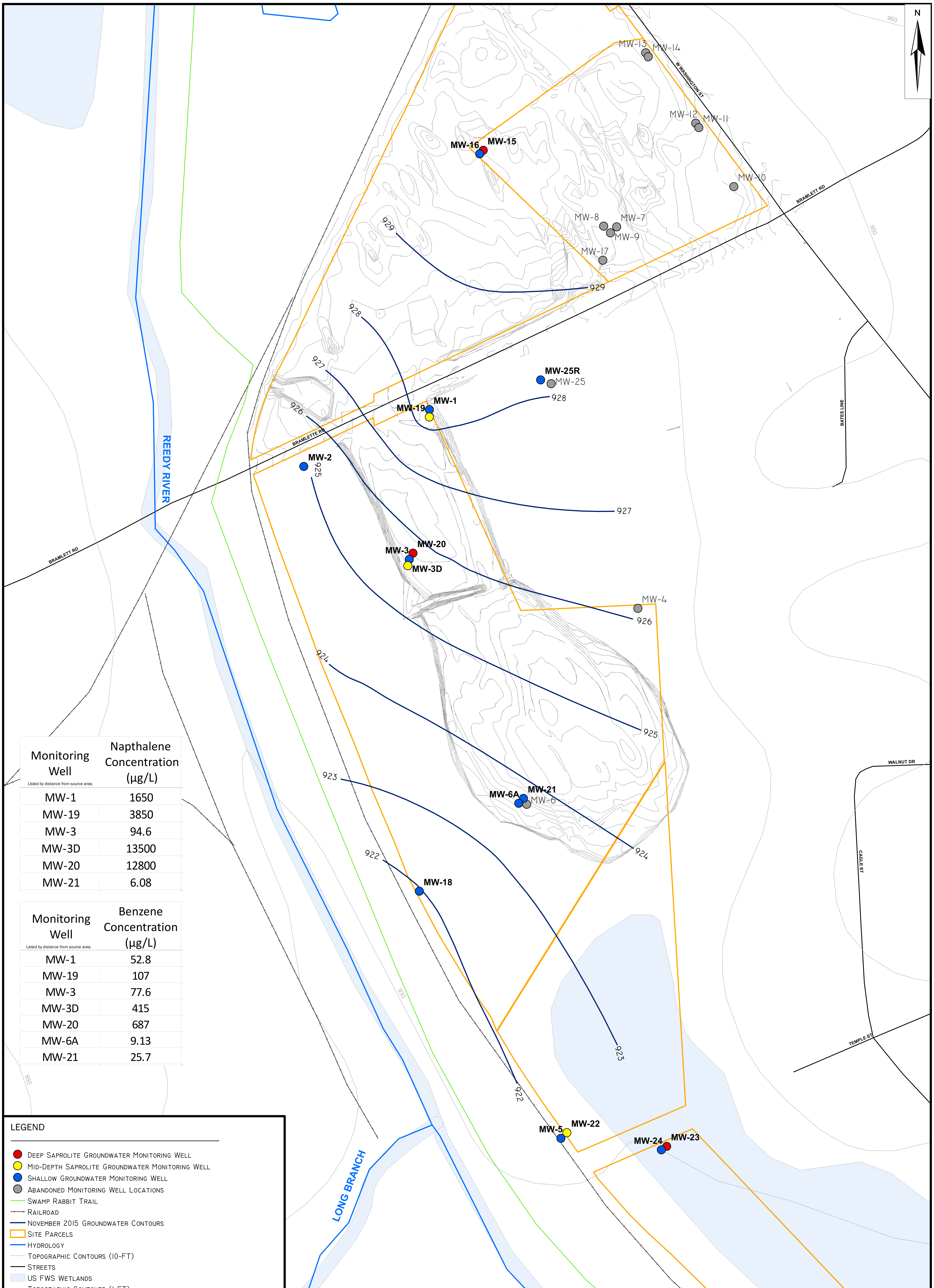
SCALE
0 100 200 400 Feet
1 inch = 100 feet
If scale different than indicated, then drawing has been altered from its original size.

Potentiometric Map Benzene and Napthalene Concentrations June 1999 Sampling

Former Bramlette MGP Facility
Greenville, Greenville County, South Carolina

P:\Duke Energy\Bramlette Road\Figures\Figure 4 - 2000 Potentiometric Map.mxd

FIGURE 4



Monitoring Well Listed by distance from source area.	Napthalene Concentration (µg/L)
MW-1	1650
MW-19	3850
MW-3	94.6
MW-3D	13500
MW-20	12800
MW-21	6.08

Monitoring Well Listed by distance from source area.	Benzene Concentration (µg/L)
MW-1	52.8
MW-19	107
MW-3	77.6
MW-3D	415
MW-20	687
MW-6A	9.13
MW-21	25.7

LEGEND

- Deep Saprolite Groundwater Monitoring Well
- Mid-Depth Saprolite Groundwater Monitoring Well
- Shallow Groundwater Monitoring Well
- Abandoned Monitoring Well Locations
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- Railroad
- November 2015 Groundwater Contours
- Site Parcels
- Hydrology
- Topographic Contours (10-FT)
- Streets
- US FWS Wetlands
- Topographic Contours (1-FT)

Data Sources:
Parcels - Greenville County GIS 2015
Hydrology - SCDNR 2013
Topographic Contours (10-FT) - USGS 2016

Notes:
1. Groundwater Elevation Contour Lines are sourced from November 2015 S&ME data.
2. Wetland Boundary and Landfill are Approximate.
3. Wetland Boundary, Landfill, and Elevation Contours (1-FT) are Based CADD drawing by Duke Energy.
4. Groundwater Contours have inferences due to data gaps.
5. Contour labels are in feet above sea level.

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Project Manager: Jennifer Verde
Client: Duke Energy
Date 11/3/2016

SCALE
0 100 200 400 Feet
1 inch = 100 feet
If scale different than indicated, then drawing has been altered from its original size.

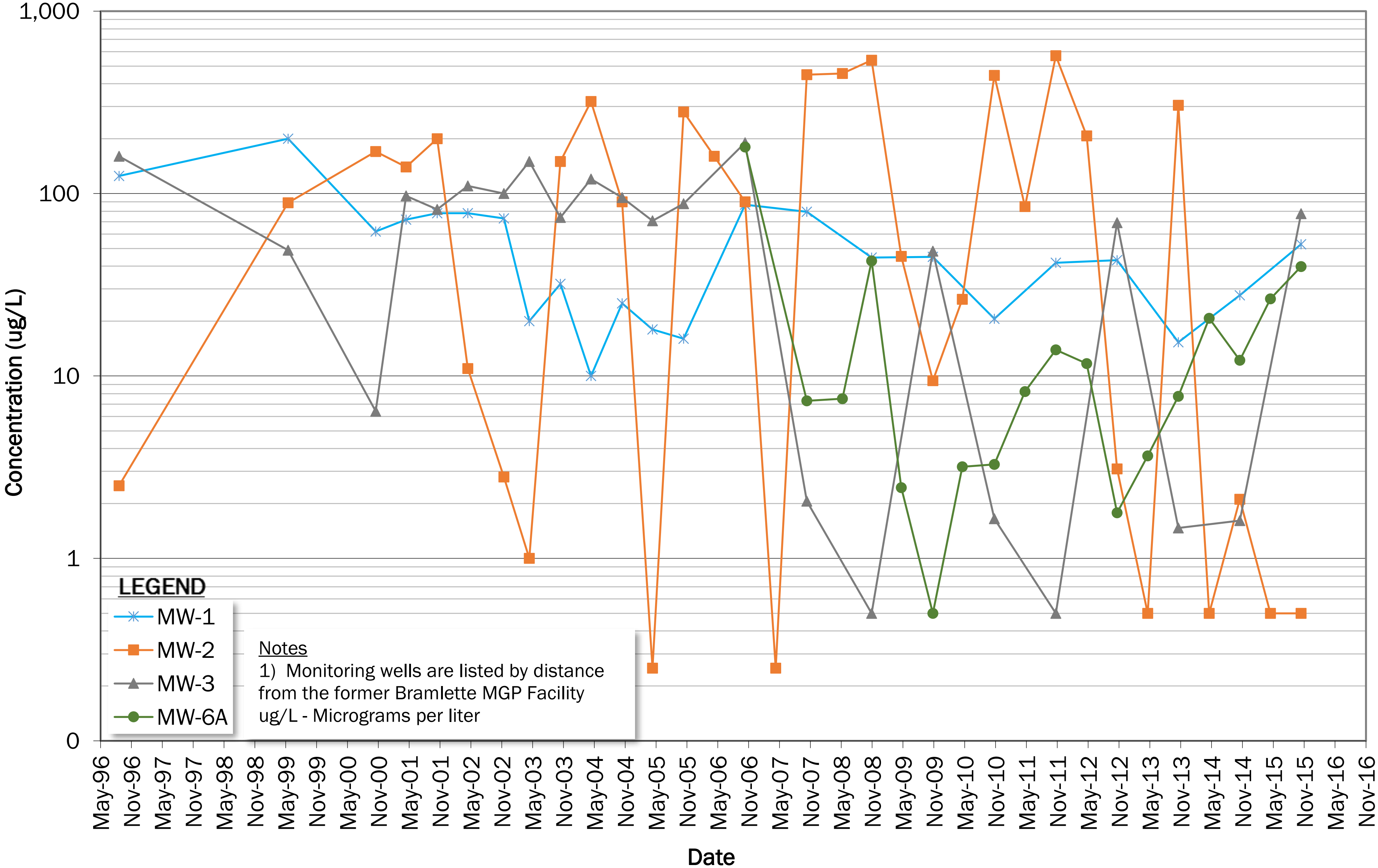
Potentiometric Map
Benzene and Napthalene Concentrations
November 2015 Sampling
Former Bramlette MGP Facility
Greenville, Greenville County, South Carolina

P:\Duke Energy\Bramlette Road\Figures\Figure 5 - 2015 Potentiometric Map.mxd

FIGURE

5

Figure 6A
Former Bramlette MGP Facility
Benzene Concentration Trend Plot
Shallow Wells



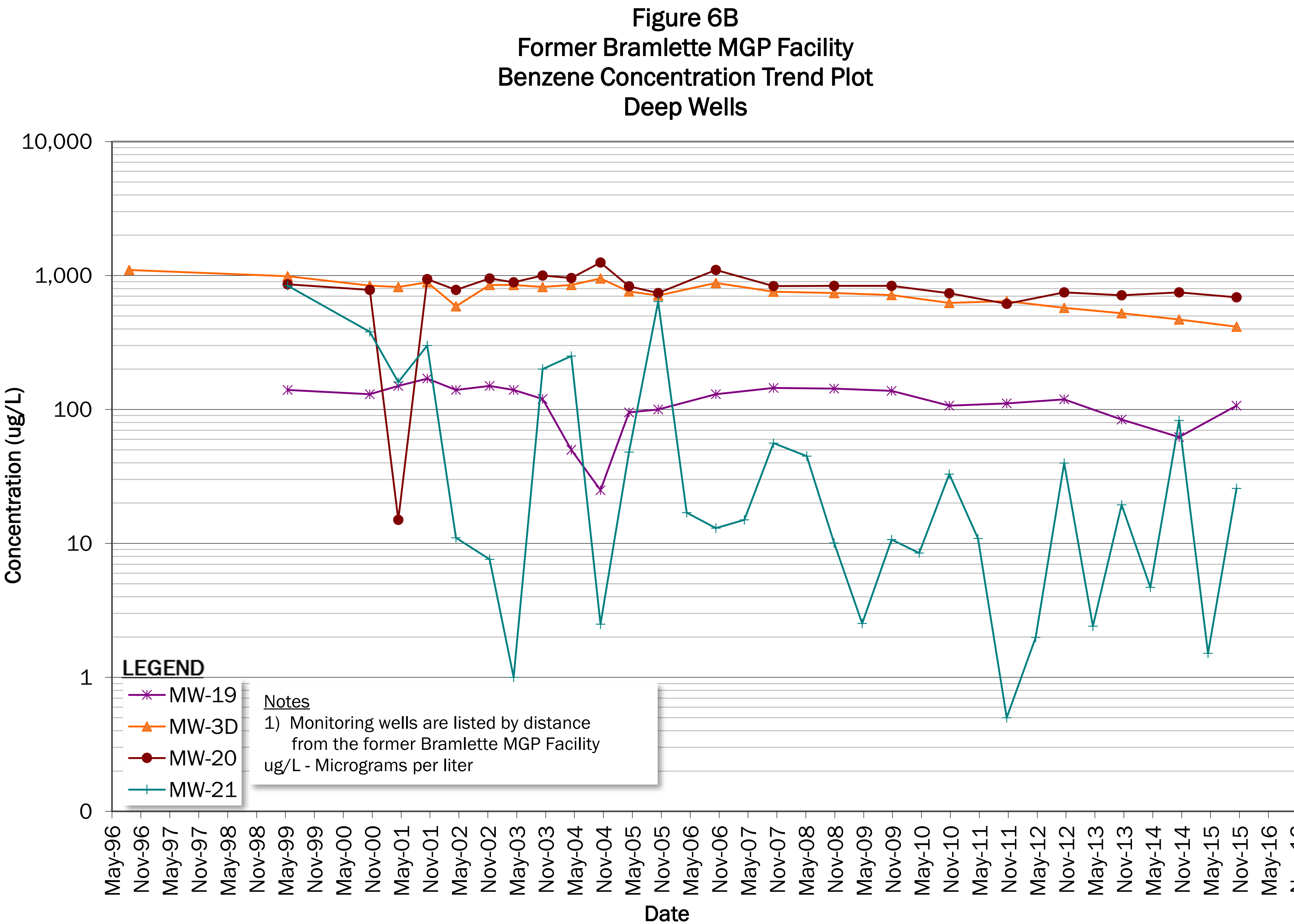


Figure 6B
Former Bramlette MGP Facility
Benzene Concentration Trend Plot
Deep Wells
10,000
1,000
100
10
1
0
Concentration (ug/L)
May-96
Nov-96
May-97
Nov-97
May-98
Nov-98
May-99
Nov-99
May-00
Nov-00
May-01
Nov-01
May-02
Nov-02
May-03
Nov-03
May-04
Nov-04
May-05
Nov-05
May-06
Nov-06
May-07
Nov-07
May-08
Nov-08
May-09
Nov-09
May-10
Nov-10
May-11
Nov-11
May-12
Nov-12
May-13
Nov-13
May-14
Nov-14
May-15
Nov-15
May-16
Nov-16
Date
LEGEND
MW-19
MW-3D
MW-20
MW-21
Notes
1) Monitoring wells are listed by distance from the former Bramlette MGP Facility
ug/L - Micrograms per liter

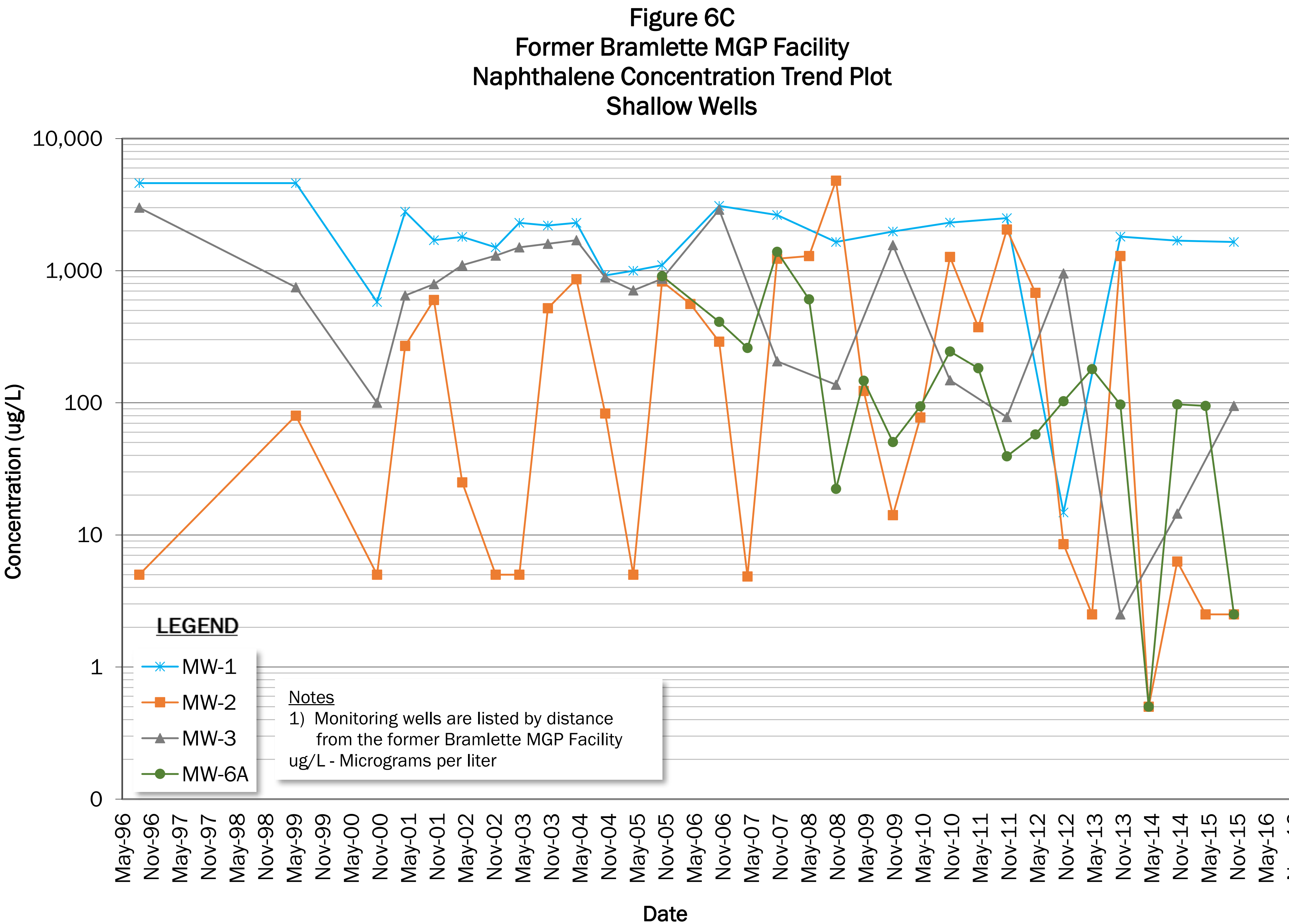


Figure 6C
Former Bramlette MGP Facility
Naphthalene Concentration Trend Plot
Shallow Wells
Concentration (ug/L)
10,000
1,000
100
10
1
0
Date
LEGEND
MW-1
MW-2
MW-3
MW-6A
Notes
1) Monitoring wells are listed by distance from the former Bramlette MGP Facility
ug/L - Micrograms per liter
May-96
Nov-96
May-97
Nov-97
May-98
Nov-98
May-99
Nov-99
May-00
Nov-00
May-01
Nov-01
May-02
Nov-02
May-03
Nov-03
May-04
Nov-04
May-05
Nov-05
May-06
Nov-06
May-07
Nov-07
May-08
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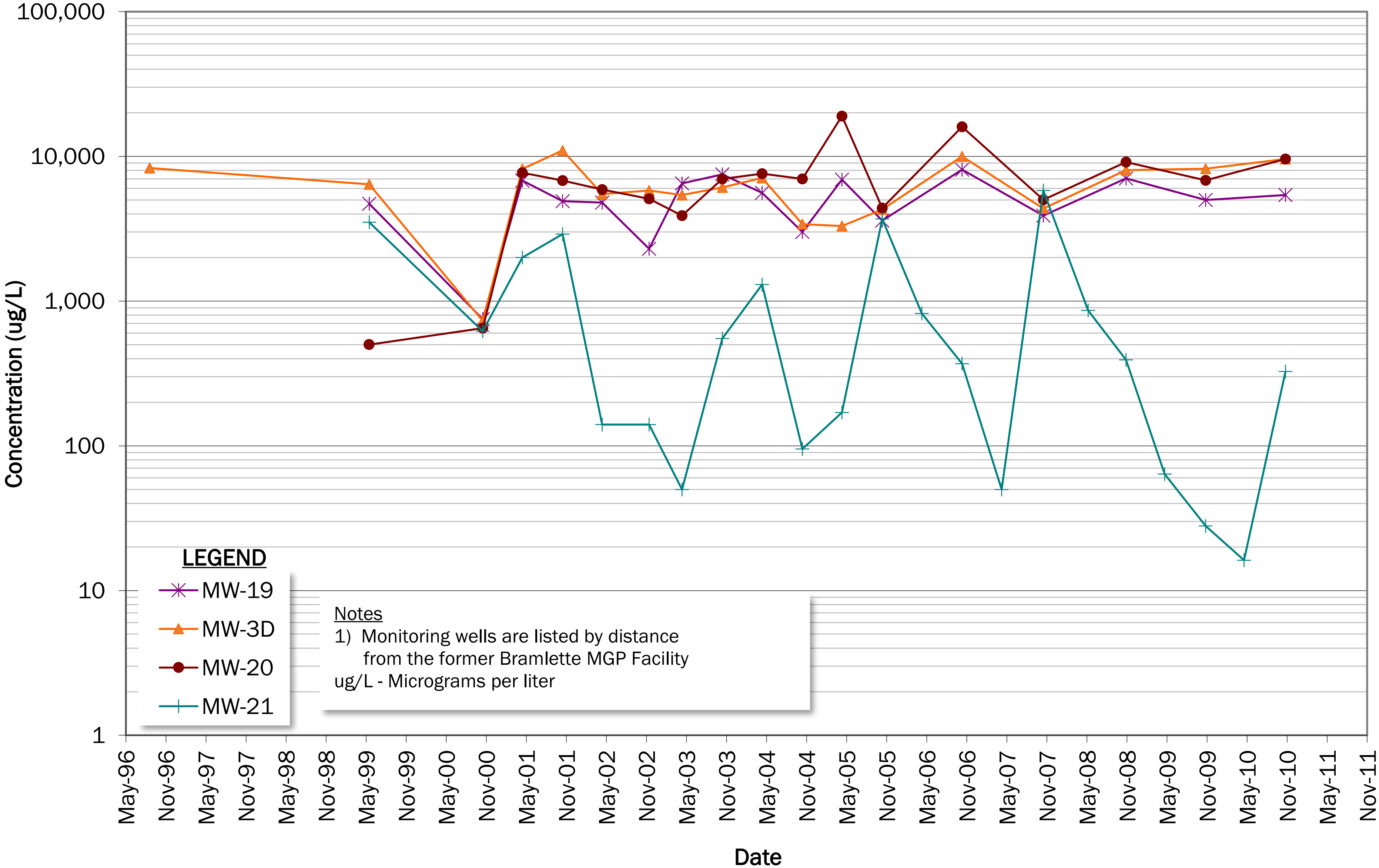
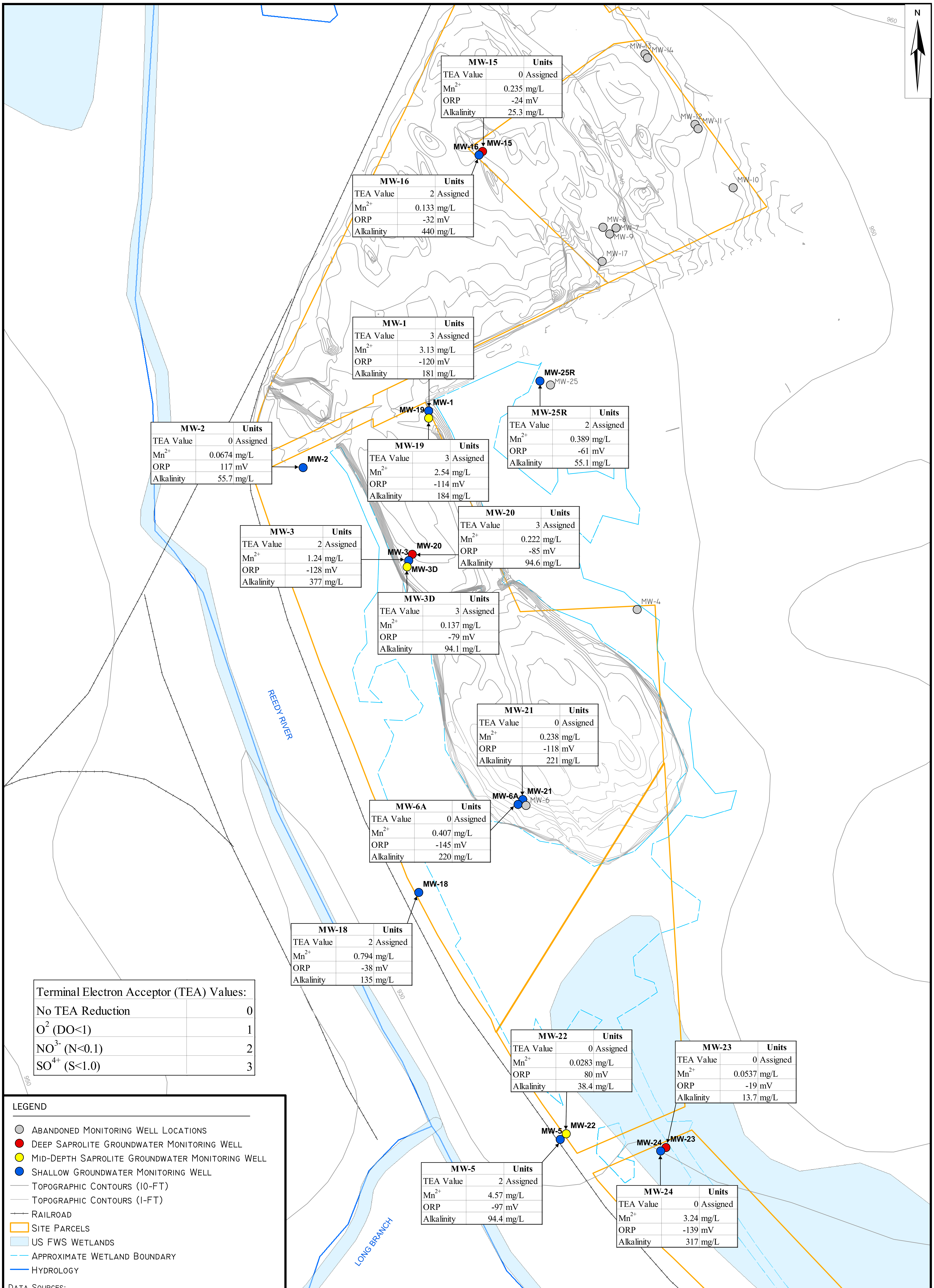
Nov-09
May-10
Nov-10
May-11
Nov-11
May-12
Nov-12
May-13
Nov-13
May-14
Nov-14
May-15
Nov-15
May-16
Nov-16

Figure 6D
Former Bramlette MGP Facility
Benzene Concentration Trend Plot
Deep Wells





MW-15		Units
TEA Value	0	Assigned
Mn^{2+}	0.235	mg/L
ORP	-24	mV
Alkalinity	25.3	mg/L

MW-16		Units
TEA Value	2	Assigned
Mn^{2+}	0.133	mg/L
ORP	-32	mV
Alkalinity	440	mg/L

MW-1		Units
TEA Value	3	Assigned
Mn^{2+}	3.13	mg/L
ORP	-120	mV
Alkalinity	181	mg/L

MW-25R		Units
TEA Value	2	Assigned
Mn^{2+}	0.389	mg/L
ORP	-61	mV
Alkalinity	55.1	mg/L

MW-2		Units
TEA Value	0	Assigned
Mn^{2+}	0.0674	mg/L
ORP	117	mV
Alkalinity	55.7	mg/L

MW-19		Units
TEA Value	3	Assigned
Mn^{2+}	2.54	mg/L
ORP	-114	mV
Alkalinity	184	mg/L

MW-20		Units
TEA Value	3	Assigned
Mn^{2+}	0.222	mg/L
ORP	-85	mV
Alkalinity	94.6	mg/L

MW-3		Units
TEA Value	2	Assigned
Mn^{2+}	1.24	mg/L
ORP	-128	mV
Alkalinity	377	mg/L

MW-3D		Units
TEA Value	3	Assigned
Mn^{2+}	0.137	mg/L
ORP	-79	mV
Alkalinity	94.1	mg/L

MW-21		Units
TEA Value	0	Assigned
Mn^{2+}	0.238	mg/L
ORP	-118	mV
Alkalinity	221	mg/L

MW-6A		Units
TEA Value	0	Assigned
Mn^{2+}	0.407	mg/L
ORP	-145	mV
Alkalinity	220	mg/L

MW-18		Units
TEA Value	2	Assigned
Mn^{2+}	0.794	mg/L
ORP	-38	mV
Alkalinity	135	mg/L

MW-22		Units
TEA Value	0	Assigned
Mn^{2+}	0.0283	mg/L
ORP	80	mV
Alkalinity	38.4	mg/L

MW-23		Units
TEA Value	0	Assigned
Mn^{2+}	0.0537	mg/L
ORP	-19	mV
Alkalinity	13.7	mg/L

MW-5		Units
TEA Value	2	Assigned
Mn^{2+}	4.57	mg/L
ORP	-97	mV
Alkalinity	94.4	mg/L

MW-24		Units
TEA Value	0	Assigned
Mn^{2+}	3.24	mg/L
ORP	-139	mV
Alkalinity	317	mg/L

Terminal Electron Acceptor (TEA) Values:	
No TEA Reduction	0
O^2 (DO<1)	1
NO^{3-} (N<0.1)	2
SO^{4+} (S<1.0)	3

LEGEND

- Abandoned Monitoring Well Locations
- Deep Saprolite Groundwater Monitoring Well
- Mid-Depth Saprolite Groundwater Monitoring Well
- Shallow Groundwater Monitoring Well
- Topographic Contours (10-FT)
- Topographic Contours (1-FT)
- Railroad
- Site Parcels
- US FWS Wetlands
- Approximate Wetland Boundary
- Hydrology

Data Sources:
Parcels - Greenville County GIS 2015
Hydrology - SCDNR 2013
Topographic Contours (10-FT) - USGS 2016

Notes:
1. Wetland Boundary and Landfill are Approximate.
2. Wetland Boundary Based on CADD Files Provided By Duke Energy.
3. mg/L - milligram per liter
4. mV - millivolt
5. ORP - Oxygen Reduction Potential
6. Mn - Manganese

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Drawn By: Jackson Bogach
Project Manager: Jennifer Verde
Client: Duke Energy
Date 11/1/2016

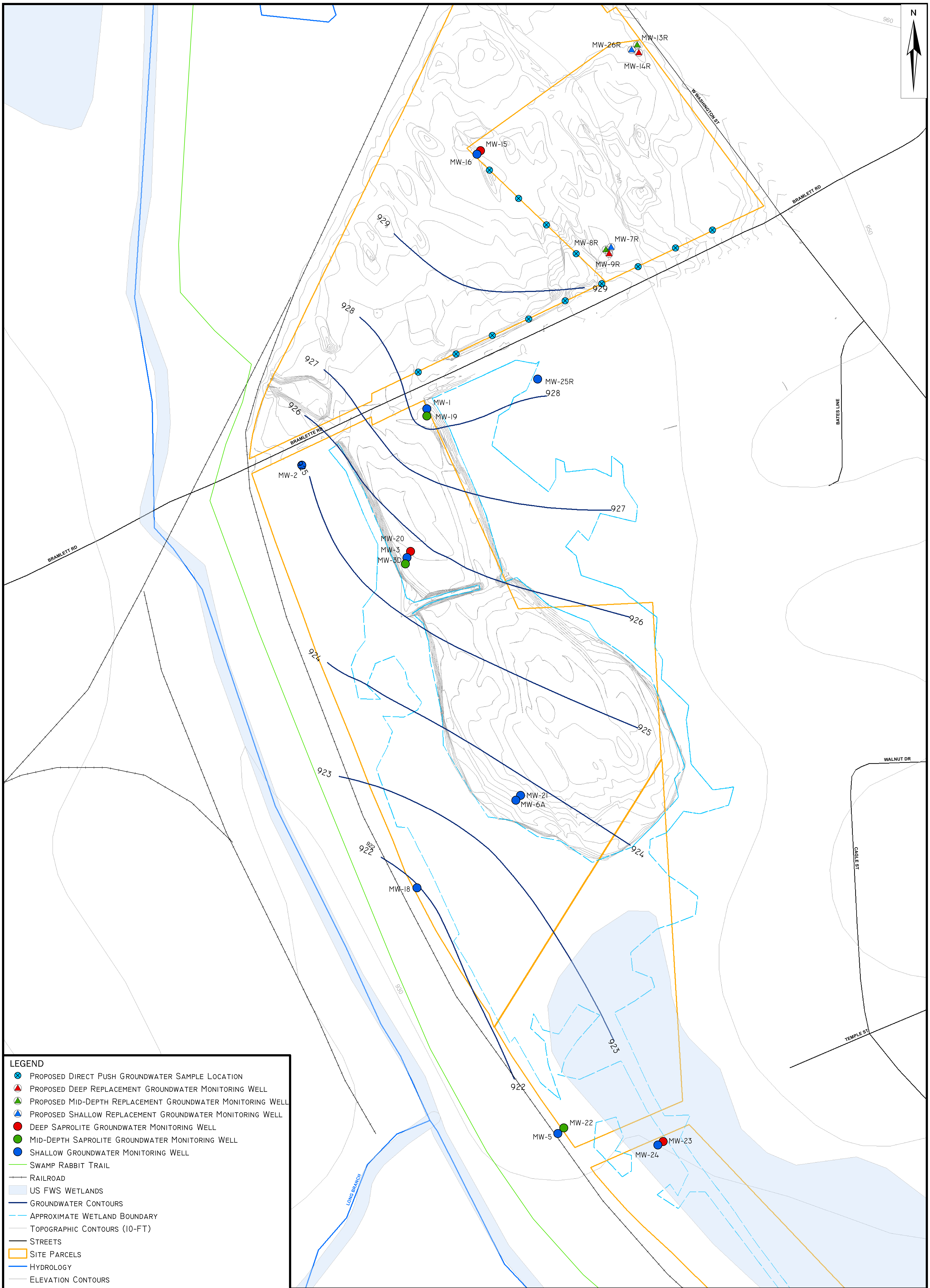
SCALE
0 100 200 400 Feet
1 inch = 100 feet
If scale different than indicated, then drawing has been altered from its original size

Monitored Attenuation Indicator Map

Former Bramlette MGP Facility
Greenville, Greenville County, South Carolina

P:\Duke Energy\Bramlette Road\Figures\Figure 7 - Alkalinity & ORP Map.mxd

FIGURE 7



LEGEND

- Proposed Direct Push Groundwater Sample Location
- Proposed Deep Replacement Groundwater Monitoring Well
- Proposed Mid-Depth Replacement Groundwater Monitoring Well
- Proposed Shallow Replacement Groundwater Monitoring Well
- Deep Saprolite Groundwater Monitoring Well
- Mid-Depth Saprolite Groundwater Monitoring Well
- Shallow Groundwater Monitoring Well
- Swamp Rabbit Trail
- Railroad
- US FWS Wetlands
- Groundwater Contours
- Approximate Wetland Boundary
- Topographic Contours (10-FT)
- Streets
- Site Parcels
- Hydrology
- Elevation Contours

Data Sources:
Parcels - Greenville County GIS 2015
Hydrology - SCDNR 2013
Topographic Contours - USGS 2016

Notes:
1. Wetland Boundary and Landfill are Approximate.
2. Wetland Boundary, Landfill, and Elevation Contours are Based on Files Provided by Client.
4. Groundwater Contours have Inferences due to Data Gaps.
5. Contour Labels are in Feet Above Sea Level.

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Client: Duke Energy
Date: 11/3/2016

Scale: 0 100 200 400 Feet
1 inch = 100 feet
If scale different than indicated, then drawing has been altered from its original size

Proposed Sampling Location Map

Former Bramlette MGP Facility
Greenville, Greenville County, South Carolina

FIGURE 8

P:\Duke Energy\Bramlette Road\Figures\Figure 8 - Proposed Sampling Location Map.mxd

TABLES

Table 1
Well Construction Data
Former Bramlette MGP Facility–Remedial Investigation Work Plan

Well	Install Date	Well Status	Northing	Easting	Ground Elevation²	TOC Elevation	Refusal		Bottom of Well		Screen Length	Screen Interval				Historical Well Classification	Preliminary Revised Hydro-Stratigraphic Well Classifications
												top	bottom	top	bottom		
			Resurveyed by Freeland & Associates, March 8, 2012				ft-bgs	Elevation	ft-bgs	Elevation	ft	ft-bgs		Elevation			
FORMER MGP FACILITY WELLS																	
MW-7	March-96	Abandoned	---	---	933.44	935.74	None		15.0	918.4	10	5.0	15.0	928.4	918.4	Shallow	---
MW-8	March-99	Abandoned	---	---	933.54	935.99	None		15.5	918.0	13	1.7	14.7	931.8	918.8	Combined	---
MW-9	March-99	Abandoned	---	---	933.54	936.03	30.4	903.1	30.4	903.1	5	25.2	30.2	908.3	903.3	Deep	---
MW-10	February-99	Abandoned	---	---	941.47	943.39	None		19.5	922.0	15	3.0	18.0	938.5	923.5	Combined	---
MW-11	February-99	Abandoned	---	---	939.49	941.81	None		25.7	913.8	10	14.0	24.0	925.5	915.5	Mid-Depth	---
MW-12	February-99	Abandoned	---	---	939.19	941.89	None		12.0	927.2	10	1.5	11.5	937.7	927.7	Shallow	---
MW-13	March-99	Abandoned	---	---	938.08	940.48	None		23.1	915.0	10	11.5	21.5	926.6	916.6	Mid-Depth	---
MW-14	March-99	Abandoned	---	---	937.64	940.18	None		13.0	924.6	10	2.0	12.0	935.6	925.6	Shallow	---
MW-15	March-99	Active	1105042.269	1574275.641	936.05	939.07	58.4	877.7	58.4	877.7	5	50.0	55.0	886.1	881.1	Deep	Deep Saprolite
MW-16	March-99	Active	1105038.349	1574271.184	936.11	938.03	None		16.0	920.1	10	5.0	15.0	931.1	921.1	Shallow	Shallow
MW-17	March-99	Abandoned	---	---	933.29	935.22	None		16.0	917.3	13.9	1.6	15.5	931.7	917.8	Combined	---
VAUGHN LANDFILL WELLS																	
MW-1	March-96	Active	1104523.657	1574148.078	930.95	933.53	None		15.0	916.0	10	5.0	15.0	926.0	916.0	Shallow	Shallow
MW-2	March-96	Active	1104412.450	1573894.799	931.39	933.92	None		15.0	916.4	10	5.0	15.0	926.4	916.4	Shallow	Shallow
MW-3	March-96	Active	1104205.886	1574124.707	932.10	934.74	None		14.0	918.1	5	9.0	14.0	923.1	918.1	Shallow	Shallow
MW-3D	March-96	Active	1104200.108	1574122.654	932.01	934.61	None		20.0	912.0	5	15.0	20.0	917.0	912.0	Deep	Mid-Depth Saprolite
MW-4	March-96	Abandoned	---	---	932.54	935.06	None		7.0	925.5	5	2.0	7.0	930.5	925.5	Shallow	---
MW-5	March-96	Active	1103060.693	1574402.095	929.73	929.58	None		14.0	915.7	10	4.0	14.0	925.7	915.7	Shallow	Shallow
MW-6	March-96	Abandoned	---	---	930.67	933.24	None		12.0	918.7	10	2.0	12.0	928.7	918.7	Shallow	---
MW-6A	November-05	Active	1103723.369	1574326.528	928.02	931.32	15.0	913.0	15.0	913.0	10	5.0	15.0	923.0	913.0	Shallow (by MW-6)	Shallow
MW-18	March-99	Active	1103556.344	1574116.419	930.47	932.47	None		25.0	905.5	15	9.5	24.5	921.0	906.0	Combined	Shallow
MW-19	March-99	Active	1104517.320	1574146.989	930.92	933.56	None		19.0	911.9	10	9.0	19.0	921.9	911.9	Mid-Depth	Mid-Depth Saprolite
MW-20	April-99	Active	1104214.273	1574128.803	932.59	934.89	25.5	907.1	25.5	907.1	5	20.0	25.0	912.6	907.6	Deep	Mid-Depth Saprolite
MW-21	March-99	Active	1103739.608	1574327.759	930.61	934.09	18.0	912.6	18.0	912.6	13	5.0	18.0	925.6	912.6	Deep	Shallow
MW-22	April-99	Active	1103064.463	1574406.312	929.91	929.66	None		36.5	893.4	10	25.0	35.0	904.9	894.9	Mid-Depth	Mid-Depth Saprolite
MW-23	May-99	Active	1103037.594	1574608.529	921.64	923.75	None		43.0	878.6	10	32.5	42.5	889.1	879.1	Deep	Deep Saprolite
MW-24	May-99	Active	1103033.003	1574601.222	921.93	925.25	None		11.0	910.9	10	0.4	10.4	921.5	911.5	Shallow	Shallow
MW-25	May-99	Abandoned	---	---	928.53	928.53	None		16.7	911.8	15	1.0	16.0	927.5	912.5	Combined	---
MW-25R	July-11	Active	1104578.506	1574384.322	930.16	930.08	None		16.6	913.6	15	1.6	16.6	928.6	913.6	Combined (by MW-25)	Shallow

Notes:

1. Proposed Hydro-Stratigraphic Well Classifications based on the following subjective criteria:

Shallow = Saturated Screen Mid-Point (SSMP) less than 7± feet.

Mid-Depth Saprolite = Saturated Screen Mid-Point between 7± and 20± feet below water table surface.

Deep Saprolite = Saturated Screen Mid-Point greater than 20± feet below water table surface.

2. Reported as Mean Sea Level; no datum provided.

ft-bgs Feet below ground surface

--- "---" indicates that data is unavailible

MGP Former Bramlette Manufactured Gas Plant facility

Table 2
Groundwater Monitoring Data
Former Bramlette MGP Facility–Remedial Investigation Work Plan

		1,2,4-Trimethylbenzene CAS No. 95-63-6	1,3,5-Trimethylbenzene CAS No. 108-67-8	Benzene CAS No. 71-43-2	Chloroform CAS No. 67-66-3	cis-1,2-Dichloroethene CAS No. 156-59-2	Ethylbenzene CAS No. 100-41-4	Isopropylbenzene CAS No. 98-82-8	Naphthalene CAS No. 91-20-3	n-Butylbenzene CAS No. 104-51-8	n-Propylbenzene CAS No. 103-65-1	p-Isopropyltoluene CAS No. 99-87-6	Styrene CAS No. 100-42-5	Toluene CAS No. 108-88-3	Xylenes, Total CAS No. 1330-20-7
	MCL	NL	NL	5	80	70	700	NL	NL	NL	NL	NL	100	1,000	10,000
Well ID	Sample Date	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
MW-1	05/30/2008	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/19/2008	**56.4**	**21.9**	**44.6**	<1	<1	**42.6**	**7.42**	**1,650**	<1	**2.23**	**3.58**	<1	**34.9**	**67.7**
	05/15/2009	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/18/2009	**52.4**	**22.2**	**45**	<1	<1	**49.5**	**8.9**	**1,980**	**2.9**	**2.72**	**3.33**	<1	**27.3**	**78.3**
	05/12/2010	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/18/2010	**53.8**	**22**	**20.6**	<1	<1	**39.8**	**8.87**	**2,310**	<1	**2.3**	**3.36**	<1	**10.5**	**63.8**
	5/18/2011	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/17/2011	**53.4**	**22.3**	**41.8**	<1	<1	**40.4**	**8.47**	**2,500**	<1	**2.08**	**3.14**	<1	**14.6**	**67.4**
	5/18/2012	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/14/2012	**53.8**	**22.1**	**43.1**	<1	<1	**48.5**	**9.04**	**14.8**	<1	**2.47**	**3.34**	<1	**24.1**	**77.7**
	5/15/2013	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/13/2013	**52.8**	**21.9**	**15.3**	<1	<1	**35.3**	**7.03**	**1,810**	**3.23**	**2.01**	**3.27**	<1	**11.4**	**60.6**
	5/14/2014	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/12/2014	**40.6**	**24.9**	**27.7**	<20	<20	**33**	<20	**1,690**	<20	<20	<20	<20	<20	<40
	5/13/2015	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/10/2015	**29.1**	**18.2**	**52.8**	<10	<10	**24.1**	<20	**1,650**	<10	<10	<10	<10	**15.5**	**40.2**
MW-2	05/30/2008	**17.9**	**3.74**	**456**	<1	<1	**143**	**5.54**	**1,290**	**143**	**1.63**	**1.1**	<1	<1	**32.9**
	11/20/2008	**37**	**7.54**	**539**	<1	<1	**131**	**7.43**	**4,810**	<1	**2.83**	**1**	<1	**1.34**	**43.2**
	05/15/2009	**2.57**	<1	**45.3**	<1	<1	**8.75**	<1	**123**	<1	<1	<1	<1	<1	**3.13**
	11/19/2009	<1	<1	**9.43**	<1	<1	<1	<1	**14.1**	<1	<1	<1	<1	<1	<3
	05/12/2010	**1.29**	<1	**26.3**	<1	<1	**4.71**	<1	**77.5**	<1	<1	<1	<1	<1	<3
	11/18/2010	**22.4**	**5.86**	**445**	<1	<1	**97.1**	**7.7**	**1,270**	<1	**2.44**	<1	<1	<1	**31.4**
	5/18/2011	**6.33**	**1.24**	**84.9**	<1	<1	**12.4**	**1.05**	**374**	<1	<1	<1	<1	<1	**5.71**
	11/17/2011	**32.4**	**6.93**	**570**	<1	<1	**103**	**8.27**	**2,050**	<1	**2.65**	<1	<1	<1	**42.8**
	5/18/2012	**11.6**	<5	**207**	<5	<5	**18.2**	<5	**681**	<5	<5	<5	<5	<5	<15
	11/15/2012	**20.9**	**3.76**	**3.1**	<1	<1	**41.5**	**6.28**	**8.51**	<1	**2**	<1	<1	<1	**32.9**
	5/15/2013	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3
	11/14/2013	**8.43**	**3.39**	**305**	<1	<1	**32.5**	**4.33**	**1,290**	<1	**1.25**	<1	<1	<1	**22**
	5/14/2014	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<2
	11/12/2014	<1	<1	**2.11**	<1	<1	<1	<1	**6.29**	<1	<1	<1	<1	<1	<2
	5/13/2015	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<2
	11/11/2015	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3

Notes:

<	">" Indicates analyte was not detected aboove the laboratory reporting limit.
CAS No.	Chemical Abstract Service Number
MCL	Maximum Contamination Levels per South Carolina Department of Health and Environmental Control (SCDHEC) State Primary Drinking Water Regulation R. 61-58, effective September 26, 2014.
µg/L	Results are expressed in micrograms per liter.
ns	not sampled
56.4	Bold indicates analyte was detected.
44.6	Bold and shaded indicates analyte was detected above the SCDHEC MCL.

Table 2
Groundwater Monitoring Data
Former Bramlette MGP Facility–Remedial Investigation Work Plan

		1,2,4-Trimethylbenzene CAS No. 95-63-6	1,3,5-Trimethylbenzene CAS No. 108-67-8	Benzene CAS No. 71-43-2	Chloroform CAS No. 67-66-3	cis-1,2-Dichloroethene CAS No. 156-59-2	Ethylbenzene CAS No. 100-41-4	Isopropylbenzene CAS No. 98-82-8	Naphthalene CAS No. 91-20-3	n-Butylbenzene CAS No. 104-51-8	n-Propylbenzene CAS No. 103-65-1	p-Isopropyltoluene CAS No. 99-87-6	Styrene CAS No. 100-42-5	Toluene CAS No. 108-88-3	Xylenes, Total CAS No. 1330-20-7
	MCL	NL	NL	5	80	70	700	NL	NL	NL	NL	NL	100	1,000	10,000
Well ID	Sample Date	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L
MW-3	05/30/2008	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/19/2008	2.28	<1	<1	<1	<1	<1	<1	137	<1	<1	<1	<1	<1	<3
	05/15/2009	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/18/2009	14.7	4.59	48.4	<1	<1	28.9	2.08	1,560	<1	<1	1.76	<1	7.23	24.5
	05/12/2010	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/18/2010	4.62	1.51	1.65	<1	<1	2.33		148	<1	<1	<1	<1	<1	<3
	5/18/2011	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/17/2011	2.54	<1	<1	<1	<1	1.38		78.1	<1	<1	<1	<1	<1	<3
	5/18/2012	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/14/2012	19.6	5.92	69.2	<1	<1	45.8	2.25	952	<1	<1	1.25	<1	<1	22.4
	5/15/2013	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/14/2013	4.04	1.4	1.47	<1	<1	1.34	<1	<5	<1	<1	<1	<1	<1	<3
	5/14/2014	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/11/2014	4.74	1.80	1.61	<1	<1	1.38	<1	14.5	<1	<1	<1	<1	<1	<2
	5/13/2015	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/10/2015	9.97	4.35	77.6	<1	<1	34.9	1.27	94.6	<1	<1	<1	<1	6.06	21.7
MW-3D	05/30/2008	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/19/2008	108	37	740	<1	<1	515	17.5	8,040	3.21	3.45	17	<1	60.8	393
	05/15/2009	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/18/2009	106	35.8	714	<1	<1	472	12.6	8,220	6.49	3.09	18.1	<1	64.3	334
	05/12/2010	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/18/2010	104	35.3	624	<1	<1	504	17.7	9,580	<1	3.37	19.4	<1	44.2	367
	5/18/2011	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/17/2011	105	35.1	644	<1	<1	564	19.3	7610	<1	3.64	15.4	<1	45.7	na
	5/18/2012	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/14/2012	103	33.2	574	<1	<1	523	15.4	12,200	<1	2.99	16.7	<1	45.7	382
	5/15/2013	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/13/2013	83.8	27.6	524	<1	<1	465	14.2	6,440	<1	2.23	16.3	<1	37.6	342
	5/14/2014	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/11/2014	73.0	25.5	469	<1	<1	475	11.6	6,760	<1	2.21	27.8	<1	26.4	336
	5/13/2015	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/10/2015	93.6	34.3	415	<1	<1	530	14.5	13,500	<1	2.31	20.1	<1	28.1	403
MW-4	05/30/2008	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3
	11/19/2008	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3
	05/15/2009	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/18/2009	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	05/12/2010	Well abandoned in January 2010													

Notes:

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μg/L	Results are expressed in micrograms per liter.
ns	not sampled
56.4	Bold indicates analyte was detected.
44.6	Bold and shaded indicates analyte was detected above the SCDHEC MCL.

Table 2
Groundwater Monitoring Data
Former Bramlette MGP Facility–Remedial Investigation Work Plan

		1,2,4-Trimethylbenzene CAS No. 95-63-6	1,3,5-Trimethylbenzene CAS No. 108-67-8	Benzene CAS No. 71-43-2	Chloroform CAS No. 67-66-3	cis-1,2-Dichloroethene CAS No. 156-59-2	Ethylbenzene CAS No. 100-41-4	Isopropylbenzene CAS No. 98-82-8	Naphthalene CAS No. 91-20-3	n-Butylbenzene CAS No. 104-51-8	n-Propylbenzene CAS No. 103-65-1	p-Isopropyltoluene CAS No. 99-87-6	Styrene CAS No. 100-42-5	Toluene CAS No. 108-88-3	Xylenes, Total CAS No. 1330-20-7
	MCL	NL	NL	5	80	70	700	NL	NL	NL	NL	NL	100	1,000	10,000
Well ID	Sample Date	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L
MW-5	05/30/2008	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/19/2008	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3
	05/15/2009	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/18/2009	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3
	05/12/2010	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/18/2010	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3
	5/18/2011	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/17/2011	<1	<1	<1	<1	<1	<1	<1	**52.2**	<1	<1	<1	<1	<1	<3
	5/18/2012	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/14/2012	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3
	5/15/2013	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/13/2013	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<2
	5/14/2014	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/11/2014	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<2
	5/13/2015	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/10/2015	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3
MW-6A	05/29/2008	**9.31**	**3.13**	**2.44**	<1	<1	**7.97**	<1	**607**	<1	<1	<1	**1.31**	**7.42**	**23.2**
	11/19/2008	<1	<1	<1	<1	<1	<1	<1	**22.3**	<1	<1	<1	<1	<1	<3
	05/15/2009	**3.72**	**1.05**	**3.18**	<1	<1	**3.8**	<1	**147**	<1	<1	<1	<1	**3.99**	**9.72**
	11/18/2009	**2.04**	<1	**3.28**	<1	<1	**2.09**	<1	**50.4**	<1	<1	<1	<1	**2.1**	**6.38**
	05/12/2010	**3.36**	<1	**8.22**	<1	<1	**4.74**	<1	**94.1**	<1	<1	<1	<1	**3.43**	**9.2**
	11/17/2010	**4.57**	**1.53**	**13.9**	<1	<1	**6.23**	<1	**245**	<1	<1	<1	<1	**13.8**	**18.1**
	5/18/2011	**3.66**	<1	**11.7**	<1	<1	**6.62**	<1	**183**	<1	<1	<1	<1	**8.86**	**13.7**
	11/17/2011	<1	<1	**1.78**	<1	<1	**1.16**	<1	**39.4**	<1	<1	<1	<1	**1.7**	<3
	5/18/2012	**1.54**	<1	**3.65**	<1	<1	**2.73**	<1	**57.6**	<1	<1	<1	<1	**2.14**	**4.99**
	11/14/2012	**1.84**	<1	**7.74**	<1	<1	**3.31**	<1	**103**	<1	<1	<1	<1	**4.43**	**8.6**
	5/15/2013	**5.64**	**1.11**	**20.7**	<1	<1	**8.03**	<1	**180**	<1	<1	<1	<1	**5.1**	**16.2**
	11/13/2013	**4.9**	**1.67**	**12.2**	<1	<1	**5.78**	<1	**96.8**	<1	<1	<1	<1	**7.67**	**19.4**
	5/14/2014	**7.7**	**2.7**	**26.5**	<1	<1	<1	<1	<1	<1	<1	<1	<1	**4.2**	**20.4**
	11/11/2014	**17.1**	**5.28**	**39.8**	<1	<1	**17.2**	**1.39**	**97.3**	<1	<1	<1	<1	**38.1**	**60.6**
	5/13/2015	**5.77**	<1	**20.1**	<1	<1	**8.22**	<1	**94.8**	<1	<1	<1	<1	**3.65**	**18.9**
	11/10/2015	**7.69**	**3.93**	**9.13**	<1	<1	<2	<1	<5	<1	<1	<1	<1	<1	**18.1**

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Table 2
Groundwater Monitoring Data
Former Bramlette MGP Facility–Remedial Investigation Work Plan

		1,2,4-Trimethylbenzene CAS No. 95-63-6	1,3,5-Trimethylbenzene CAS No. 108-67-8	Benzene CAS No. 71-43-2	Chloroform CAS No. 67-66-3	cis-1,2-Dichloroethene CAS No. 156-59-2	Ethylbenzene CAS No. 100-41-4	Isopropylbenzene CAS No. 98-82-8	Naphthalene CAS No. 91-20-3	n-Butylbenzene CAS No. 104-51-8	n-Propylbenzene CAS No. 103-65-1	p-Isopropyltoluene CAS No. 99-87-6	Styrene CAS No. 100-42-5	Toluene CAS No. 108-88-3	Xylenes, Total CAS No. 1330-20-7
	MCL	NL	NL	5	80	70	700	NL	NL	NL	NL	NL	100	1,000	10,000
Well ID	Sample Date	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
MW-15	05/29/2008	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/19/2008	<1	<1	<1	<1	**1.94**	<1	<1	<5	<1	<1	<1	<1	<1	<3
	05/15/2009	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/19/2009	<1	<1	<1	<1	**2.56**	<1	<1	<5	<1	<1	<1	<1	<1	<3
	05/12/2010	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/18/2010	<1	<1	<1	<1	**2.17**	<1	<1	<5	<1	<1	<1	<1	<1	<3
	5/18/2011	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/17/2011	<1	<1	<1	<1	**2.78**	<1	<1	<5	<1	<1	<1	<1	<1	<3
	5/18/2012	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/14/2012	<1	<1	<1	<1	**1.6**	<1	<1	<5	<1	<1	<1	<1	<1	<3
	5/15/2013	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/12/2013	<1	<1	<1	<1	**1.98**	<1	<1	<5	<1	<1	<1	<1	<1	<2
	5/14/2014	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/12/2014	<1	<1	<1	<1	**2.14**	<1	<1	<5	<1	<1	<1	<1	<1	<2
	5/13/2015	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/11/2015	<1	<1	<1	<1	**1.45**	<1	<1	<5	<1	<1	<1	<1	<1	<3
MW-16	05/29/2008	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/19/2008	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3
	05/15/2009	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/18/2009	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3
	05/12/2010	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/18/2010	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3
	5/18/2011	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/17/2011	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3
	5/18/2012	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/14/2012	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3
	5/15/2013	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/13/2013	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<2
	5/14/2014	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/12/2014	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<2
	5/13/2015	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/11/2015	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3

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Groundwater Monitoring Data
Former Bramlette MGP Facility–Remedial Investigation Work Plan

Well ID	Sample Date	1,2,4-Trimethylbenzene CAS No. 95-63-6	1,3,5-Trimethylbenzene CAS No. 108-67-8	Benzene CAS No. 71-43-2	Chloroform CAS No. 67-66-3	cis-1,2-Dichloroethene CAS No. 156-59-2	Ethylbenzene CAS No. 100-41-4	Isopropylbenzene CAS No. 98-82-8	Naphthalene CAS No. 91-20-3	n-Butylbenzene CAS No. 104-51-8	n-Propylbenzene CAS No. 103-65-1	p-Isopropyltoluene CAS No. 99-87-6	Styrene CAS No. 100-42-5	Toluene CAS No. 108-88-3	Xylenes, Total CAS No. 1330-20-7
	MCL	NL	NL	5	80	70	700	NL	NL	NL	NL	NL	100	1,000	10,000
Well ID	Sample Date	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
MW-18	05/29/2008	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3
	11/19/2008	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3
	05/15/2009	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3
	11/18/2009	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3
	05/12/2010	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3
	11/18/2010	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3
	5/18/2011	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3
	11/17/2011	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3
	5/18/2012	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3
	11/14/2012	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3
	5/15/2013	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3
	11/13/2013	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3
	5/14/2014	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<2
	11/12/2014	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<2
	5/13/2015	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<2
	11/11/2015	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3
MW-19	05/29/2008	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/19/2008	**134**	**48.6**	**143**	<1	<1	**164**	**19.6**	**7,040**	**4.19**	**5.11**	<1	<1	**180**	**256**
	05/15/2009	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/19/2009	**112**	**43.4**	**138**	<1	<1	**153**	**19**	**5,000**	**3.55**	**5.26**	**4.2**	<1	**176**	**239**
	05/12/2010	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/18/2010	**121**	**43**	**107**	<1	<1	**168**	**19**	**5,410**	<1	**4.57**	**4.97**	<1	**166**	**243**
	5/18/2011	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/19/2011	**121**	**44**	**111**	<1	<1	**170**	**19.9**	**6,150**	<1	**4.89**	**4.02**	<1	**165**	**255**
	5/18/2012	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/15/2012	**115**	**41.7**	**119**	<1	<1	**170**	**19.1**	**7.13**	**3.54**	**4.86**	**5.3**	<1	**147**	**246**
	5/15/2013	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/13/2013	**122**	**44.4**	**84**	<1	<1	**157**	**16.2**	**5,150**	**4.15**	**4.69**	**4.62**	<1	**128**	**225**
	5/14/2014	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/12/2014	**88.6**	**40.1**	**62.2**	<20	<20	**63.9**	<20	**3,900**	<20	<20	<20	<20	**53.3**	**165**
	5/13/2015	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/10/2015	**73.6**	**42.9**	**107**	<20	<20	**110**	<20	**3,850**	<20	<20	<21	<22	**84.9**	**178**

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Former Bramlette MGP Facility–Remedial Investigation Work Plan

		1,2,4-Trimethylbenzene CAS No. 95-63-6	1,3,5-Trimethylbenzene CAS No. 108-67-8	Benzene CAS No. 71-43-2	Chloroform CAS No. 67-66-3	cis-1,2-Dichloroethene CAS No. 156-59-2	Ethylbenzene CAS No. 100-41-4	Isopropylbenzene CAS No. 98-82-8	Naphthalene CAS No. 91-20-3	n-Butylbenzene CAS No. 104-51-8	n-Propylbenzene CAS No. 103-65-1	p-Isopropyltoluene CAS No. 99-87-6	Styrene CAS No. 100-42-5	Toluene CAS No. 108-88-3	Xylenes, Total CAS No. 1330-20-7
	MCL	NL	NL	5	80	70	700	NL	NL	NL	NL	NL	100	1,000	10,000
Well ID	Sample Date	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
MW-20	05/29/2008	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/19/2008	115	39.5	839	<1	<1	473	17.3	9,120	4.47	4.01	3.72	<1	93.9	395
	05/15/2009	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/18/2009	109	35.8	838	<1	<1	450	12.5	6,830	7.94	3.24	3.02	<1	82.3	352
	05/12/2010	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/18/2010	108	36.2	736	<1	<1	450	16.7	9,580	<1	3.75	4.95	<1	76.9	361
	5/18/2011	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/17/2011	88.4	29.2	616	<1	<1	344	15.3	6,410	3.18	3.03	2.53	<1	75.1	368
	5/18/2012	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/14/2012	98	30.3	748	<1	<1	488	13.8	12,700	<1	3.04	5.29	<1	70.7	369
	5/15/2013	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/14/2013	85.4	28.4	713	<1	<1	405	13.2	7,280	<1	2.41	4.26	<1	71.4	369
	5/14/2014	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/11/2014	86.9	31.0	750	<1	<1	383	11.1	6,130	<1	2.34	4.23	<1	68.1	404
	5/13/2015	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/10/2015	92	33.7	687	<1	<1	359	10.7	12,800	4.23	1.08	2.86	<1	54.5	400
MW-21	05/29/2008	13	4.75	44.8	<1	<1	15.6	1.82	863	<1	<1	<1	<1	15.9	34.8
	11/19/2008	5.39	1.98	10.1	<1	<1	6.45	<1	392	<1	<1	<1	<1	7.39	14.5
	05/15/2009	1.49	<1	2.53	<1	<1	1.08	<1	63.7	<1	<1	<1	<1	<1	<3
	11/18/2009	2.17	<1	10.7	<1	<1	2.87	<1	27.9	<1	<1	<1	<1	1.93	3.88
	05/12/2010	1.53	<1	8.47	<1	<1	2.18	<1	16.2	<1	<1	<1	<1	1.65	3.13
	11/17/2010	6.97	2.11	33	<1	<1	10.5	<1	326	<1	<1	<1	<1	10.7	21.8
	5/18/2011	4.9	<1	10.9	<1	<1	5.21	<1	62.4	<1	<1	<1	<1	1	7.8
	11/17/2011	<1	<1	<1	<1	<1	<1	<1	62.3	<1	<1	<1	<1	<1	<3
	5/18/2012	<1	<1	1.99	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<3
	11/14/2012	6.27	2.49	39.8	<1	<1	5.31	<1	205	<1	<1	<1	<1	1.92	17.3
	5/15/2013	<1	<1	2.41	<1	<1	<1	<1	9.89	<1	<1	<1	<1	<1	<3
	11/13/2013	3.28	1.47	19.4	<1	<1	3.3	<1	59	<1	<1	<1	<1	2.97	9.07
	5/14/2014	<1	<1	4.7	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<2
	11/11/2014	9.75	3.37	82.7	<1	<1	13.8	1.29	<5	<1	<1	<1	<1	8.36	25.7
	5/13/2015	<1	<1	1.51	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<2
	11/10/2015	2.89	1.09	25.7	<1	<1	5.07	<1	6.08	<1	<1	<1	<1	<1	7.92

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Table 2
Groundwater Monitoring Data
Former Bramlette MGP Facility–Remedial Investigation Work Plan

		1,2,4-Trimethylbenzene CAS No. 95-63-6	1,3,5-Trimethylbenzene CAS No. 108-67-8	Benzene CAS No. 71-43-2	Chloroform CAS No. 67-66-3	cis-1,2-Dichloroethene CAS No. 156-59-2	Ethylbenzene CAS No. 100-41-4	Isopropylbenzene CAS No. 98-82-8	Naphthalene CAS No. 91-20-3	n-Butylbenzene CAS No. 104-51-8	n-Propylbenzene CAS No. 103-65-1	p-Isopropyltoluene CAS No. 99-87-6	Styrene CAS No. 100-42-5	Toluene CAS No. 108-88-3	Xylenes, Total CAS No. 1330-20-7
	MCL	**NL**	**NL**	**5**	**80**	**70**	**700**	**NL**	**NL**	**NL**	**NL**	**NL**	**100**	**1,000**	**10,000**
Well ID	**Sample Date**	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L
MW-22	05/29/2008	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/19/2008	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3
	05/15/2009	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/18/2009	**1.22**	<1	<1	<1	<1	<1	<1	<5	**2.89**	<1	<1	<1	<1	<3
	05/12/2010	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/18/2010	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3
	5/18/2011	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/17/2011	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3
	5/18/2012	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/14/2012	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3
	5/15/2013	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/13/2013	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<2
	5/14/2014	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/11/2014	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<2
	5/13/2015	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	11/10/2015	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3
MW-23	05/29/2008	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3
	11/19/2008	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3
	05/15/2009	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3
	11/18/2009	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3
	05/12/2010	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3
	11/18/2010	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3
	5/18/2011	<1	<1	<1	**1**	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3
	11/17/2011	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3
	5/18/2012	<1	<1	<1	**1.05**	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3
	11/13/2012	<1	<1	<1	**1.58**	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3
	5/16/2013	<1	<1	<1	**1.65**	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3
	11/13/2013	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<2
	5/14/2014	<1	<1	<1	**1.1**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<2
	11/11/2014	<1	<1	<1	**1.18**	<1	<1	<1	<5	<1	<1	<1	<1	<1	<2
	5/13/2015	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<2
	11/10/2015	<1	<1	<1	**1.74**	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3

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Former Bramlette MGP Facility–Remedial Investigation Work Plan

		1,2,4-Trimethylbenzene CAS No. 95-63-6	1,3,5-Trimethylbenzene CAS No. 108-67-8	Benzene CAS No. 71-43-2	Chloroform CAS No. 67-66-3	cis-1,2-Dichloroethene CAS No. 156-59-2	Ethylbenzene CAS No. 100-41-4	Isopropylbenzene CAS No. 98-82-8	Naphthalene CAS No. 91-20-3	n-Butylbenzene CAS No. 104-51-8	n-Propylbenzene CAS No. 103-65-1	p-Isopropyltoluene CAS No. 99-87-6	Styrene CAS No. 100-42-5	Toluene CAS No. 108-88-3	Xylenes, Total CAS No. 1330-20-7
	MCL	**NL**	**NL**	**5**	**80**	**70**	**700**	**NL**	**NL**	**NL**	**NL**	**NL**	**100**	**1,000**	**10,000**
Well ID	Sample Date	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
MW-24	05/29/2008	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3
	11/19/2008	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3
	05/15/2009	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3
	11/18/2009	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3
	05/12/2010	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3
	11/18/2010	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3
	5/18/2011	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3
	11/17/2011	<1	<1	<1	**1.35**	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3
	5/18/2012	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3
	11/14/2012	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3
	5/15/2013	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3
	11/13/2013	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<2
	5/14/2014	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<2
	11/11/2014	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<2
	5/13/2015	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<2
	11/10/2015	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3
MW-25R	05/29/2008	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3
	11/19/2008	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3
	05/15/2009	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3
	11/18/2009	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3
	05/12/2010	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3
	11/18/2010	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3
	5/18/2011	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3
	11/17/2011	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3
	5/18/2012	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3
	11/14/2012	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3
	5/15/2013	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3
	11/13/2013	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3
	5/14/2014	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<2
	11/12/2014	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<2
	5/13/2015	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<2
	11/11/2015	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<3

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Table 3
Monitored Natural Attenuation Data
Former Bramlette MGP Facility–Remedial Investigation Work Plan

Well		Date Sampled	Groundwater Quality Data								Indirect Bio-Activity Indicators			Terminal Electron Acceptors			Biologic Byproducts	
			Measured Well Depth	Depth to Water	TOC Elevation	Groundwater Elevation	Well Volume	Temperature	Specific Conductance	Turbidity	pH	Alkalinity[1]	ORP[2]	Dissolved Oxygen[3]	Nitrate (as N)	Sulfate	Manganese	Ferrous Iron[4]
			(feet)	(feet)			(gallons)	(°C)	(umho/cm)	(NTU)	(su)	(mg/L)	(mV)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
Shallow	MW-1	Nov-15	16.92	5.36	933.53	928.17	2.00	18	417	3.00	6.22	181	-120	0.57	< 0.1	<1.0	3.13	34.7
	MW-1	May-15	16.92	6.78	933.53	926.75	---	---	---	---	---	---	---	---	---	---	---	---
	MW-1	May-14	16.92	6.96	933.53	926.57	---	---	---	---	---	---	---	---	---	---	---	---
	MW-1	Nov-14	16.92	7.00	933.53	926.53	1.7	18	406	2.52	5.59	166	-87	1.55	< 0.1	< 1	2.97	31.9
	MW-1	Nov-13	16.92	7.34	933.53	926.19	1.7	17	400	1.07	6.27	128	-95	0.07	< 0.1	< 1	2.13	33.3
Shallow	MW-2	Nov-15	18.20	9.05	933.92	924.87	1.6	20	169	16.30	5.52	55.7	117	1.51	0.279	26.8	0.0674	0.266
	MW-2	May-15	18.20	10.23	933.92	923.69	1.4	18	172	2.82	5.69	41.6	141	0.52	0.156	33.2	0.0485	< 0.1
	MW-2	May-14	18.20	10.41	933.92	923.51	1.4	17	192	10.3	5.38	54.2	202	0.74	0.46	24.9	0.058	< 0.5
	MW-2	Nov-14	18.20	10.97	933.92	922.95	1.3	21	274	12.9	5.29	114	75.7	1.02	< 0.1	28.3	0.268	0.207
	MW-2	Nov-13	18.20	11.88	933.92	922.04	1.1	20	439	1.90	6.08	190	29	0.01	< 0.1	2.84	1.68	7.64
Shallow	MW-3	Nov-15	16.68	9.18	934.74	925.56	1.3	17	787	9.00	6.35	377	-128	0.27	< 0.1	2.09	1.24	22.9
	MW-3	May-15	16.68	9.44	934.74	925.30	---	---	---	---	---	---	---	---	---	---	---	---
	MW-3	May-14	16.68	9.72	934.74	925.02	---	---	---	---	---	---	---	---	---	---	---	---
	MW-3	Nov-14	16.68	9.71	934.74	925.03	1.2	17	1015	2.03	6.24	484	-98.8	0.39	< 0.1	1.66	0.822	22.5
	MW-3	Nov-13	16.68	10.40	934.74	924.34	1.1	16	1043	3.22	6.30	496	-73	0.00	< 0.1	< 1	0.852	22.8
Deep	MW-3D	Nov-15	23.42	8.85	934.61	925.76	2.5	16	249	1.00	6.09	94.1	-79	0.21	< 0.1	<1.0	0.137	11.8
	MW-3D	May-15	23.42	9.42	934.61	925.19	---	---	---	---	---	---	---	---	---	---	---	---
	MW-3D	May-14	23.42	9.61	934.61	925.00	---	---	---	---	---	---	---	---	---	---	---	---
	MW-3D	Nov-14	23.42	9.68	934.61	924.93	2.4	16	269	3.16	6.05	98.2	-60.5	0.55	< 0.1	< 1	0.131	10.8
	MW-3D	Nov-13	23.42	10.34	934.61	924.27	2.3	16	250	5.34	6.02	86.6	-39	0.52	< 0.1	< 1	0.146	12.8
Shallow	MW-5	Nov-15	15.92	6.80	929.58	922.78	1.6	20	217	5.00	5.78	94.4	-97	0.91	< 0.1	12	4.57	22.5
	MW-5	May-15	15.92	7.82	929.58	921.76	---	---	---	---	---	---	---	---	---	---	---	---
	MW-5	May-14	15.92	7.97	929.58	921.61	---	---	---	---	---	---	---	---	---	---	---	---
	MW-5	Nov-14	15.92	8.27	929.58	921.31	1.3	21	243	1.10	5.43	101	-36	1.22	< 0.1	11.9	0.781	6.56
	MW-5	Nov-13	15.92	9.42	929.58	920.16	1.1	20	290	0.80	5.68	101	-60	0.04	< 0.1	< 1	0.799	6.26
Shallow	MW-6A	Nov-15	17.45	7.73	931.32	923.59	1.7	18	540	27.0	6.49	220	-145	1.15	< 0.1	37.1	0.407	13.1
	MW-6A	May-15	17.45	8.30	931.32	923.02	1.6	15	348	2.60	6.77	213	-135	2.96	< 0.1	4.02	0.297	8.52
	MW-6A	May-14	17.45	8.63	931.32	922.69	1.5	16	626	5.44	6.51	267	-119	2.68	< 0.02	8.5	0.349	1.6
	MW-6A	Nov-14	17.45	8.51	931.32	922.81	1.6	19	647	4.04	6.42	264	-137	1.11	< 0.1	1.3	0.758	38.9
	MW-6A	Nov-13	17.45	9.07	931.32	922.25	1.5	17	778	3.41	6.49	299	-122	0.00	< 0.1	< 1	0.715	33.9
Deep	MW-15	Nov-15	57.51	7.68	939.07	931.39	8.5	16	154	83.0	6.37	25.3	-24	9.70	7.43	2.57	0.235	3.4
	MW-15	May-15	57.51	9.48	939.07	929.59	---	---	---	---	---	---	---	---	---	---	---	---
	MW-15	May-14	57.51	9.58	939.07	929.49	---	---	---	---	---	---	---	---	---	---	---	---
	MW-15	Nov-14	57.51	9.76	939.07	929.31	8.4	18	136	76.5	6.18	23.9	26	8.46	8.28	2.9	0.085	0.191
	MW-15	Nov-13	57.51	10.05	939.07	929.02	8.3	16	154	601	6.08	21.9	-6	4.18	8.05	2.65	0.066	0.312
Shallow	MW-16	Nov-15	17.92	7.84	938.03	930.19	1.8	17	1221	9.0	6.40	440	-32	0.66	0.16	291	0.133	0.846
	MW-16	May-15	17.92	9.22	938.03	928.81	---	---	---	---	---	---	---	---	---	---	---	---
	MW-16	May-14	17.92	9.32	938.03	928.71	---	---	---	---	---	---	---	---	---	---	---	---
	MW-16	Nov-14	17.92	9.58	938.03	928.45	1.5	19	659	9.53	5.69	247	30	0.60	< 0.1	73.1	0.087	0.508
	MW-16	Nov-13	17.92	9.73	938.03	928.30	1.4	17	769	7.74	6.28	276	7	0.00	< 0.1	84.6	0.233	0.746

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Former Bramlette MGP Facility–Remedial Investigation Work Plan

Well		Date Sampled	Groundwater Quality Data								Indirect Bio-Activity Indicators			Terminal Electron Acceptors			Biologic Byproducts	
			Measured Well Depth	Depth to Water	TOC Elevation	Groundwater Elevation	Well Volume	Temperature	Specific Conductance	Turbidity	pH	Alkalinity[1]	ORP[2]	Dissolved Oxygen[3]	Nitrate (as N)	Sulfate	Manganese	Ferrous Iron[4]
			(feet)	(feet)			(gallons)	(°C)	(umho/cm)	(NTU)	(su)	(mg/L)	(mV)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
Combined	MW-18	Nov-15	27.28	10.49	932.47	921.98	2.9	19	339	1.0	5.91	135	-38	0.32	< 0.1	20.2	0.794	4.18
	MW-18	May-15	27.28	11.79	932.47	920.68	2.7	16	283	1.86	6.22	105	-50	0.24	< 0.1	16.7	0.608	4.35
	MW-18	May-14	27.28	11.83	932.47	920.64	2.7	15	266	7.61	5.62	98.8	-25	0.27	< 0.02	21.5	0.434	3.4
	MW-18	Nov-14	27.28	12.14	932.47	920.33	2.6	20	344	0.27	5.47	131	-15.6	0.25	< 0.1	27.3	0.626	5.28
	MW-18	Nov-13	27.28	12.58	932.47	919.89	2.6	19	338	0.32	5.78	126	-31	0.03	< 0.1	25.9	0.585	4.57
Mid-Depth	MW-19	Nov-15	21.86	5.41	933.56	928.15	2.9	18	411	3.0	6.16	184	-114	0.4	< 0.1	<1.0	2.54	34.8
	MW-19	May-15	21.86	6.79	933.56	926.77	---	---	---	---	---	---	---	---	---	---	---	---
	MW-19	May-14	21.86	6.94	933.56	926.62	---	---	---	---	---	---	---	---	---	---	---	---
	MW-19	Nov-14	21.86	7.08	933.56	926.48	2.6	18	405	7.38	5.36	163	-87	0.33	< 0.1	< 1	2.6	33.4
	MW-19	Nov-13	21.86	7.43	933.56	926.13	2.5	17	403	2.50	6.20	136	-92	0.27	< 0.1	< 1	2.16	35.8
Deep	MW-20	Nov-15	28.04	9.11	934.89	925.78	3.3	16	249	2.0	6.05	94.6	-85	0.30	< 0.1	<1.0	0.222	16.3
	MW-20	May-15	28.04	9.76	934.89	925.13	---	---	---	---	---	---	---	---	---	---	---	---
	MW-20	May-14	28.04	9.94	934.89	924.95	---	---	---	---	---	---	---	---	---	---	---	---
	MW-20	Nov-14	28.04	9.95	934.89	924.94	3.2	16	251	2.69	5.75	93.7	-46.3	1.04	< 0.1	< 1	0.209	15.9
	MW-20	Nov-13	28.04	10.64	934.89	924.25	3.0	15	252	1.31	5.75	86.8	-20	0.58	< 0.1	< 1	0.208	16.7
Deep	MW-21	Nov-15	20.58	10.19	934.09	923.90	1.8	17	674	34.0	6.71	221	-118	3.35	0.304	111.0	0.238	3.25
	MW-21	May-15	20.58	11.02	934.09	923.07	1.7	16	443	1.80	6.91	214	-127	0.82	0.155	21.1	0.372	4.64
	MW-21	May-14	20.58	11.20	934.09	922.89	1.6	16	567	2.23	6.78	261	-112	2.29	< 0.02	4.6	0.295	1.3
	MW-21	Nov-14	20.58	11.35	934.09	922.74	1.6	18	652	10.1	6.21	270	-106	0.84	0.112	4.7	0.601	11.6
	MW-21	Nov-13	20.58	11.78	934.09	922.31	1.5	18	749	1.02	6.56	274	-105	0.00	< 0.1	< 1	1.06	38.2
Mid-Depth	MW-22	Nov-15	35.36	7.11	929.66	922.55	4.9	18	165	6.00	5.73	38.4	80	1.09	1.87	9.31	0.0283	< 0.100
	MW-22	May-15	35.36	8.47	929.66	921.19	---	---	---	---	---	---	---	---	---	---	---	---
	MW-22	May-14	35.36	8.59	929.66	921.07	---	---	---	---	---	---	---	---	---	---	---	---
	MW-22	Nov-14	35.36	8.82	929.66	920.84	4.6	18	182	8.83	4.85	33.3	223	1.91	3.48	9.36	0.027	< 0.1
	MW-22	Nov-13	35.36	9.72	929.66	919.94	4.5	18	159	15.6	4.96	32.9	253	0.92	3.97	4.15	0.03	< 0.1
Deep	MW-23	Nov-15	45.36	0.45	923.75	923.30	7.6	18	199	17.0	6.38	13.7	-19	3.64	4.06	21.6	0.0537	< 0.100
	MW-23	May-15	45.36	2.82	923.75	920.93	7.4	17	196	41.4	5.99	12.7	41	5.40	4.31	23.2	0.015	< 0.1
	MW-23	May-14	45.36	1.34	923.75	922.41	7.7	19	185	34.9	5.40	13.7	177	5.40	4.2	17.9	0.187	< 0.5
	MW-23	Nov-14	45.36	1.86	923.75	921.89	7.6	18	182	39.3	6.46	16.7	32.8	6.09	4.46	17.9	0.174	< 0.1
	MW-23	Nov-13	45.36	2.29	923.75	921.46	7.5	16	183	90.1	6.02	17.8	184	1.90	4.24	25.1	0.469	< 0.2
Shallow	MW-24	Nov-15	10.30	2.28	925.25	922.97	1.4	18	779	108.0	6.15	317	-139	2.05	< 0.1	12.1	3.24	74.8
	MW-24	May-15	10.30	1.53	925.25	923.72	1.5	19	640	232	6.32	232	-110	1.40	< 0.1	24.0	3.18	66.7
	MW-24	May-14	10.30	3.19	925.25	922.06	1.2	18	526	350	5.66	168	-39	2.41	< 0.02	31.9	2.34	11.4
	MW-24	Nov-14	10.30	3.17	925.25	922.08	1.2	15	655	167	3.67	276	-82.5	3.6	< 0.1	37.1	3.01	57.4
	MW-24	Nov-13	10.30	3.98	925.25	921.27	1.1	15	578	59.9	6.17	188	-53	0.01	<0.1	43.7	2.04	29.1

Table 3
Monitored Natural Attenuation Data
Former Bramlette MGP Facility–Remedial Investigation Work Plan

Well		Date Sampled	Groundwater Quality Data								Indirect Bio-Activity Indicators			Terminal Electron Acceptors			Biologic Byproducts	
			Measured Well Depth	Depth to Water	TOC Elevation	Groundwater Elevation	Well Volume	Temperature	Specific Conductance	Turbidity	pH	Alkalinity[1]	ORP[2]	Dissolved Oxygen[3]	Nitrate (as N)	Sulfate	Manganese	Ferrous Iron[4]
			(feet)	(feet)			(gallons)	(°C)	(umho/cm)	(NTU)	(su)	(mg/L)	(mV)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
Combined	MW-25R	Nov-15	15.90	2.01	930.08	928.07	2.4	21	264	243	6.14	55.1	-61	0.85	< 0.1	17.5	0.389	11.5
	MW-25R	May-15	15.90	2.99	930.08	927.09	2.3	19	226	9.08	5.87	45.6	-29	0.17	< 0.1	21.5	0.249	8.03
	MW-25R	May-14	15.90	3.02	930.08	927.06	2.3	20	201	25.2	5.57	54.6	-32	0.20	< 0.02	13.5	0.219	6.4
	MW-25R	Nov-14	15.90	2.87	930.08	927.21	2.3	23	214	16.2	5.44	45.4	-17.8	2.0	< 0.1	24.3	0.235	6.56
	MW-25R	Nov-13	15.90	3.05	930.08	927.03	2.2	17	163	17.5	6.29	36.7	22	0.24	1.15	16	0.0589	0.885

Notes:

1. Alkalinity and oxygen-reduction potential (ORP) have an inverse relationship with biological activity which increases alkalinity and decreases ORP (negative).
2. The more reducing the groundwater conditions (negative ORP), the greater the depletion of electron acceptors.
3. Dissolved oxygen (DO) should be less than 1 mg/L when ORP is negative.
4. Ferrous iron should be present only if DO is less than 1 mg/kg, and ORP is negative.

°C	Degrees celsius
mg/L	Milligrams per liter
mV	Microvolts
NTU	Naphelometric turbidity unit
su	Standard units
TOC	Top of casing
umho/cm	micromhos, which is the equivalent of microSiemens (uS/cm).
---	Data is unavailable

APPENDICIES

APPENDIX A
DHEC Correspondence

D H E C

PROMOTE PROTECT PROSPER

2600 Bull Street
Columbia, SC 29201-1708

RECEIVED
MAR 01 2001
Duke Power
Environmental Engineering

February 26, 2001

Mr. Fred Veal
US Army Corps of Engineers
69-A Hagood Ave.
Charleston SC 29403

Re: CSX Bramlette Road MGP/Vaughn Landfill, Site ID #00801
Contamination in Former Wetland Area
Greenville County

Dear Mr. Veal:

Applied Science & Engineering (AES) submitted an Assessment Report (1995) which documented the presence of free phase coal tar in the referenced unpermitted landfill site (Vaughn Landfill). An Assessment Report submitted in 1996 assessed the extent of the coal tar contaminant plume. Further Assessment Reports were submitted to the Department in September 2000 and January 2001. A Corrective Action Plan (CAP) was received in October 2000 and approved in November 2000. In each of these reports, the extent of the coal tar plume was documented and has remained stable.

As you are aware, the CSX/Vaughn Landfill site is located in the eastern-bank floodplain of the Reedy River and was developed as an unpermitted C&D landfill by Mr. Robert Vaughn. Biological and geotechnical assessments of the site have demonstrated that the coal tar constituents are not significantly impacting flora and fauna in the wetland area. However, free phase coal tar and coal tar impacted groundwater are present underlying the debris at the soil/ saprolite interface.

Per our conversation, coal tar is a very viscous, relatively non-mobile material. The areal extent of the contaminant plume has not enlarged since it was first documented in 1996. No surface water or downstream/downgradient impact has been documented, nor are there any drinking water wells within 0.5 miles of the site. Activities associated with physical removal of the fill would very likely result in mobilization of the coal tars and destruction of the existing, unaltered wetlands. Continued monitoring of the monitoring wells proximal to the landfill will be the only action required at this time. For these reasons, the Department recommends that offsite mitigation be pursued rather than onsite mitigation.

On all correspondence regarding this site, please reference Site ID #00801. If you have any questions, please contact me at (803) 898.4155 or email boyntosj@columb32.dhec.state.sc.us.

Sincerely,

Jennifer Boynton, Hydrogeologist
Groundwater Quality Section
Water Monitoring Assessment and Protection Division
Bureau of Water

cc: Appalachia II District EQC
Eileen Appolone, BOW
Dave Butler, AES, 2261 Perimeter Park Dr., Suite 1, Atlanta GA 30341

D H E C

PROMOTE PROTECT PROSPER

2600 Bull Street
Columbia, SC 29201-1708

August 21, 2001

RECEIVED
AUG 27 2001
Duke Power
Environmental Engineering

Mr. Mark McGary
Duke Engineering & Services
610 Toddville Rd, Building 5643
Charlotte NC 28214

Re: Bramlette Road MGP/Vaughn Landfill
Site ID # 00801
Remediation Action Plan
Greenville County

Dear Mr. McGary:

The Groundwater Quality Section (Section) of the Bureau of Water approved a Remedial Action Plan for this site in correspondence dated April 25, 2001. Please note that this approval is for the remediation of contaminated soil at the referenced site. Disposal of contaminated materials is regulated by the Waste Assessment Section of the Bureau of Land & Waste Management. Contaminated soil should be disposed of at a permitted facility utilizing approved protocols. Any questions regarding disposal requirements shuld be directed to Steve Burdick at 803.896.4120. Documentation of proper soil disposal should be provided to me for inclusion in the file.

On all correspondence please reference Site ID #00801. If you have any questions, please feel free to call me at 803.898.4155 or email boyntosj@columb32.dhec.state.sc.us.

Sincerely,

Jennifer Boynton, Hydrogeologist
Groundwater Quality Section
Water Monitoring, Assessment, and Protection Division
Bureau of Water

cc: Appalachia II District EQC
Juli Blalock, BLWM
Steve Burdick, BLWM
Ralph Roberts, Duke Power, Mail Code EC 12 ZB, 526 Church St, PO 1006 28201
Dave Butler, AES, 2261 Perimeter Park Drive, Suite 1, Atlanta GA 30391

SCDHEC/BOW/jb/010821

D H E C

PROMOTE PROTECT PROSPER

2600 Bull Street
Columbia, SC 29201-1708

November 6, 2000

Mr. Ralph Roberts
Duke Power/Engineering
526 S. Church St
P.O.Box 1006
Charlotte NC 28201

Re: Bramlette Road MGP/Vaughn Landfill
Site ID # 00801
Remedial Action Plan Received October 18, 2000
Greenville County

Dear Mr. Roberts:

The Groundwater Quality Section of the Bureau of Water has reviewed the referenced plan and concurs with your consultant's recommendations for remedial action. However, the Section requests that a groundwater monitoring event be implemented either prior to initiation of the RAP or as a part of the remedial activities.

On all correspondence please reference Site ID #00801. If you have any questions, please feel free to call me at 803.898.4155.

Sincerely,

Jennifer Boynton, Hydrogeologist
Groundwater Quality Section
Water Monitoring, Assessment, and Protection Division
Bureau of Water

cc: Appalachia II District EQC

SCDHEC/BOW/jb/001106

DHEC

PROMOTE PROTECT PROSPER

2600 Bull Street
Columbia, SC 29201-1708

July 11, 2003

RECEIVED
JUL 16 2003
Duke Power
Environmental Engineering

Mr. Ralph Roberts
Duke Power
Environmental Health & Safety
526 South Church St, PO Box 1006
Charlotte NC 28201

Re: Bramlette Road MGP/Vaughn Landfill
Site ID # 00801
Groundwater Monitoring Report received July 3, 2003
Greenville County

Dear Mr. Roberts:

The Department has reviewed the submitted data. At this time the indicator parameters are within acceptable limits.

Please submit the next groundwater monitoring report to me attention on or before February 1, 2004. On all correspondence please reference Site ID #00801. If you have any questions, please feel free to call me at 803.898.4155 or email boyntosj@dhec.sc.gov.

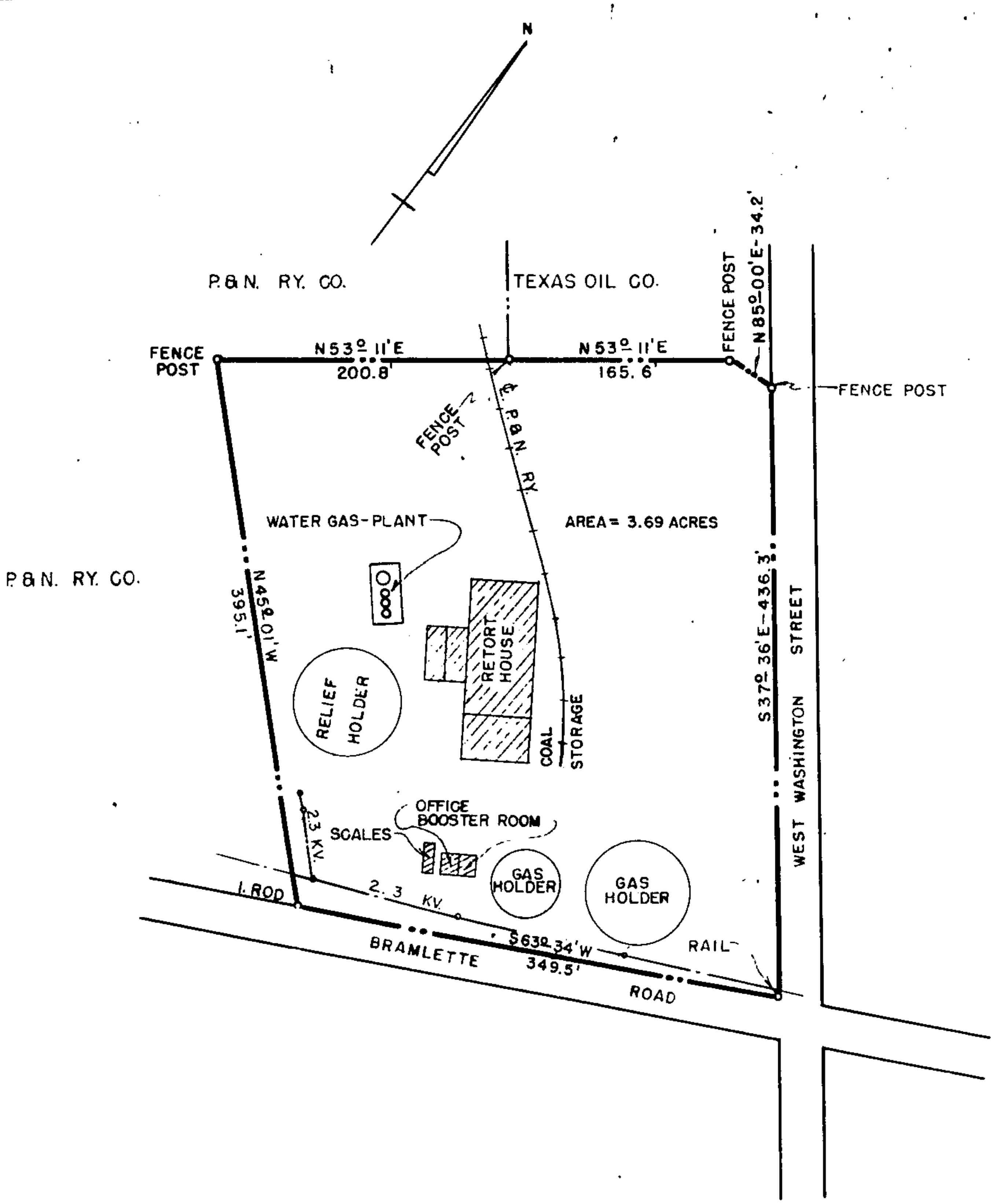
Sincerely,

Jennifer Boynton, Hydrogeologist
Groundwater Quality Section
Water Monitoring, Assessment, and Protection Division
Bureau of Water

cc: Appalachia II District EQC
Dave Butler, AES, 2261 Perimeter Park Drive, Suite 1, Atlanta GA 30391

APPENDIX B
1951 Parcel 1 Plat

BOOK 434 PAGE 312



Recorded May 11th. 1951 at 5:21 P. M. #11125

DUKE POWER COMPANY
GREENVILLE GAS PLANT PROPERTY
DEEDED TO
PIEDMONT NATURAL GAS CO. INC.
GREENVILLE, S.C.

SCALE: 1" = 100'

MARCH 27, 1951

FILE NO. 12-25

APPENDIX C
Aerial Photographs


INQUIRY #: 4709796.3
YEAR: 1943
= 500'
N
EDR

INQUIRY #: 4709796.3

YEAR: 1955

= 500'

N

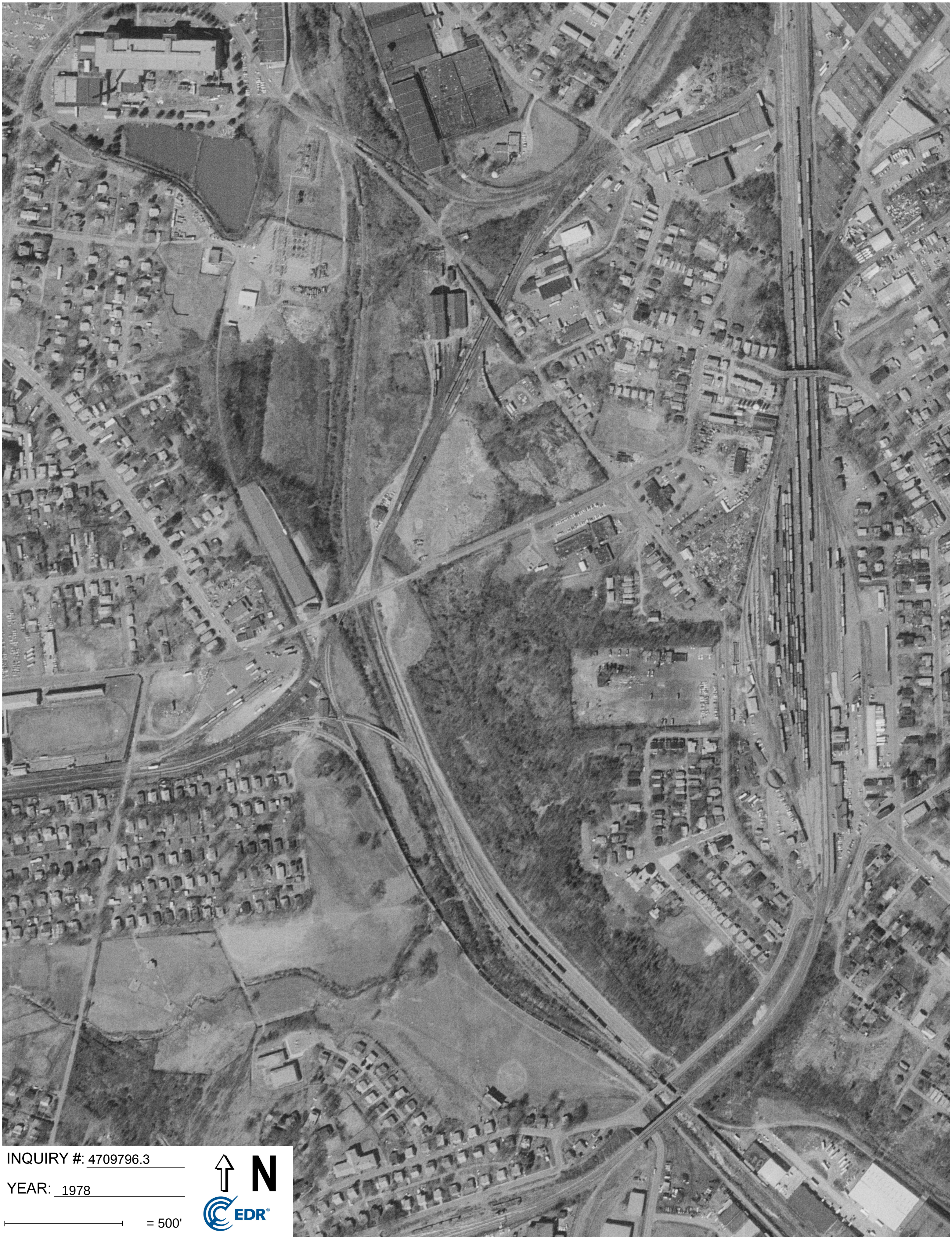
INQUIRY #: 4709796.3

YEAR: 1965

N

= 500'

EDR



INQUIRY #: 4709796.3

YEAR: 1978

= 500'

N

INQUIRY #: 4709796.3

YEAR: 1994

= 500'

N

EDR

INQUIRY #: 4709796.3

YEAR: 2005

= 500'

N

APPENDIX D
Adjacent Property and Owners

Appendix D
Adjacent Properties and Owners
Former Bramlette MGP Facility-Remedial Investigation Work Plan

Property Identification No.	Property Owner	Property Mailing Address
0139000700103	Margaret Rampey	11 St. Clair Street
0139000700100	Somerhil Properties, LLC	1702 West Washington Steet
		1704 West Washington Steet
		1706 West Washington Steet
0139000700102	Somerhil Properties, LLC	1708 West Washington Steet
		1710 West Washington Steet
0139001000300	Greater Greenville Sanitation	1600 West Washington Steet
0025000100101	Dixie Iron & Metal Co. Inc.	1530 West Washington Steet
0138000100300	Legacy School Properties, LLC	1613 West Washington Steet
0025000401000	County of Greenville/Greater Greenville Sanitation	1501 West Washington Steet
0054000200903	Robert Adams	107 Temple Steet
0054000200902	Palmetto Investors, LLC	202 Temple Steet
0054000201000	Mountain View Baptist Church Trust	108 Temple Steet
0054000900100	Mountain View Baptist Church	111 Cagle Steet