Duke Engineering & Services
A Duke Energy Company

# CSX/VAUGHN LANDFILL AND BRAMLETTE ROAD MGP SITES

# REMEDIAL ACTION PLAN

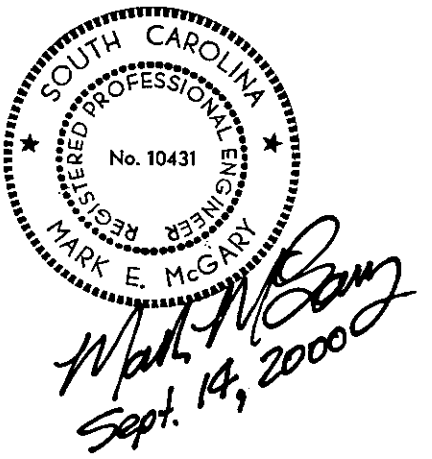

PREPARED BY:

SITE REMEDIATION SERVICES GROUP
DUKE ENGINEERING & SERVICES, INC.
400 SOUTH TRYON STREET
P.O. BOX 1004
CHARLOTTE, NORTH CAROLINA
28201-1004


SEPTEMBER 2000

# CSX/VAUGHN LANDFILL
# AND
# BRAMLETTE ROAD MGP SITES

## REMEDIAL ACTION PLAN




Prepared by:

**SITE REMEDIATION SERVICES GROUP**
DUKE ENGINEERING & SERVICES

SEPTEMBER 2000

# Table of Contents

## List of Tables



## List of Figures

# List of Appendices

# BRAMLETTE ROAD MGP SITE

# REMEDIAL ACTION PLAN

## 1.0 INTRODUCTION

This remedial action plan describes activities that will be performed to remediate certain impacted soils and free tars located within the site of the former Bramlette Road manufactured gas plant (MGP) and along a drainage pathway leading from the site located north of Bramlette Road. Site cleanup will be managed and performed by Duke Engineering & Services personnel.

## 2.0 SITE DESCRIPTION

The Bramlette Road MGP site is located in the community of City View in Greenville County, South Carolina as indicated on Figures 1 and 2. The site lies just outside of the Greenville City limits. The site covers 3.69 acres and is located at 400 South Bramlette Road in the western quadrant of the intersection of Bramlette Road and West Washington Street (Figure 4). The site is currently vacant and access is restricted by perimeter fencing. Lockable gates are located near the southern corner of the site along Bramlette Road and along West Washington Street.

The Bramlette Road MGP site is owned by CSX Transportation and has been investigated along with the adjacent CSX/Vaughn Landfill site. The Landfill site covers approximately 7 acres and is located approximately 800 feet west of this intersection across and south of Bramlette Road. Both the Bramlette Road MGP and the CSX/Vaughn Landfill sites are owned by CSX Transportation (CSXT). The two sites are part of more extensive CSXT property holdings in the Bramlette Road area that total approximately 40 acres and contain rail lines and an office for crew transfers and

scheduling activities. The majority of these properties lie within the floodplain of the Reedy River located to the west. Land use immediately east of the MGP and Landfill sites is primarily residential with the exception of the property located in the southern quadrant of the intersection of Bramlette Road and West Washington Street. This property contains a school building and is owned by the Greenville County School District. The property bordering the MGP site to the north is owned by Suburban Propane and is currently used as a propane tank storage facility.

## 3.0 SITE HISTORY

The Bramlette Road MGP site was originally developed as a manufactured gas plant by Southern Public Utilities in 1917. The Bramlette Road plant was constructed as a replacement for an existing gas plant located at Broad Street in Greenville; and was a larger plant that produced gas using the more economical coal gas process. The site eventually contained a retort house, three gas holders, a water gas plant, tar and ammonia washer tanks, purifiers, a tar extractor and holder, and an underground heating oil tank. Locations of historical site structures are indicated on Figure 3.

Gas plant ownership and operation transferred to Duke Power Company in 1935. Piedmont Natural Gas Company purchased the site in 1951 and subsequently demolished the gas plant sometime in the late 1950s. Site ownership transferred to Piedmont and Northern Railway in 1963. Piedmont and Northern Railway became part of Seaboard Coast Line (CSX) in 1967. The site was used as a trucking facility in the 1970s and 1980s.

The CSX/Vaughn Landfill site is located within the eastern bank floodplain of the Reedy River. The site was developed as an unpermitted landfill by Mr. Robert Vaughn of Vaughn Construction and Demolition Company in Greenville. Mr. Vaughn attempted to purchase approximately 16 acres from CSXT in 1988 for the purpose of constructing a solid waste landfill. Following payment of a deposit, Mr. Vaughn began unpermitted landfilling activities on the property. The property transfer was never finalized, however,

Mr. Vaughn continued to operate the landfill. The South Carolina Department of Health and Environmental Control (SCDHEC) advised Mr. Vaughn in 1993 that his landfilling activities were improper. In February of 1994, the U.S. Army Corps of Engineers (ACE) notified CSXT that the property on which the landfill is located is considered a wetlands, and the landfilling operation was a violation of Section 301 of the Clean Water Act. Following notification by the ACE, CSXT ordered Mr. Vaughn to cease landfilling activities and the site was closed.

## 4.0 SUMMARY OF SITE INVESTIGATIONS

Three primary investigations of the CSX/Vaughn Landfill and Bramlette Road MGP sites have been performed. A Phase I investigation was conducted in early 1995 at the CSX/Vaughn Landfill site by Applied Engineering and Science (AES) of Atlanta, Georgia. This investigation included soil, sediment, surface water and groundwater sampling across and around the Landfill. The results of this investigation were documented in an AES report entitled "Site investigation; Soil, Sediment, and Groundwater Sampling; Vaughn Landfill, CSX Real Property; March 1995".

A Phase II investigation was conducted by AES in 1996. This investigation included the installation of 8 monitoring wells to assess groundwater quality at both the MGP site and the Landfill site; and soil sampling at the MGP site to assess the extent of coal tar. This investigation also included a biological survey conducted in the wetlands area surrounding the Landfill site, and included a site characterization and contaminant pathway/exposure evaluation. The results of this investigation were documented in an AES report entitled "Site Investigation Phase II, Vaughn Landfill/Duke Power Sites, CSXT Real Properties, Bramlette Road, Greenville, South Carolina, September 1996".

A Phase III investigation was conducted by Duke Power Company in 1999 and documented in the report "CSX/Vaughn Landfill and Bramlette Road MGP Sites, Phase III Investigation and Site Assessment Report, Site Remediation Services Group, Duke Engineering & Services, June 2000". The Phase III investigation included the installation of 18 additional groundwater monitoring wells within both the MGP site and

the Landfill site. The Phase III report summarized the findings of the two previous AES investigations, provided additional characterization of soils and groundwater, and documented the results of additional biological assessments in the wetlands area surrounding the landfill. This report also provided a characterization of risks to human health from potential exposure to soil and groundwater contaminants associated with the MGP site.

Chemical constituents of interest typically associated with MGP residuals include polycyclic aromatic hydrocarbon (PAH) compounds, naphthalene, volatile organic compounds (VOCs), phenols, cyanides, and various other inorganics. The quantity and makeup of these constituents found at a specific MGP site is dependent on several factors including the age of the site, the geologic setting of the site, the gas manufacturing process utilized, the amount of by-product recovered during plant operation, waste disposal practices employed during operation, and the manner in which the site was demolished.

Investigation efforts have verified the presence of typical MGP residuals in soils and groundwater within the MGP site, and along surface migration pathways leading from site.

### 4.1 Soil

Significant quantities of coal tar contaminated soils and some free tar are present within the MGP site, along a ditch that drains the MGP site (Ditch 1), and in native wetland soils below and around the Landfill. Free tars are present in as many as 3 masonry tar wells located on the MGP site. Contamination within the MGP site originated from day to day operations of the facility, and was made pervasive across the site when the facility was demolished. During operation, coal tar and coal tar laden wastewaters were discharged into Ditch 1 leading from the facility. These constituents settled into ditches, depressions and pools within wetlands south of Bramlette Road. An unpermitted construction and demolition debris landfill has been placed on top of most of the coal tar contaminated soils in the wetlands. The Landfill covers approximately 7 acres of wetlands and ranges in depth from 7 to 14 feet.

Soil samples have been collected and field characterized from 46 locations within the MGP site and along Ditch 1 (Figure 4). Field characterization of samples collected indicated coal tar contaminated soils present in a broad band extending from the southern corner of the MGP site near Bramlette Road to the northern corner of the site along West Washington Street (Figures 5 through 12). Within this band, coal tar residuals were indicated at varying depths from the surface down to 14 feet. The soil samples indicated varying thicknesses of highly disturbed soils intermixed with MGP debris consisting of coal, coal tar, coal ash, coke, brick, wood, and other demolition debris.

From the 46 sampling locations, twelve samples of varying levels of contamination were selected and submitted for laboratory analyses (Tables 1 and 2). The highest levels of contamination within the MGP site were indicated in a sample taken in the southern corner of the site in the vicinity of monitoring wells MW7, MW8 and MW9. The sample was collected from a depth of 5 to 7 feet and indicated a total PAH concentration of 310 ppm. Much higher concentrations of PAHs would be expected in tarry near-surface soils observed in this same area. The maximum total PAH concentration from the laboratory analyses was 23,960 ppm in a near-surface sample taken along Ditch 1approximately 200 feet from the MGP site boundary.

No significant contamination was indicated in soils in the eastern corner of the site. Native soils in the western corner of the site are overlain by approximately 7 feet of a mixture of highly disturbed soils and landfill debris. No MGP related contaminates were indicated in the landfilled debris or in the underlying soil.

Some amount of free product coal tar is present at the MGP site. An undetermined quantity of free tar is contained within as many as 3 intact masonry tar wells at the site. Other minor isolated pockets of free tar have been noticed in various locations around the site.

Beneath the Landfill, coal tars reside at the debris-native soil interface and at the interface between overlying alluvial soils and underlying saprolite.

## 4.2 Groundwater

Eleven monitoring wells have been installed to-date within the MGP site. Fifteen additional wells have been installed downgradient from the site within the Landfill site and at other locations south of Bramlette Road. Surficial groundwater at the MGP site and beneath the Landfill has been impacted by volatile and semi-volatile organics originating from free tars and coal tar constituents in soils at the MGP site, along Ditch 1, and beneath the Landfill.

Depth to groundwater within the MGP site varies from 3 to 8 feet below the ground surface (Table 3). Groundwater movement at the MGP site is west-southwesterly, eventually turning more southwesterly toward the Landfill. The plume of contamination extends from the MGP site southwesterly into the Landfill site. No groundwater contamination has been indicated in monitoring wells located south and east of the Landfill.

BTEX compounds were detected in 4 wells (MW7, MW8, MW9 and MW17) at the MGP site (Table 4). The maximum total BTEX concentrations were indicated in wells located near the southern corner of the site. Benzene was indicated at concentrations from 6 to 570 ppb in these 4 wells, and was the only BTEX compound indicated at concentrations exceeding the MCL. Various PAH compounds were detected in the same 4 wells discussed above (Table 5). Naphthalene was the predominant PAH indicated, and was detected at a maximum concentration of 6,400 ppb.

Variations in groundwater sulfate and iron concentrations in wells within the MGP site suggests that some degree of biodegradation is occurring, particularly with regard to degradation of the lower molecular weight organics. Other natural attenuation processes such as adsorption are likely occurring as well, however these processes appear to be insufficient to completely retain contaminants within the MGP site boundary in the absence of some degree of source removal. Analytical results also indicate that some degree of natural attenuation is occurring at the Landfill site as well. Additional monitoring wells have been recommended to assess whether or not

groundwater contaminants are discharging into the Reedy River from the Landfill site. Should this assessment indicate that no contaminants are discharging into the river, then the groundwater contaminants are likely stabilized and contained wholly within CSX properties.

### 4.3 Surface Water

No organics were indicated in any surface water samples obtained from several locations in the wetlands surrounding the Landfill and in drainage pathways leading from the Landfill. No organics were indicated in samples from the Reedy River.

### 4.4 Biological Assessments

Two separate biological assessments have concluded that coal tar constituents indicated in wetland soils and sediments are not detrimental to plants and animals living in the wetlands environment surrounding the Landfill.

## 5.0 REMEDIAL ACTION OBJECTIVES AND OVERVIEW

The overall objective of remedial action proposed for the MGP site is to minimize present risks to human health; and to transform the property into an acceptable condition that is suitable for future commercial or industrial development. The specific objectives of remedial actions proposed are to:

a. Cleanup near-surface soils within the MGP site and along Ditch 1 that represent the greatest present risk to human health;

b. Reduce the amount of source material contributing to groundwater contamination;

c. Remove free tars contained within the masonry tar wells on-site.

As discussed in the Phase III Investigation and Site Assessment Report, the greatest present risk associated with contaminants at the MGP site involves ingestion of carcinogenic PAH compounds adsorbed onto near-surface soils. Site trespassers, particularly children, are assumed to be the population at risk. Consequently, remediation activities will be focused primarily on the reduction of this present risk by the risk-based cleanup of these soils within the MGP site and along Ditch 1. Near-surface soils are herein defined as being located within the top 3 feet of the existing ground surface. Considering the proximity of the site to nearby residential properties, cleanup concentrations will be based on exposures to near-surface soils in a residential setting. The determination of risk-based cleanup concentrations is documented in Appendix A. Cleanup will be accomplished by the excavation and treatment of near-surface soils that exceed the specified cleanup concentration. Excavated areas will be backfilled with treated soil meeting the specified cleanup criteria, and/or with virgin clean material obtained from off-site sources. Free tars contained within on-site tar wells will also be removed along with the actual tar well structures.

No remediation is planned at this time for soils located below 3 feet deep. There is no risk associated with exposure to these soils in the current setting, and shallow groundwater at the site renders deeper excavation impractical and of questionable additional benefit as discussed below. Cleanup of specific areas of soils below 3 feet deep will be performed as necessary at such time that the property is developed, excavated, or altered in such a manner that results in potential human exposure to these soils.

This plan does not include remediation of groundwater at the MGP site or at the Landfill site. As discussed in the Phase III Investigation and Site Assessment Report, there is no risk associated with exposure to contaminated groundwater in the vicinity of the MGP site. Drinking water in the area surrounding the site is provided by the local municipal water supply system. There are no known water supply wells in operation in the area immediately surrounding the site. Since municipal water is readily available, there is little likelihood that water supply wells would be constructed in the future.

Groundwater at the MGP site has become contaminated from the percolation of rainwater through contaminated near-surface soils, and from direct contact with deeper contaminated soils. Cleanup of near-surface soils will serve to reduce the source of continuing groundwater contamination. Contaminated soils, sediments and groundwater are pervasive within the CSX/Vaughn Landfill site located downgradient from the MGP site. Efforts to remediate groundwater within the MGP site would be counterproductive as this same groundwater would become recontaminated upon migration into the Landfill site. Excavation and removal of contaminated soils and sediments within the Landfill site would likely result in severe damage, if not complete destruction, to the wetland environment. Biological assessments have indicated that the presence of MGP constituents in soils and sediments within the wetlands has no adverse impact to fauna. Sampling results have suggested that natural attenuation processes may be acting to contain groundwater contaminants within CSX property boundaries.

## 6.0 CLEANUP CRITERIA

EPA Region III guidelines were used to establish a risk-based cleanup criteria for near-surface soils at the MGP site as documented in Appendix A. Cleanup target concentrations are based on exposure to carcinogenic PAHs adsorbed onto near-surface soils. Direct ingestion of PAH contaminated soil is the primary controlling pathway. Benzo(a)pyrene is assumed to be the most potent carcinogenic PAH and is therefore used as the surrogate carcinogen. The EPA Region III allowable risk-based soil concentration of benzo(a)pyrene based on ingestion of soil in a residential setting is 0.087 mg/kg.

To establish a non-compound specific cleanup concentration, a statistical evaluation was performed on soil samples from the MGP site. The evaluation included only data from samples that indicated PAH contamination above method detection limits. Samples indicating no detectable PAHs were omitted from the evaluation. Total concentrations of PAHs, carcinogenic PAHs, and carcinogenic PAHs as benzo(a)pyrene were calculated. Non-detected compounds were included in total sums at one-half the

method detection limit. A total carcinogenic PAHs as benzo(a)pyrene concentration was calculated by factoring the concentration of each individual carcinogenic PAH compound by it's associated B(a)P equivalent potency factor. Average and upper confidence level ratios of total carcinogenic PAHs as B(a)P to total carcinogenic PAHs were determined. Average and upper confidence level ratios of total carcinogenic PAHs as B(a)P to total PAHs were also determined. Target cleanup concentrations for total carcinogenic PAHs and for total PAHs were determined by factoring the allowable concentration of benzo(a)pyrene (0.087 mg/kg) by the calculated ratios. At a 95% upper confidence level ratio, target cleanup concentrations for near-surface soils within the MGP site are summarized as follows:

| Target Cleanup Concentrations [mg/kg] | | |
|---|---|---|
| Total Carcinogenic PAHs as B(a)P | Total Carcinogenic PAHs | Total PAHs |
| 0.087 | 0.319 | 0.9 |

## 7.0 REMEDIAL OPTIONS EVALUATION

A limited number of remedial options are available for the cleanup of MGP sites. As part of an MGP site cleanup in 1996, Duke Power, in collaboration with the Electric Power Research Institute (EPRI), conducted a remedial options/feasibility study. The study involved evaluations of several remedial options including various bioremediation technologies, recycling of MGP wastes into asphalt and brick, thermal desorption, and co-burning with coal in utility boilers. Duke has further evaluated various cleanup technologies for MGP sites remediated in 1997 and 1999.

Various bioremediation methods are typically successful at reducing concentrations of volatile organics and some lighter-weight semi-volatiles. Bioremediation, however, has little effect on the heavier-weight carcinogenic PAHs that typically control risks at an MGP site.

Recycling MGP wastes into asphalt was not feasible at the study site due to incompatibilities with the soil chemistry. Recycling MGP wastes into brick involves significant soil screening efforts that are typically uneconomical. Furthermore, the ability of brick kilns to achieve acceptable temperatures and holding times for complete destruction of MGP organics is suspect.

Co-firing with coal in utility boilers is an effective treatment method for MGP wastes. This option, however, involves maintenance risks to coal-pulverizing equipment and expensive retrofits to store, handle and feed the wastes into the coal stream.

Thermal desorption is a timely, effective and economical treatment method for MGP wastes. Both on-site and off-site treatment options are available with this technology. Thermal desorption is recommended as the best available treatment option for wastes at the Bramlette Road MGP site.

## 8.0 PROPOSED REMEDIAL METHOD

The remedial method proposed for cleanup of the Bramlette Road MGP site is excavation and thermal treatment of near-surface contaminated soils. Both treated soil and clean virgin fill material will be used to backfill excavated areas.

### 8.1 Soil Excavation and Handling

The quantity of near-surface (surface to 3 feet deep) soil within the MGP site exceeding the proposed risk-based cleanup target is approximately 22,500 tons. The quantity of soil along Ditch 1 exceeding the proposed risk-based cleanup target is estimated to be between 4000 and 5000 tons. Soil will be excavated from the MGP site first, beginning in the northern area of the site. Excavation will proceed south toward the southern (lower) corner of the site. Soil excavation along Ditch 1 will proceed from the MGP site

boundary toward the culvert beneath Bramlette Road. Based on a recent United States Court of Appeals decision, all MGP remediation waste materials are considered non-hazardous.

All excavated soil will be screened on-site to remove demolition and other debris not suitable for thermal treatment. Screening will be performed using a Read Screen-All RD150B with a 6" screen opening.

Material passing the screen will be stockpiled on-site for subsequent thermal treatment. Material rejected by the screen will be stockpiled on-site for transportation to an acceptable landfill facility. All stockpiles of contaminated materials will be covered with polyethylene sheeting when not being worked. Contaminated materials stockpiled in areas not planned for excavation will also be placed on a polyethylene liner.

The rate of excavation, screening, and stockpiling will be controlled by either: a) the capacity of the thermal treatment facility, b) the availability of trucking, or c) the local weather conditions. Buffer quantities of soil will be excavated, screened and stockpiled prior to any transportation of materials to the treatment facility or the landfill. These buffer quantities of ready-to-ship stockpiled materials will be maintained throughout the project. Long-term stockpiling of contaminated materials is not expected.

### 8.2 Transportation of Site Materials

All contaminated materials leaving the Bramlette Road MGP site will be transported in accordance with DOT regulations. Contaminated soil and debris leaving the site will be loaded onto trucks for transport to a thermal treatment facility (reference Section 8.3), or to a landfill facility, respectively (reference Section 8.4). Weigh scales on the loading equipment and at the thermal treatment facility will be used to document the amount of material shipped. Material manifests will be maintained on every loaded truck leaving the site.

All trucks utilized for hauling will be in good working condition with no holes or perforations in the beds. A washed stone gravel pad will be maintained at the egress point for all trucks leaving the site. Loaded trucks will be inspected and tires cleaned prior to leaving the site to minimize tracking of soil onto county roads. All loaded trucks will be securely covered to prevent spillage and dust en route.

### 8.3 Soil Treatment

Contaminated soils will be thermally treated by a thermal desorption facility. Both on-site and off-site treatment is under consideration.

Potential off-site treatment facilities under consideration include:

a. Pergo Environmental; Glen Allen, Virginia
b. Southeastern Soil Recovery (SSR); Charleston, South Carolina
c. Philip Services Corporation; Calhoun, Georgia
d. Williams Environmental Services, Inc. Stone Mountain, Georgia

Potential on-site treatment contractors under consideration include:

a. Midwest Soil Remediation, Inc.; Elgin, Illinois
b. Southwest Soil Remediation, Inc.; Tucson, Arizona
c. Thermal Remediation; Bartlette, Illinois
d. Philip Services Corporation; Calhoun, Georgia
e. Williams Environmental Services, Inc. Stone Mountain, Georgia

Should on-site treatment be chosen, the treatment contractor will secure all necessary permits for operation of the unit. If feasible, an on-site treatment unit would be located at the Landfill site to minimize interference with excavation activities at the MGP site.

Thermal treatment providers will be responsible for all verification sampling and testing of treated soil as discussed in Section 8.12.

## 8.4 Debris Handling

Significant quantities of debris are typically encountered during the remediation of MGP sites. Debris is expected to be found in the form of bricks, broken concrete, wood, rail track, rail ties, rebar, iron pipe, etc. Large debris such as concrete pads, chunks of masonry walls and large pipes will be placed directly on the debris stockpile. Other debris will be collected as screen rejects and stockpiled.

All debris generated at the Bramlette Road MGP site will be disposed of at the Waste Management, Inc. Palmetto Landfill Facility located in Wellford, South Carolina.

## 8.5 Free Tar Handling and Disposal

Based on a recent United States Court of Appeals decision, all MGP remediation waste materials are considered non-hazardous and thus suitable for treatment by thermal desorption. Free tars at the Bramlette Road MGP site will be mixed with other on-site contaminated soil to a consistency suitable for handling, transport, and thermal treatment.

## 8.6 Erosion Control and Stormwater Management

An Erosion Control and Stormwater Management Plan will be developed by Duke Engineering & Services and submitted for approval by the appropriate Greenville County regulatory agencies prior to any excavation activities. The plan will include the design of temporary measures to manage and direct stormwater runoff around and away from excavated areas, and to minimize off-site transportation of sediments from the site. The plan will also include specifications for establishing permanent vegetation on all disturbed areas across the MGP site and along Ditch 1.

To minimize the amount of water in the excavations, every effort will be made to maintain excavation depths above the surficial groundwater table. Groundwater or

surface water entering the excavation and coming into contact with contaminated soil will be pumped out by a local waste recovery and disposal contractor.

### 8.7 Odor and Dust Control

Odors are a significant concern in association with the excavation and handling of typical MGP contaminated soils. Odor levels will be continuously monitored by on-site remediation personnel, and various odor suppression measures will be used to minimize the magnitude of odors emanating from the site. Polyethylene sheeting will be used to cover all contaminated stockpiles when not being worked. Odor suppression foam will be maintained on-site, and will be applied to stockpiles and/or open excavations as necessary. Odor suppression foam is biodegradable, non-toxic, non-hazardous, and non-flammable. The foam forms a flexible membrane over the soil surface resulting in a seal that minimizes volatile emissions. The foam does not inhibit subsequent thermal treatment of the soil, and has been used successfully at several other MGP site cleanups.

Due to their tarry nature and usually high moisture content, coal tar contaminated soils are typically not a significant source of dust emissions from an MGP site. The primary source of fugitive dust from the site will be dry backfill soils (treated soil and/or virgin material) that has been placed in the excavation or has been stockpiled. Water sprays will be used to suppress dust emanating from dry backfilled soils. Polyethylene sheeting will be used to cover stockpiles of backfill material as needed.

### 8.8 Backfilling of Excavations

All excavated areas will be backfilled to near original grades. Slight changes in grade may be necessary to assure positive drainage of stormwater runoff across the final ground surface.

Material used as backfill will likely be a combination of treated soil returned to the site and clean virgin material obtained locally. A certain quantity of virgin material will be required due to loss of volume from debris removed from the site. Alternatively, virgin material may be used exclusively as backfill should returning treated soil to the site prove uneconomical.

Analytical tests will be performed on all treated soil as discussed in Section 8.12. All treated soil returned to the site will show contaminant concentration levels below cleanup target concentrations.

### 8.9 Health & Safety Plan

A site-specific Health & Safety Plan has been prepared for remediation activities at the Bramlette Road MGP site and is provided in Appendix B. All Duke Engineering & Services personnel on-site will be HAZWOPER certified. Duke Engineering & Services will maintain a Health & Safety Officer full-time at the site during normal working hours.

### 8.10 Air Monitoring Program

An air monitoring program will be conducted at the Bramlette Road MGP site to measure concentrations of airborne constituents of interest associated with remediation activities (excavation, screening, truck loading, etc.). The program will consist of both real-time screening and constituent-specific sampling, and will be conducted in addition to, or to supplement, air monitoring requirements stipulated in the site-specific Health and Safety Plan. The air monitoring program will be conducted and/or overseen by the designated on-site health and safety coordinator. Specifics of the air monitoring are provided in Appendix C.

### 8.11 Site Security and Access Control

Access to the Bramlette Road MGP site will be restricted by perimeter fencing and lockable gates. No unauthorized persons will be allowed access to the site during working hours. Duke Engineering & Services personnel will be on-site at all times during normal working hours.

Site access and egress for vehicles and areas for vehicle decontamination will be carefully controlled. Contaminated areas (open excavations, contaminated stockpiles, screening operations, etc) will be considered exclusion zones and will be clearly designated with high visibility fencing and tape. Designated exclusion zone access/egress locations will be established along with personnel decontamination facilities.

### 8.12 Confirmation Sampling

Soil samples will be collected from the sidewalls of the excavation and field screened using a RaPID Assay for carcinogenic PAH compounds, and a photo ionization detector (PID) for volatile organics. Samples will be taken every 50 feet of sidewall length and will be collected at a depth of 1 to 2 feet below the ground surface. The excavation depth will generally be limited to 3 feet. A limited number of samples will be collected from the bottom of the excavation for documentation purposes, and as information for future site development decisions.

Laboratory confirmation samples will be collected every 200 feet of sidewall length at a depth of 1 to 2 feet below the ground surface. Laboratory samples will be submitted for analyses of volatile organics and semi-volatile organics by EPA Methods 8260 and 8270, respectively. Laboratory samples will be analyzed by Duke Power Company's Laboratory Services (South Carolina Certification 99005)

Laboratory confirmation samples will be taken of treated soil at the thermal treatment facility. Composite samples of treated soil will be collected no less frequently than 1

sample per every 1000 tons processed. Samples will be submitted for laboratory analyses of volatile organics and semi-volatile organics by EPA Methods 8260 and 8270, respectively.

## 9.0 WORK SCHEDULE

The schedule for implementation of the proposed scope of work is dependent on SCDHEC review and approval of the work plan. Upon approval, remedial activities are expected to take approximately 6 months to complete.

# TABLES

**Bramlette Road MGP Site**
**Soil Data Summary**
**Volatile Organics by EPA Method 8260**

Units in ppm
**Detects in bold text,** Non-detects in plain text at one-half the detection limit

| Sampling Location: | DP1A | DP9 | DP14 | DP16 | DP18 | DP21 | DP23 | DP26 | DP28 | DP29 | NB1 | NB8 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Depth [ft]: | 5-7 | ? | 0-3 | 0-3 | 4-6 | 3-6 | 6 | 0-1 | 0-1 | surface | 9-12 | ? |
| MTBE | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Isopropyl Ether | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzene | 0.60 | 0.0030 | 0.0035 | 0.0030 | 0.0030 | 0.0035 | 0.0035 | 0.0035 | **0.007** | 0.0040 | 0.0030 | **6.5** |
| Toluene | 0.60 | 0.0030 | 0.0035 | 0.0030 | 0.0030 | 0.0035 | 0.0035 | 0.0035 | 0.0035 | 0.0040 | 0.0030 | **17** |
| Ethylbenzene | 0.60 | 0.0030 | 0.0035 | 0.0030 | 0.0030 | 0.0035 | 0.0035 | 0.0035 | 0.0035 | 0.0040 | 0.0030 | **11** |
| m-p-Xylene | **1.3** | 0.0030 | 0.0035 | 0.0030 | 0.0030 | 0.0035 | 0.0035 | 0.0035 | 0.0035 | 0.0040 | 0.0030 | **22** |
| o-Xylene | 0.60 | 0.0030 | 0.0035 | 0.0030 | 0.0030 | 0.0035 | 0.0035 | 0.0035 | 0.0035 | 0.0040 | 0.0030 | **10** |
| **Total BTEX (detected):** | **1.3** | ND | ND | ND | ND | ND | ND | ND | **0.007** | ND | ND | **66.5** |
| **Other Compounds Detected:** | | | | | | | | | | | | |
| Naphthalene | **79** | **0.069** | 0.0035 | 0.0030 | 0.0030 | 0.0035 | 0.0035 | 0.0035 | **0.020** | **0.210** | 0.0030 | **990** |
| 1,2,4-Trimethylbenzene | 0.60 | 0.0030 | 0.0035 | 0.0030 | 0.0030 | 0.0035 | 0.0035 | 0.0035 | 0.0035 | 0.0040 | 0.0030 | **16** |
| 1,3,5-Trimethylbenzene | 0.60 | 0.0030 | 0.0035 | 0.0030 | 0.0030 | 0.0035 | 0.0035 | 0.0035 | 0.0035 | 0.0040 | 0.0030 | **5.4** |
| Styrene | 0.60 | 0.0030 | 0.0035 | 0.0030 | 0.0030 | 0.0035 | 0.0035 | 0.0035 | **0.034** | 0.0040 | 0.0030 | **4.1** |
| Trichloroethene | 0.60 | 0.0030 | 0.0035 | 0.0030 | 0.0030 | 0.0035 | 0.0035 | **0.094** | 0.0035 | 0.0040 | 0.0030 | 1.0 |

NA = Not Analyzed ? Sample depth not stated in Sep 1996 report
ND = Not Detected ^ Estimated depth
* Overall depth probe range at this location; actual sample depth not stated in report

**Table 1**

**Bramlette Road MGP Site**

**Soil Data Summary**

**Semi-Volatile Organics by EPA Method 8270**

Units in ppm

**Detects in bold text,** Non-detects in plain text at one-half the detection limit

| | Sampling Location: | DP1A | DP9 | DP14 | DP16 | DP18 | DP21 | DP23 | DP26 | DP28 | DP29 | NB1 | NB8 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Sample Depth [ft]: | 5-7 | ? | 0-3 | 0-3 | 4-6 | 3-6 | 6 | 0-1 | 0-1 | surface | 9-12 | ? |
| **PAH Compounds:** | | | | | | | | | | | | | |
| Non-Carcinogenic PAHs | Naphthalene | **48** | 3.35 | 0.22 | 0.205 | 0.20 | 0.225 | 0.165 | 0.165 | 0.165 | 16.5 | 0.195 | **5,800** |
| | Acenaphthylene | 2.0 | **7.9** | 0.22 | 0.205 | 0.20 | 0.225 | 0.165 | 0.165 | 0.165 | 16.5 | 0.195 | 330 |
| | Acenaphthene | **20** | 3.35 | 0.22 | 0.205 | 0.20 | 0.225 | 0.165 | 0.165 | 0.165 | 16.5 | 0.195 | **600** |
| | Fluorene | **17** | 3.35 | 0.22 | 0.205 | 0.20 | 0.225 | 0.165 | 0.165 | 0.165 | 16.5 | 0.195 | **1,700** |
| | Phenanthrene | **44** | **15** | 0.22 | 0.205 | 0.20 | 0.225 | 0.165 | 0.165 | 0.165 | 16.5 | **1.8** | **3,800** |
| | Anthracene | **15** | 3.35 | 0.22 | 0.205 | 0.20 | 0.225 | 0.165 | 0.165 | 0.165 | 16.5 | 0.195 | **1,400** |
| | Fluoranthene | **32** | **22** | 0.22 | 0.205 | 0.20 | 0.225 | 0.165 | 0.165 | 0.165 | 16.5 | **2** | **2,000** |
| | Pyrene | **30** | **19** | 0.22 | 0.205 | 0.20 | 0.225 | 0.165 | 0.165 | 0.165 | 16.5 | **1.7** | **2,600** |
| | Benzo(g,h,I)perylene | **7.5** | **15** | 0.22 | 0.205 | 0.20 | 0.225 | 0.165 | 0.165 | 0.165 | 16.5 | **0.49** | 380 |
| Carcinogenic PAHs | Benzo(a)anthracene | **14** | **12** | 0.22 | 0.205 | 0.20 | 0.225 | 0.165 | 0.165 | 0.165 | 16.5 | **0.78** | **1,000** |
| | Chrysene | **13** | **14** | 0.22 | 0.205 | 0.20 | 0.225 | 0.165 | 0.165 | 0.165 | **53** | **0.89** | **980** |
| | Benzo(b)fluoranthene | **9.1** | **14** | 0.22 | 0.205 | 0.20 | 0.225 | 0.165 | 0.165 | 0.165 | **62** | **0.67** | **460** |
| | Benzo(k)fluoranthene | **9.6** | **17** | 0.22 | 0.205 | 0.20 | 0.225 | 0.165 | 0.165 | 0.165 | **72** | **0.63** | **700** |
| | Benzo(a)pyrene | **12** | **20** | 0.22 | 0.205 | 0.20 | 0.225 | 0.165 | 0.165 | 0.165 | 16.5 | **0.60** | **780** |
| | Indeno(1,2,3-c,d)pyrene | **6.7** | **15** | 0.22 | 0.205 | 0.20 | 0.225 | 0.165 | 0.165 | 0.165 | 16.5 | **0.46** | **340** |
| | Dibenzo(a,h)anthracene | 2.0 | 3.35 | 0.22 | 0.205 | 0.20 | 0.225 | 0.165 | 0.165 | 0.165 | 16.5 | 0.195 | 330 |
| | **Total Carcinogenic PAHs:** | **66.4** | **95.4** | 1.54 | 1.44 | 1.40 | 1.58 | 1.16 | 1.16 | 1.16 | **253.0** | **4.23** | **4,590** |
| | **Total PAHs:** | **281.9** | **187.7** | 3.52 | 3.3 | 3.2 | 3.6 | 2.6 | 2.6 | 2.6 | **401.5** | **11.19** | **23,200** |
| **Other Compounds Detected:** | | | | | | | | | | | | | |
| | 2-Methylnaphthalene | **13** | 3.350 | 0.220 | 0.205 | 0.20 | 0.225 | 0.165 | 0.165 | 0.165 | 16.5 | 0.195 | 380 |
| | Dibenzofuran | **15** | 3.350 | 0.220 | 0.205 | 0.20 | 0.225 | 0.165 | 0.165 | 0.165 | 16.5 | 0.195 | 380 |

? Sample depth not stated in Sep 1996 report

* Overall depth probe range at this location; actual sample depth not stated report

^ Estimated depth

**Table 2**

## Bramlette Road MGP Site

## Groundwater Level Summary
## June 15-17, 1999

| Well ID | Top Casing Elev [ft] | Depth To Free Product [ft] | Depth to Groundwater From Top of Casing [ft] | Depth to Groundwater From Ground Surface [ft] | Adjusted Groundwater Elevation [ft] |
|---|---|---|---|---|---|
| **MGP Site Wells:** | | | | | |
| MW-7 | 935.74 | NA | 5.06 | 2.77 | 930.68 |
| MW-8 | 935.99 | NA | 5.48 | 3.19 | 930.51 |
| MW-9 | 936.03 | NA | 5.36 | 3.07 | 930.67 |
| MW-10 | 943.39 | NA | 7.37 | 5.08 | 936.02 |
| MW-11 | 941.81 | NA | 6.50 | 4.21 | 935.31 |
| MW-12 | 941.89 | NA | 6.65 | 4.36 | 935.24 |
| MW-13 | 940.48 | NA | 6.38 | 4.09 | 934.10 |
| MW-14 | 940.18 | NA | 6.30 | 4.01 | 933.88 |
| MW-15 | 939.07 | NA | 10.28 | 7.99 | 928.79 |
| MW-16 | 938.75 | NA | 10.30 | 8.01 | 928.45 |
| MW-17 | 935.22 | NA | 5.03 | 2.74 | 930.19 |

Water levels and well depths are referenced to top of PVC casing.

**Bramlette Road MGP Site**
**Groundwater Data Summary - June 15-17, 1999**
**Volatile Organics by EPA Method 8260**

Units in ppb
**Detects in bold text,** Non-detects in plain text at one-half the detection limit

| Monitoring Wells: | *MCL* | MW7 | MW8 | MW9 | MW10 | MW11 | MW12 | MW13 | MW14 | MW15 | MW16 | MW17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MTBE | | 15 | 15 | 7.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 75 |
| Isopropyl Ether | | 15 | 15 | 7.5 | 1.5 | 1.5 | 1.5 | **29** | 1.5 | 1.5 | 1.5 | 75 |
| Benzene | *5* | **570** | **340** | 7.5 | 1.5 | 1.5 | 1.5 | **6** | 1.5 | 1.5 | 1.5 | **120** |
| Toluene | *1,000* | 15 | 15 | 7.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | **360** |
| Ethylbenzene | *700* | **350** | **140** | 7.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | **150** |
| m-p-Xylene | *10000** | **170** | **75** | 15 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | **400** |
| o-Xylene | | **140** | **40** | 7.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | **180** |
| **Total BTEX (detected):** | | **1,230** | **595** | ND | ND | ND | ND | **6** | ND | ND | ND | **1,210** |
| **Other Compounds Detected:** | | | | | | | | | | | | |
| Naphthalene | | **1,400** | **1,400** | **120** | | | | | | **5.9** | | **6,400** |
| 1,2,4-Trimethylbenzene | | **57** | **24** | | | | | | | | | |
| cis-1,2-Dichloroethene | | | | | | | | | **15** | | | |
| Bromochloromethane | | | | | | | | | | | | |
| 1,2 Dichloroethane | *5* | | | | | | | **3.7** | | | | |
| Chloroform | | | | | | | | | **3** | | | |
| Trichloroethene | | | | | | | | | **100** | | | |
| Tetrachloroethene | | | | | | | | | **2.3** | | | |
| **TICs:** | | | | | | | | | | | | |
| indane | | 860 | 410 | | | | | | | | | |
| indene | | 53 | | | | | | | | | | 920 |
| methyl indane | | | | | | | | | | | | |
| methyl naphthalene | | 51 | | | | | | | | | | |
| benzothiophene | | | | | | | | | | | | |
| dimethyl naphthalene | | | | | | | | | | | | |

* Total Xylenes ND = Not Detected

**Table 4**