CSX/VAUGHN LANDFILL AND
BRAMLETTE ROAD, MGP SITE
PHASE III WORKPLAN

MARCH 21, 1997

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1.0 INTRODUCTION

This workplan describes the various field and laboratory tasks to be included in the Phase III site investigation of the former Bramlette Rd. Manufactured Gas Plant and Vaughn Landfill sites in Greenville, South Carolina.

1.1 Site Description and History

The Bramlette Road Manufactured Gas Plant (MGP) site is located in the north-west quadrant of the Bramlette Road and West Washington Street intersection in the City View section of Greenville, SC. The Vaughn Landfill site is located approximately 800 feet west of the intersection and south of Bramlette Rd. (Figures 1 and 2).

Both sites are owned by CSX Transportation (CSXT) and are part of more extensive CSXT holdings in the vicinity of Bramlette Rd. and east of the railway right-of-way, totaling approximately 40 acres. The MGP site covers an area of 3.69 acres and the landfill covers an area of approximately seven acres.

The MGP site was developed by Southern Public Utilities in 1917. The plant site plan is shown in Figure 3. Plant ownership and operation transferred to Duke Power Company (DPC) in 1935. Piedmont Natural Gas Company purchased the site in 1951 and demolished the gas plant in the late 1950's. The property was sold to Piedmont and Northern Railway in 1963 which became part of the Seaboard Cost Line (CSX) in 1967.

The site was used as a trucking facility during the 1970's and 1980's. The property is currently vacant. Access is restricted with a fence.

The Vaughn Landfill site was developed as an unpermitted demolition landfill in 1988. The depth of debris varies from eight to 14 feet. It is located in the flood plain of the Reedy River. The flood plain has been classified as a wetland by the Army Corps of Engineers (ACE).

1.2 Previous Investigations

A phase I investigation was completed by Applied Engineering and Science Inc. (AES) in early 1995. The investigation included 34 soil borings and seven groundwater samples in the landfill and seven soil borings and four surface water samples from the floodplain immediately adjacent to the landfill. Analytical results indicated impact to soil and water by volatile and semi-volatile organic compounds and metals. Results of the investigation are presented in an AES report dated March 1995 and titled "Site Investigation; Soil, Sediment, and Groundwater Sampling; Vaughn Landfill, CSX Real Property."

A phase II investigation was completed by AES in 1996. It included a biological survey in the landfill/wetlands area, the installation of eight monitoring wells to assess groundwater quality, an assessment of the extent of the coal tar in the soil and groundwater in both the landfill area and the former MGP site and a site characterization and a contaminant pathway evaluation. The investigation results are presented in an AES report dated September 1996 entitled "Site Investigation Phase II Vaughn Landfill/Duke Power Sites CSXT Real Properties Bramlette Road Greenville, South Carolina."

1.3 Scope and Objectives

The South Carolina Department of Health and Environmental Control (SCDHEC) provided comments to the Phase II Assessment Report and suggestions for additional work in a letter dated December 6, 1996 from Tom Knight to Charles Bristow (Appendix I). Additional guidance was provided in a meeting with the SCDHEC, CSXT, AES, the ACE and DPC held December 18, 1996. The SCDHEC requests additional information on the following:

- Evaluate the potential impact to the fauna from the site contaminants.
- Determine the horizontal and vertical extent of the groundwater contaminant plume.
- Determine the extent of free product coal tar.
- Resample monitoring wells and surface water. Include analyses for Fe and Mn.

The basic objective of Phase III is to collect the data necessary to develop a corrective action plan.

2.0 FAUNAL STUDY

2.1 Background

The CSXT/Vaughn Landfill site was identified as containing approximately 40 acres of jurisdictional wetland by the ACE in 1994. Results of an investigation by AES indicates the site has been impacted by coal tar residues originating from the former DPC MGP. The site investigation included an evaluation of the effects of the coal tar residue on the

flora of the wetlands. This study was conducted by Environmental Corporation of America. SCDHEC has recommended that the Phase III investigation include a faunal survey of the impacted wetland and compare the results to a nearby wetland not impacted with coal tar residues. Discussions with the Army Corps of Engineers revealed that Chewacla soils (which are present at the CSX site) are not common in this area and finding a comparable control wetland with this soil type would be difficult or impossible. Because of this constraint, we propose to conduct an intensive faunal survey of the CSX site and compare our finding to those reported in the scientific literature.

2.2 Rational and Study Design

The site vegetation evaluation by Environmental Corporation of America indicated that most of the wetlands area had some standing water during their sampling work, with deeper water in drainage ditches located on the site. The standing water would leach any soluble coal tar constituents from the soil and also potentially receive coal tar constituents from the groundwater.

This proposed study will sample the fauna which comes in direct contact with the soil (amphibians), mud (amphibians, macrobenthos and some fish) and the water column (fish and zooplankton). Sampling animals from these habitats should represent the "worst case" scenarios, where exposure to coal tar residues would be the greatest.

Two locations are proposed to be sampled. One site will be adjacent to the CSXT/Vaughn Landfill in an area known to be impacted by coal tar residues, based on the investigations by AES and Environmental Corporation of America. The second site is a wetland area along the southern section of Ditch 5 near monitoring well MW5 south of the coal tar plume identified in the 1996 phase II report (Figure 3).

Sampling will consist of backpack shocking or seining for fish, dip netting for frogs and salamanders and net sampling for zooplankton. Aquatic insects will be sampled using qualitative techniques with comparable level of efforts expended at each sampling location. Sampling will be conducted along transects in the two areas. Water samples will be taken at the time of faunal sampling and analyzed for the parameters listed in Section 3.3.

3.0 SURFACE WATER SAMPLING

3.1 Previous Sampling and Results

Four surface water samples were collected for the Phase I study (Figure 4). Two samples (WE001 and WE002) from the wetlands east of the Vaughn Landfill and two samples (WW001 and WW002) from the wetlands west of the Vaughn Landfill. These samples were generally analyzed for total petroleum hydrocarbons (TPH), volatile organic compounds (VOC), semi-volatile organic compounds (S-VOC) and Metals. Results were below the detection limit for VOC and S-VOC. The metals Pb, Se and Ba were above the MCL for one or more of the samples. TPH was detected in three samples at concentrations of 4.5 to 40 ppm.

Four surface water samples were collected for the Phase II study (Figure 4). Two samples from the Reedy River (RR1 and RR2). Both samples were below the detection limit for VOC. Both samples contained low levels (<120 parts per billion (ppb)) of Di-N-Butylphthalate (DBP) and the upstream sample also contained 20 ppb Butylbenzylphthalate (BBP). Both compounds are not typically associated with MGP sites. One surface water sample (FD1) was collected from the end of Ditch 5 near where it discharges to the Reedy River. An additional sample (WD1) was collected from a small ditch draining Willard St. and discharging to Ditch 5. Both of these samples

contained low levels DBP and BBP. The Ditch 5 sample also contained nine ppb of Naphthalene.

3.2 Proposed Sample Locations

A total of nine surface water samples are proposed for this work plan (Figure 4). All surface water samples will be "grab" samples.

To determine if the Reedy River has been impacted by discharges from the MGP and Vaughn Landfill sites, two samples will be collected from the river at the locations sampled in the Phase II investigation. One sample will be collected where the river passes under Bramlette St. This sample will be considered as a background sample since surface and ground water flows from the MGP and Vaughn Landfill sites are believed to intersect the Reedy River downgradient from this location. A second Reedy River sample will be collected where the river passes under Willard St. This location is less than fifty yards downstream from where Ditch 5, which is the surface water outflow from the MGP and Vaughn sites, enters the Reedy River.

The end of Ditch 5 will be sampled at the location sampled in Phase II. An additional sample will be collected from Ditch 5 near the location of monitoring well MW-5 and the faunal study location.

Surface water samples will also be collected from Ditch 1 and Ditch 2 where each ditch passes under Bramlette Road. These samples will give an indication of the water quality for some of the water flowing into the wetlands area. It should be noted that additional surface water enters the wetlands area from the railroad right-of-way east of the wetlands and from industrial and residential properties along Washington St. east of the wetlands. Samples are not planned for these areas.

One surface water sample will be collected from the wetlands area east of the Vaughn Landfill, near Ditch 4 and former surface water sample WE002, one sample will be collected from the wetlands area west of the landfill near monitoring well MW-6 and former surface water sample WW002. An additional surface water sample will be collected from the area selected for the faunal study near the landfill.

3.3 Sample Collection and Analysis

Surface water samples will be collected by Duke Power Company, Scientific Services. In-situ analysis of surface water samples will be conducted using a Hydrolab® Water Quality Analyzer. Parameters measured will include temperature, pH, Specific Conductance and dissolved oxygen

Surface water samples will be analyzed by Duke Power Company, Laboratory Services, Huntersville, NC, SCDHEC certification # 99005.

Surface water samples will be analyzed for VOC following EPA Method 601/602 and for S-VOC following EPA Method 625.

Surface water samples will also be analyzed for the following total dissolved metals following appropriate EPA Methodology: Barium, Calcium, Iron, Potassium, Magnesium, Manganese, Sodium Tin, Zinc, Cadmium, Chromium, Copper, Nickel, Lead, Arsenic, Selenium and Mercury. Samples will also be analyzed for Chloride, Ammonia, Acidity, Alkalinity, Cyanide, Sulfate, Oil and Grease, Total Suspended Solids Total Dissolved Solids and Total Organic Carbon.

4.0 GROUNDWATER INVESTIGATION

The proposed groundwater investigation is designed to determine the vertical and horizontal extent of the groundwater contaminant plume and to determine the extent of free product coal tar.

4.1 Previous Investigations

Seven groundwater samples were collected for the Phase I investigation. All samples were collected from the Vaughn Landfill using either pits or temporary boreholes. Samples were analyzed for VOC, S-VOC, PCB and metals. Three sample locations (LF23A, LF25A and LF27A) detected VOC above state standards and two sample locations (LF23A and LF27A) detected S-VOC above recommended levels.

Seven shallow groundwater monitoring wells and one deep groundwater monitoring well were constructed for the Phase II investigation (Figure 5). One well (MW7) was located on the former MGP site. Four wells were located on the Vaughn Landfill, including one deep well. One well was located upgradient and east of the landfill and two wells were located west of the landfill between the Reedy River and the landfill. The wells were checked for free product and analyzed for VOC and S-VOC.

The deep monitoring well (MW3D) contained approximately three inches of free product tar. Three wells, one shallow (MW3) and the deep well on the landfill and the well at the MGP site, exceeded MCLs for VOC and five wells (all of the wells on the landfill and the well on the MGP site) exceeded the recommended concentrations for S-VOC.

4.2 Monitoring Well Locations

4.2.1 MGP Site

One shallow monitoring well currently exists at the MGP site. Sample analytical results exceeded state standards for VOC and recommended levels for S-VOC in that well. To determine the horizontal extent of contamination at the MGP site five new shallow monitoring wells are proposed (Figure 5). These wells are generally placed in each corner of the site plus one in the middle of the site near an area of heavily stained soil between the former retort house and purifier boxes. Existing monitoring well MW7 was placed near the former tar separators, the area most likely to have the highest contaminant concentrations and the potential for free product. The shallow monitoring wells will be screened to intersect the water table. See Section 4.3 for well construction details.

To determine if a dense non-aqueous phase liquid (DNAPL), which is the expected form of free product coal tar, exists at the MGP site, mid depth wells will be nested with each of the proposed shallow monitoring wells and the existing shallow well MW7. The mid depth wells will terminate at the stiff saprolite confining layer identified in MW3D or at the first significant confining layer. This is the location free product tar would be expected to accumulate. An additional deep well will be installed near MW7 which will terminate at the top of bedrock. This well will be used to determine if any DNAPL has migrated past the saprolite to the top of bedrock. This well will also help determine the vertical extent of contamination. See Section 4.3 for deep well construction details.

4.2.2 CSX/Vaughn Landfill Site

To further define the horizontal extent of dissolved contaminants at the water table three new shallow wells are proposed (Figure 5). There is potential that contaminants have migrated in a narrow band along Ditch 5. To help define the southern boundary of the

If the depth difference between the water table and the confining layer where the mid depth well would terminate is less than 13 feet, only one well will be installed at that location. The one well will be a combined well, instead of the proposed shallow and mid depth monitoring wells. The screened interval for the combined well will be from the top of saprolite to the water table.

4.3 Well Construction

Monitoring wells will be constructed by a SCDHEC certified driller, Duke Power Company, Geotechnical Center, Seneca, SC.

Shallow monitoring wells will be constructed by boring with a hollow stem auger to a depth of approximately nine feet below the water table. A 10 foot long, two inch diameter PVC screen will be set to intersect the water table (Figure 6).

The mid depth wells will be constructed the same as the shallow wells except the boring will terminate at the top of the stiff saprolite and a five foot screen will be set at the bottom of the well (Figure 7). The combined well will be constructed similar to the mid depth well except a 15 foot screen will be used and will extend from the bottom of the well to the water table.

The deep wells will be constructed by boring with a hollow stem auger to the top of the confining layer. A PVC outer casing will be set and grouted in place. The boring will then continue through the outer casing to auger refusal. A five foot screen will be set at the bottom of the boring (Figure 8).

Based on the free product assessment in the new wells, additional wells may be required to more closely define the extent of free product in the vicinity of MW3D or other monitoring wells.

4.4 Groundwater Sampling and Analysis

Groundwater samples will be collected using generally accepted groundwater sampling procedures (Appendix II) by Duke Power Company, Scientific Services. In-situ analysis will include pH, Specific Conductance, Temperature, Dissolved Oxygen and Redox Potential.

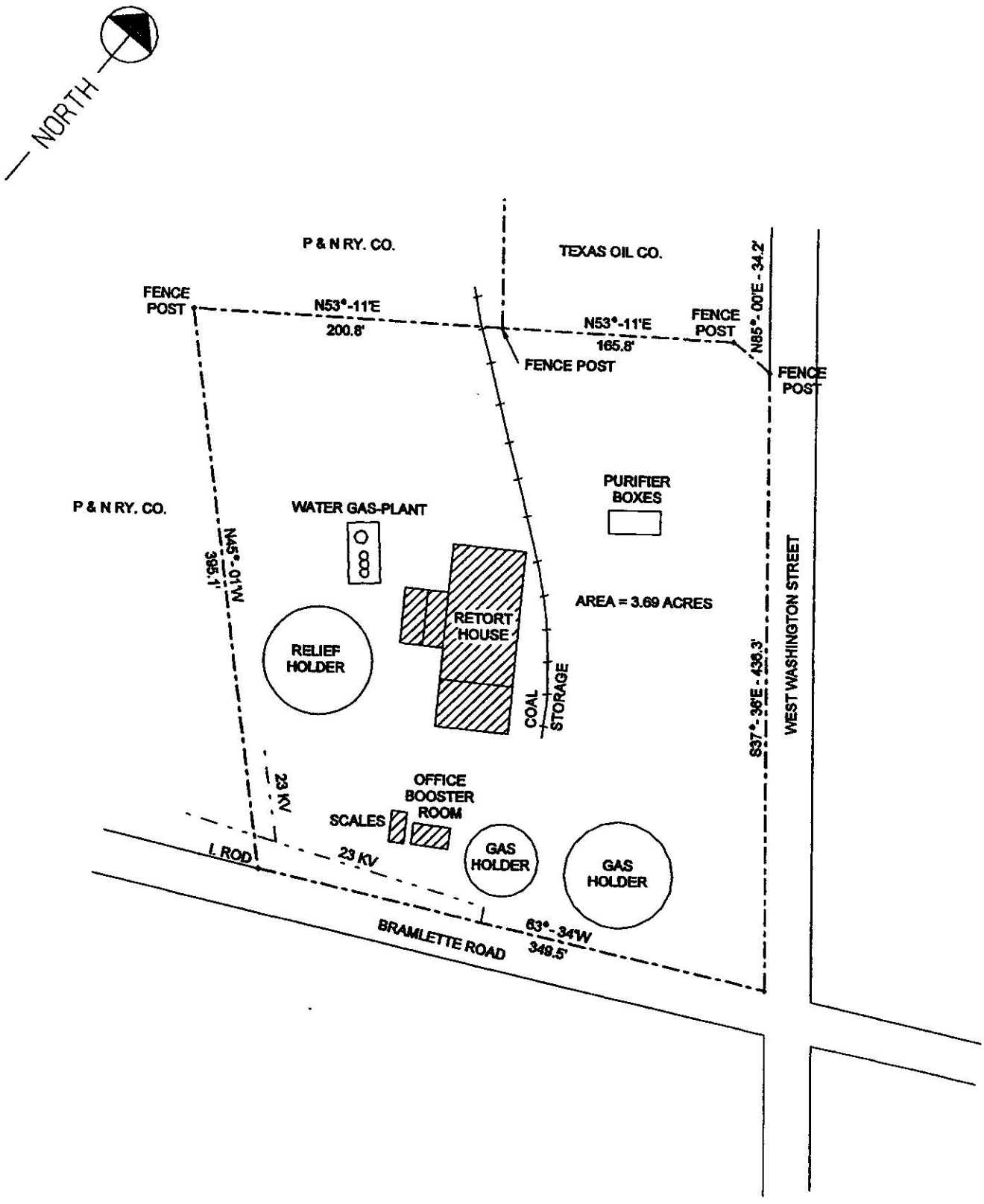
Groundwater samples will be analyzed by Duke Power Company, Laboratory Services, Huntersville, NC, SCDHEC certification # 99005.

Samples will be analyzed for VOC following EPA Method 601/602 and for S-VOC following EPA Method 625. Samples will also be analyzed for the following total dissolved metals following appropriate EPA Methodology: Barium, Calcium, Iron, Potassium, Magnesium, Manganese, Sodium Tin, Zinc, Cadmium, Chromium, Copper, Nickel, Lead, Arsenic, Selenium and Mercury. Samples will also be analyzed for Chloride, Ammonia, Acidity, Alkalinity, Sulfate, Total Dissolved Solids and Total Organic Carbon.

5.0 SOIL SAMPLING

Soil samples will be collected from the auger borings for all new mid depth, combined and deep monitoring wells. Samples will be collected at continuous depths using a split-barrel sample spoon. Soil samples will be classified in the field using the Unified Soil Classification System, and verified by a S.C. registered geologist.

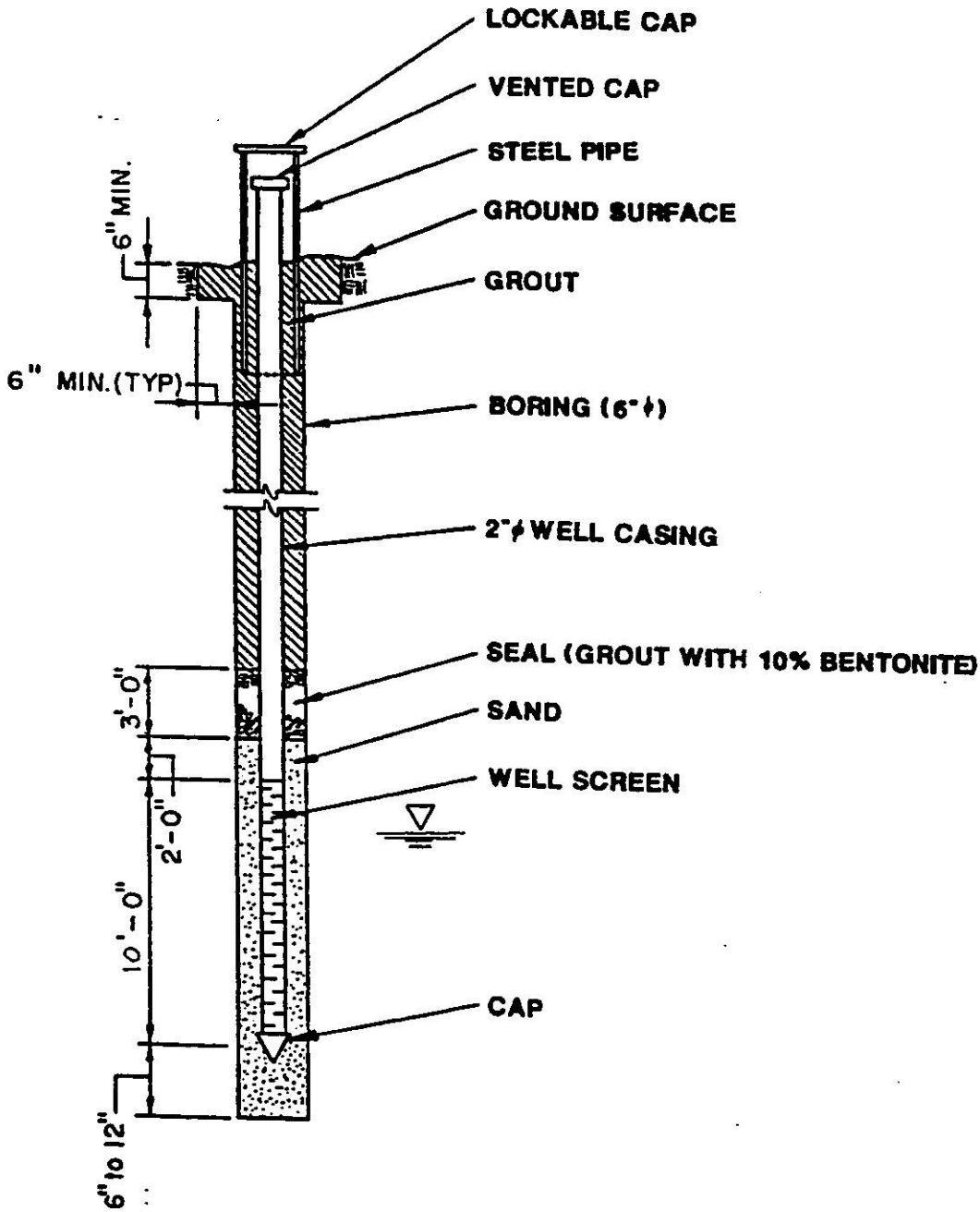
Based on field inspection approximately three samples from each boring will be selected for field screening. One sample per boring will be selected for laboratory analysis for VOC, S-VOC, cyanide and metals.



DUKE POWER COMPANY

HISTORIC SITE PLAN
BRAMLETTE ST. MGP
GREENVILLE, S.C.

FIGURE 2

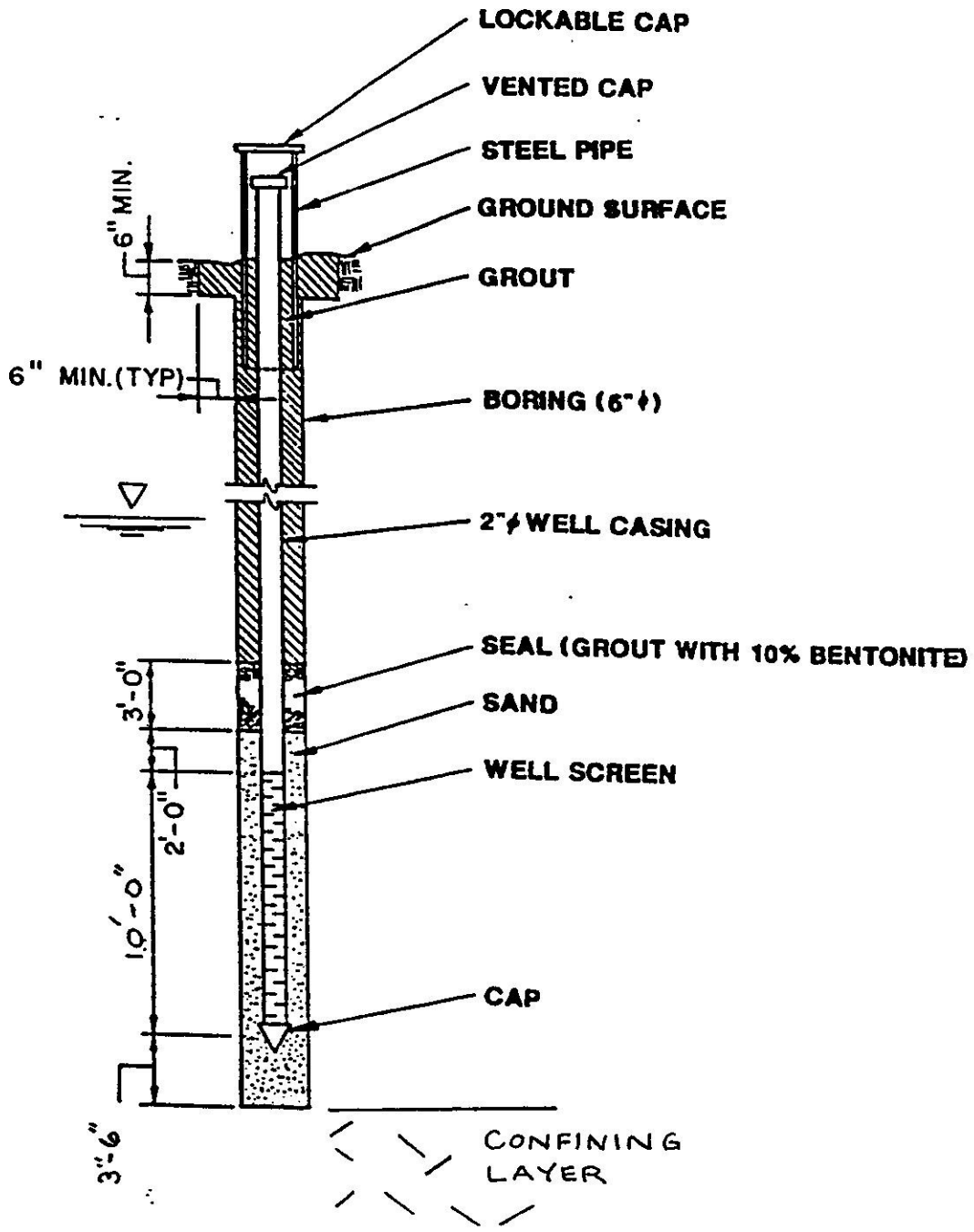


NOTES: 1.ALL DIMENSIONS ARE APPROXIMATE.
2.ALL CASING MATERIAL SHALL BE Sch 40 PVC.
3.WELL SCREEN MATERIAL SHALL BE Sch 40 PVC.

FIGURE 6

DUKE POWER CO.

SHALLOW WELL CONSTRUCTION DETAILS

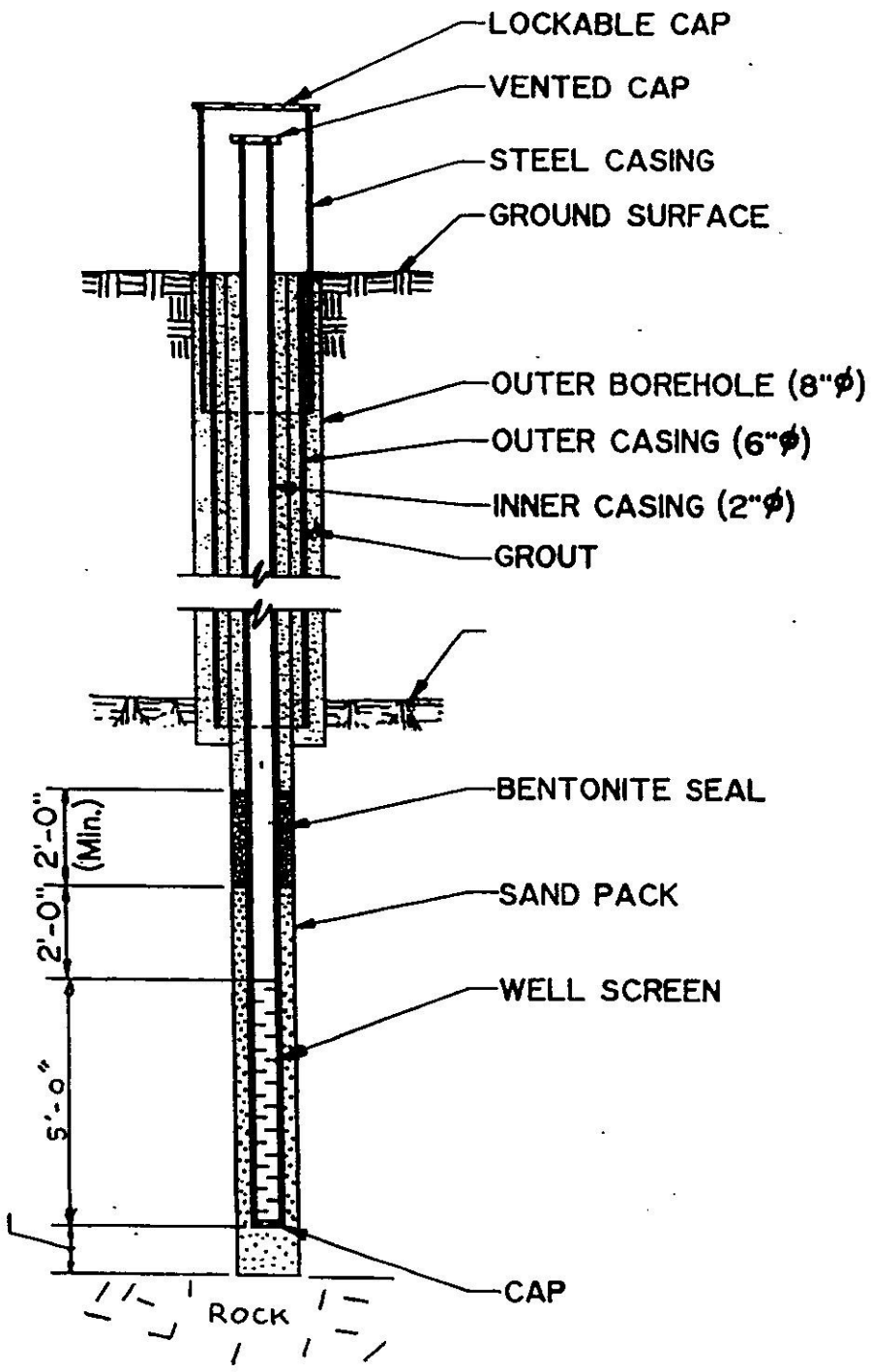


NOTES: 1.ALL DIMENSIONS ARE APPROXIMATE.
2.ALL CASING MATERIAL SHALL BE Sch 40 PVC.
3.WELL SCREEN MATERIAL SHALL BE Sch 40 PVC.

FIGURE 7

DUKE POWER CO.

MID DEPTH WELL
CONSTRUCTION DETAILS



NOTES:

1. ALL CASING JOINTS HAVE SCREW CONNECTORS.
2. ALL CASING MATERIAL SHALL BE Sch 40 PVC.
3. WELL SCREEN MATERIAL SHALL BE Sch 40 PVC.

FIGURE 8

DUKE POWER CO.

DEEP WELL CONSTRUCTION DETAILS

APPENDIX I

SCDHEC LETTER

Charles Cabrera

S17-W

D H E C

PROMOTE PROTECT PROSPER

South Carolina Department of Health and Environmental Control

M E M O R A N D U M

To: Charles Bristow, Hydrogeologist
Appalachia II District EQC

From: Tom Knight, PG, Manager
Geohydrologic Section
Water Monitoring, Assessment and Protection Division

Date: December 6, 1996

RECEIVED
DEC 11 1996
EQC GREENVILLE

Re: CSX Transportation-Bramlette Road Site
Assessment Report (9/3/96)
Greenville County

I have reviewed the referenced report and offer the following comments:

- The recommendations are acceptable and should be implemented.

- A meeting should be scheduled to discuss the next phase of investigation with both Duke Power and CSX if both parties are agreeable.

- I agree that the current status of the water supply well at the former Coal Gasification plant should be determined soon.

- The free phase coal tar (DNAPL) at well MW-3B is noted. Some process to remove the product as it collects in this well should be devised.

- The vertical extent of the contaminant plume needs to be determined. The product at MW-3B is at a location distal to the gasification plant. Areas where the coal tar may have settled should be evaluated.

- It is not anticipated that the saprolite is impermeable at the site. The DNAPL at well MW-3B is probably moving along the interface between alluvial sediments and saprolite due to a permeability difference at that location. The top of bedrock and the transition zone also should be investigated.

- I recommend that the next sampling event include the parameters dissolved iron and manganese. Apparently strong reducing conditions or direct reduction of the metals are being developed by the degradation of the hydrocarbons (I noticed heavy iron bacteria throughout the wetlands area). Potential toxic effects of these metals on aquatic toxicity should be evaluated.

- Free product should be remediated as this will remain an ongoing source for dissolved constituents in groundwater.

- Prioritization of activities should include an evaluation of the relative risks from the various exposure pathways with the most likely pathways to be targeted for corrective action to remove the risk first. Additional considerations include long term impact to the environment and to groundwater quality, plus the discharges to the Reedy River, the stream and the wetlands.

- Corrective action will be necessary at this site due to ongoing discharges to the wetlands, DNAPL present in the groundwater, and concentrations of contaminants including known and/or probable human carcinogens in surficial soils.

- Although the plant survey is helpful in establishing the potential impact to the plant community, the potential impact upon the fauna needs to be evaluated as well (especially aquatic toxicity effects- hydrocarbons have been noticed in the stream in various places to its confluence with the Reedy River).

- The source of the sulfate in well MW-3 should be evaluated as this concentration is above the proposed MCL for this compound.

- Please note that the maximum concentration allowable in groundwater for the 15 National Toxicity Program designated polynuclear aromatic hydrocarbons (PAH, i.e. probable human carcinogens) is 2 ug/l (list attached). Non-differentiated PAH maximum concentrations are established at 2 ug/l and all other PAH maximum allowable concentrations in groundwater are established at 25 ug/l. These levels are based upon available data for the protection of human health as advised by the Department's toxicologist, Dr. John Brown.

- Please include field specific conductance and field pH data in the data summary table in future reports.

- Several compounds are present in the groundwater above or near 10 percent of their respective solubility limits in wells MW-1, 3, 6, 7, and in boring LF-023A. This strongly suggests that free phase coal tar is present in the immediate vicinity of each of these locations.

If you have any questions, please contact me at (803) 734-5227.

TK

enc: Designated PAH's

cc: Doug Johns
Quinton Epps

DESIGNATED PAH's

Benz[a]anthracene
Benzo[b]fluoranthene
Benzo[j]fluoranthene
Benzo[k]fluoranthene
Benzo[a]pyrene
Dibenzo[a,h]acridine
Dibenzo[a,j]acridine
Dibenz[a,h]anthracene
Dibenzo[c,g]carbazole
Dibenzo[a,e]pyrene
Dibenzo[a,h]pyrene
Dibenzo[a,i]pyrene
Dibenzo[a,l]pyrene
Ideno[1,2,3-cd]pyrene
5-Methylchrysene

12/5/96

TK