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Aug. 27, 2020

Mr. Greg Cassidy South Carolina Department of Health and Environmental Control 2600 Bull Street Columbia, SC 29201

Subject: Remedial Investigation Work Plan Addendum – Former Storm Water

Conveyance Ditches

Former Bramlette Manufactured Gas Plant 400 East Bramlette Road, Greenville SC

VCC 16-5857-RP

Dear Mr. Cassidy:

Please find enclosed the referenced work plan for additional remedial investigation activities associated with the former storm water conveyance ditches. Pending receipt of wetland permits and access agreements, the work is planned to take place in October/November of this year.

If you have any questions, please contact me at (980) 373-2663 or at Richard.powell2@duke-energy.com.

Sincerely,

Richard E. Powell, P.G.

Richard C. Powell

Lead Environmental Specialist

cc: Kevin Boland, CSXT

Daniel Schmitt, Esq., CSXT



REMEDIAL INVESTIGATION WORK PLAN ADDENDUM – FORMER STORM WATER CONVEYANCE DITCHES

FORMER BRAMLETTE MGP SITE 400 EAST BRAMLETTE ROAD GREENVILLE, SOUTH CAROLINA VCC 16-5857-RP

AUGUST 2020

PREPARED FOR



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Duke Energy Carolinas, LLC - Former Bramlette MGP Site

SynTerra

LIST OF ACRONYMS

bls below land surface

CSXT CSXT Transportation, Inc.
CSM Conceptual Site Model
DPT direct push technology

Duke Energy Duke Energy Carolinas, LLC IDW investigation derived waste MGP manufactured gas plant NAPL non-aqueous phase liquid

PIANO paraffins, isoparaffin, aromatics, naphthenes, and olefins

PAH polycyclic aromatic hydrocarbons

PID photoionization

QAPP quality assurance project plan

RI remedial investigation

RIWP Remedial Investigation Work Plan

RIWP-A Remedial Investigation Work Plan Addendum

SCDHEC South Carolina Department of Health and Environmental Control

SESD Science and Ecosystem Support Division

Site Five parcels [Parcel 1 location of former MGP), Parcel 2, Parcel 3,

Parcel 4, and Parcel 5] owned by CSXT Transportation, Inc.

SOP standard operating procedure VOC semi-volatile organic compounds

USEPA U.S. Environmental Protection Agency

VCC Voluntary Cleanup Contract VOC volatile organic compounds

1.0 INTRODUCTION

Duke Energy Carolinas LLC (Duke Energy) is conducting a remedial investigation (RI) at the site of the former Bramlette manufactured gas plant (MGP) (400 East Bramlette Road, Greenville, South Carolina) (**Figure 1-1**). The RI is being conducted under a Responsible Party Voluntary Cleanup Contract (VCC 16-5857-RP) with the South Carolina Department of Health and Environmental Control (SCDHEC) dated July 29, 2016. RI activities to delineate the source, nature, and extent of affected environmental media resulting from past operation of the MGP began in 2017. Results of the investigation through April 2020 were summarized in the RI Report, which was submitted to the SCDHEC on June 26, 2020.

The RI Report indicated additional data is needed to determine the extent of impacts remaining in sediment and soil associated with historical drainage ditches present during the time of MGP operations. Several constituents also were identified with maximum concentrations greater than ecological screening criteria. This RI Work Plan Addendum (RIWP-A) for the Former Storm Water Conveyance Ditches proposes activities to complete assessment of MGP-related constituents in the historical ditches.

1.1 Objectives

Based on a review of historical aerial photography, a network of ditches was present on the Site during the time of MGP operations. The ditches appear to have been associated with plant operations. Observed non-aqueous phase liquid (NAPL) consistent with the location of these ditches indicates a likely migration pathway for overland flow resulting from MGP operations.

This RIWP-A for the Former Storm Water Conveyance Ditches describes activities and procedures to collect additional data and achieve the following objectives:

- Define the horizontal and vertical extent of NAPL in sediment and underlying soil within historical Site ditches.
- Determine the concentration and distribution volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs) present within sediments in historical Site ditches.
- Conduct testing to determine probable risk from exposure to polycyclic aromatic hydrocarbons (PAH)s for ecological receptors within the historical ditch on Parcels 3, 4, and 5.

1.2 Site Setting and Description

The Site is comprised of five parcels that cover approximately 30 acres. The Site is bounded by the CSX Transportation, Inc. (CSXT) railroad corridor to the north, west, and south, and by West Washington Street, the Legacy Charter Elementary School (Legacy Elementary), and the City of Greenville Sanitation Department to the east. The Reedy River and Swamp Rabbit Trail define the western boundary of the Site. The following table summarizes each parcel.

Tax Map Serial Number	Parcel ID (Zoning Classification)	Land Use
0140000300300	Parcel 1 (I-1)	Vacant lot and location of former MGP operations
0140000300200	Parcel 2 (I-1)	Active rail operations and location of a former asphalt manufacturing plant (operational in 2003, www.gcgis.org aerial photograph) and debris pile
0138000100100	Parcel 3 (I-1)	Active rail operations and location of CSX field office, unpermitted Vaughn Landfill, and numerous sewer lines and access manways
0054000300100	Parcel 4 (R-6)	Jurisdictional wetland, and therefore, not suitable for development; vacant lot
0054000600100	Parcel 5 (S-1)	Jurisdictional wetland; vacant lot

A detailed summary of Site background information including setting and description, MGP operational history, receptors, and previous assessment activities is presented in the RI Report.

1.3 Former Storm Water Conveyance Description

Historical aerial imagery was reviewed to determine the presence of historical storm water conveyance ditches during MGP operations (Appendix B, RI Report). The network of historical ditches was present in 1943 (the earliest imagery available) and are shown on **Figure 1-2**. The 1943 image shows that runoff from the MGP Parcel (Parcel 1) was connected to the primary ditch that transects Parcels 2 through 5 by pipelines and trenches (**Figure 1-3**). Except for Ditch 1 (**Figure 1-2**) historical drainage patterns remain unchanged from their original configuration.

The configuration of the historical ditch network, and observation of NAPL consistent with the location of the ditches, indicate that the ditches were a likely migration pathway for process water and coal tar residuals. The conceptual site model (CSM) presented in Section 8.2 of the RI Report concludes that NAPL accumulated in the ditches and low energy zones, such as the wetlands, and migrated vertically through

the unsaturated zone to the water table. Once enough accumulated, NAPL continued to migrate vertically through the water column until a less permeable matrix was encountered (saprolite and bedrock).

Five ditch segments have been identified for additional assessment and are described below:

- Ditch 1 originates on Parcel 1 near the coal pile for the MGP. The ditch flowed to the west and then south a distance of approximately 984 feet. The ditch discharged to a larger ditch flowing southeast at Bramlette Road. This ditch is no longer apparent and does not convey surface water flow.
- Ditch 2 is located on Parcel 1 and Parcel 2 and originates at a culvert from West Washington Street. The ditch flows approximately 763 feet through Parcel 1 to the southwest and parallels Bramlette Road before entering a culvert that conveys flow to the southeast toward Parcel 3. This ditch conveys wet weather storm water flow.
- Ditch 3 is associated with the wetlands area between the Vaughn Landfill and Legacy Charter Elementary School. The northern portion of Ditch 3 was previously assessed. Surface water flow from the wetlands enters a culvert and flows southwest through an incised ditch that bisects the Vaugh Landfill. The approximate length of ditch planned for assessment is 139 feet. The southern portion of the wetlands is routinely inundated. Depth of water present can range from approximately 1 foot to 3 feet.
- Ditch 4 transects Parcel 3, Parcel 4, and Parcel 5. The portion of Ditch 4 planned for assessment begins at the south end of the Vaughn Landfill and flows approximately 1,637 feet prior to discharging into the Reedy River. This ditch conveys storm water drainage and during dry periods continues to flow with drainage from wetlands areas on Parcel 3.
- Ditch 5 conveys storm water flow from West Washington Street along Willard Street. The ditch segment to be assessed begins at Cagle Street and flows southwest 469 feet where it discharges to Ditch 4 described above. This ditch conveys wet weather storm water flow.

2.0 PROPOSED ASSESSMENT METHODS

Investigation procedures, document management, sample nomenclature, and data quality will be conducted in accordance with the Quality Assurance Project Plan (QAPP, SynTerra 2018). Proposed assessment activities (in order of implementation) are depicted on **Figure 1-2** and include:

- Parcel 1 and Parcel 2 soil borings
- Parcel 3, Parcel 4, and Parcel 5 soil borings
- Willard Street soil borings

2.1 Pre-Construction Wetland Evaluation and Permitting

Proposed assessment activities in Parcels 3, 4 and 5 and Willard Street include work in a federally classified wetland. Nationwide Permit 38 has been determined to be the appropriate permit for work within wetlands at the Bramlette Road MGP. Proposed ditch assessment activities that are planned within a jurisdictional wetland will be implemented after receiving permit approval.

2.2 Sampling Methodology

An objective of this assessment, and the overall RI, is to determine the presence and delineate the extent of NAPL, if encountered. As such, additional soil borings along the centerline of historical drainage ditches at Parcels 1, 2, 3, 4, and 5 are proposed (**Figure 1-2**). Soil borings will be spaced approximately 100 feet apart and advanced using direct push technology (DPT) drilling methods. Where proposed borings are submerged, a temporary PVC surface casing may be used to maintain borehole integrity during drilling and abandonment.

Borings will be advanced from land surface to a minimum of 2 feet into the underlying saprolite. The sediment/soil cores will be visually inspected and logged for lithology and presence/absence of NAPL from MGP operations. Field screening will include headspace measurements using a photoionization detector (PID) in accordance with procedures described in Section 3.2 of the QAPP. Field screening results will be used to select portions of core to be retained for laboratory analysis, as described in Section 3.2 below. Additional delineation borings may be necessary to define the lateral extent of visually observed NAPL, if encountered. Existing ditch edges, as identified by the ordinary high water mark, will be targeted in the direction perpendicular to surface water flow. Where historical ditches are no longer evident additional delineation borings will be a located a minimum of 10 feet from the primary boring in the direction

perpendicular to historical surface water flow. Additional delineation borings in the upstream and downstream direction of existing and historical ditches will be located a minimum of 10 feet from the primary boring.

Borings will be abandoned upon completion to terminal depth in accordance with SCDHEC well installation standards, R. 61-71. Boring locations are shown on **Figure 1-2**. A summary of proposed assessment activities is provided in the table below.

Ditch ID	Proposed Assessment Activity	
Ditch 1	11 borings – DA1-SB-01 through DA1-SB-11	
	Depth - 22 feet below land surface (bls) to 35 feet bls (2 feet into saprolite)	
	Samples – 11 (additional samples may be collected based on field observations).	
Ditch 2	9 borings – DA2-SB-11 through DA2-SB-20	
	22 feet bls (2 feet into saprolite)	
	Samples – 9 (additional samples may be collected based on field observations).	
Ditch 3	3 borings – DA3-SB-21 through DA3-SB-23	
	17 feet bls (2 feet into saprolite)	
	Samples – 3 (additional samples may be collected based on field observations).	
Ditch 4	15 borings – DA4-SB-24 through DA4-SB-38	
	12 feet bls (2 feet into saprolite)	
	Samples – 15 (additional samples may be collected based on field observations).	
Ditch 5	7 borings – DA5-SB-39 through DA5-SB-45	
	12 feet bls (2 feet into saprolite)	
	Samples – 7 (additional samples may be collected based on field observations).	

2.3 Sediment Sampling

Cores will be collected using direct push technology. After collection, the core intervals containing sediment will be maintained in an upright position to the extent practicable. Any superficial water collected during the coring will be drained from the sampling device (e.g., if using a hard liner, by drilling a small hole a few inches above the sediment surface and allowing the water to drain). The core will be sub-sectioned using a handheld saw or similar device. Care will be taken to prevent material from flowing out of the hard liner during sectioning. Core sections will be emptied into stainless-steel bowls for homogenization.

Sediment samples will be collected from soil boring cores to assess current sediment quality beneath the historical drainage ditches. Samples will be collected in general accordance with U.S. Environmental Protection Agency (USEPA) Science and Ecosystem Support Division (SESD) Operating Procedure SESDPROC-200-R3 (August 21, 2014) and SynTerra's sediment sampling standard operating procedures (SOPs) employed by SynTerra (QAPP Appendix B, SynTerra 2018). Field screening results will be used to select the sample interval from each boring that represents the greatest potential COI concentrations.

Any foreign materials present (*e.g.*, gravel, vegetation) in the sediment will be removed when filling sample bottles. The sediment samples will be placed in ice-filled coolers and managed under chain-of-custody protocols for submittal to the appropriate laboratory

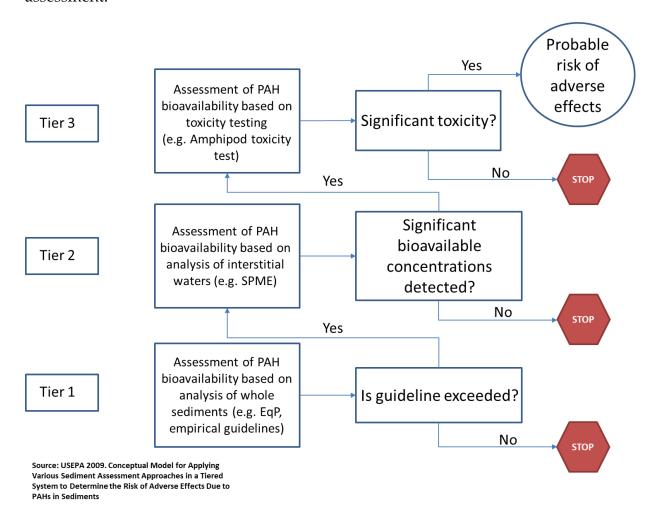
2.4 Sediment Analysis

All sediment samples collected will be analyzed for VOCs and SVOCs. Based on visual observations, field screening results, and boring location, select samples may be analyzed for additional constituents including Paraffins, isoparaffin, aromatics, naphthenes, and olefins (PIANO), alkylated PAHs, and saturated hydrocarbons Analyses and laboratory analytical methods are su2-2_mmarized in the table below.

Analysis	Laboratory Analytical Method
VOCs	USEPA Method 8260
SVOCs	USEPA Method 8270 (low level benzo(a)pyrene)
PIANO	USEPA Method 8260B/5035 High-Resolution sampling and analysis
Alkylated PAHs	USEPA Method 8270D-SIM
Saturated hydrocarbons	USEPA Method 8015D-modified

2.5 Sediment Toxicity

Several PAHs in sediment were identified at concentrations greater than ecological screening values in the RI Report. Sediment toxicity testing is proposed to further evaluate PAH concentrations in sediment and determine whether a probable risk of adverse effects to ecological receptors exists within historical ditches on Parcels 3, 4, and 5. The results of the risk determination will be considered in the development of potential remedial strategies considered in a feasibility study. The proposed toxicity assessment approach is consistent with the tiered system to determine the risk of adverse effects due to PAHs in sediments presented in Figure 1.3 from USEPA (2009), which is provided below as a general guidance for toxicity testing for ecological risk assessment.



Conceptual Model for Applying Various Sediment Assessment Approaches in a Tiered System to Determine the Risk of Adverse Effects Due to PAHs in Sediments (USEPA 2009).

Sample locations for sediment toxicity testing within Parcels 3, 4, and 5 will be determined in the field. Proposed sample quantities are summarized in the table below.

Parcel Number	Sediment Toxicity Sample Quantity
3	2
4	3
5	3
Willard Street (reference location)	1

2.6 Toxicity Sampling Methodology

Samples collected for toxicity analysis will be collected directly from the ditch adjacent to soil and sediment boring locations. Sample collection for Tier 1 and Tier 3 assessment includes collection of bulk sediment samples representing the upper 2-3 centimeters (cm) of surface sediments. Approximately 1-gallon of sediment from each location will be collected using a stainless steel spoon or scoop consistent with procedures described in SESDPROC-200-R3 and SynTerra SOPs (QAPP Appendix B, SynTerra 2018).

Sediment pore water collection for Tier 2 assessment will be performed in accordance with procedures described in SESDPROC-513-R2. Samples will be collected using a pore water extracting device such as a PushPoint TM sampler. The sampling end of the pore water device is inserted into the sediment to the desired depth, and pore water is extracted using a syringe or peristaltic pump. Other similar devices may be used providing that the integrity of the sample is maintained and no ambient surface water is allowed to mix with the sample.

2.7 Toxicity Analysis

Each toxicity assessment sample will be analyzed for the parameters summarized in the table below.

Tier	Analysis	Laboratory Analytical Method
1 and 2	SVOCs	USEPA Method 8270C
1	Total organic carbon	USEPA Method 9060
1	Black carbon	Gustafsson method (Gustafsson 1997)
3	Toxicity - amphipod	28-day exposure, USEPA Method 100.4
	Hyalella Azteca	-

2.8 IDW Management

Solid and liquid investigation derived waste (IDW) will be generated during collection of soil cores and environmental media sampling. Solids and liquids will be contained, as appropriate, in 55-gallon barrels or lined roll-off containers, and will be transported to an approved disposal facility in a timely manner. IDW containing NAPL will be segregated. Reusable equipment will be decontaminated using Liquinox (or similar) and water between sampling locations. Decontamination fluids will be collected and disposed of with IDW.

3.0 SCHEDULE AND REPORTING

After completion of the assessment activities, an RI Report Addendum will be prepared. The report will summarize the compiled results of the assessment conducted under the VCC. The report will include the following:

- Description of assessment activities
- Results of the sample analysis
- Laboratory data sheets
- Data tables summarizing results of the assessment
- Figures illustrating assessment activities and results of the sampling activities

The following preliminary schedule is proposed. The schedule is dependent on approval of the RIWP-A for the Former Storm Water Conveyance Ditches by the SCDHEC and obtaining the necessary permits and property access agreements. Upon approval, an updated project schedule will be developed.

Task	Date
Remedial Investigation Work Plan Addendum – Former Storm Water Conveyance Ditches submittal to SCDHEC	August 2020
SCDHEC approval of 2020 work plan	September 2020
Execute access agreements (approximately 45 days from submittal of amended access agreement)	October 2020
Initiate 2020 assessment	October 2020
Complete 2020 assessment	November 2020
Submit Report	First Quarter 2021

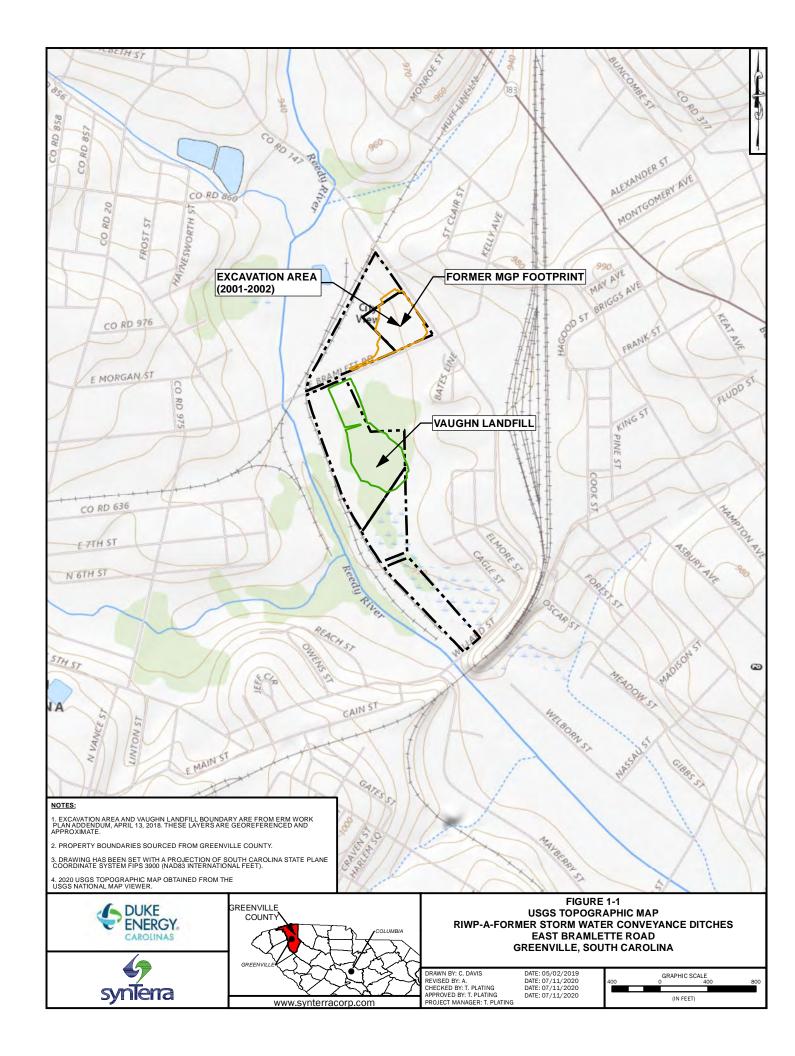
4.0 REFERENCES

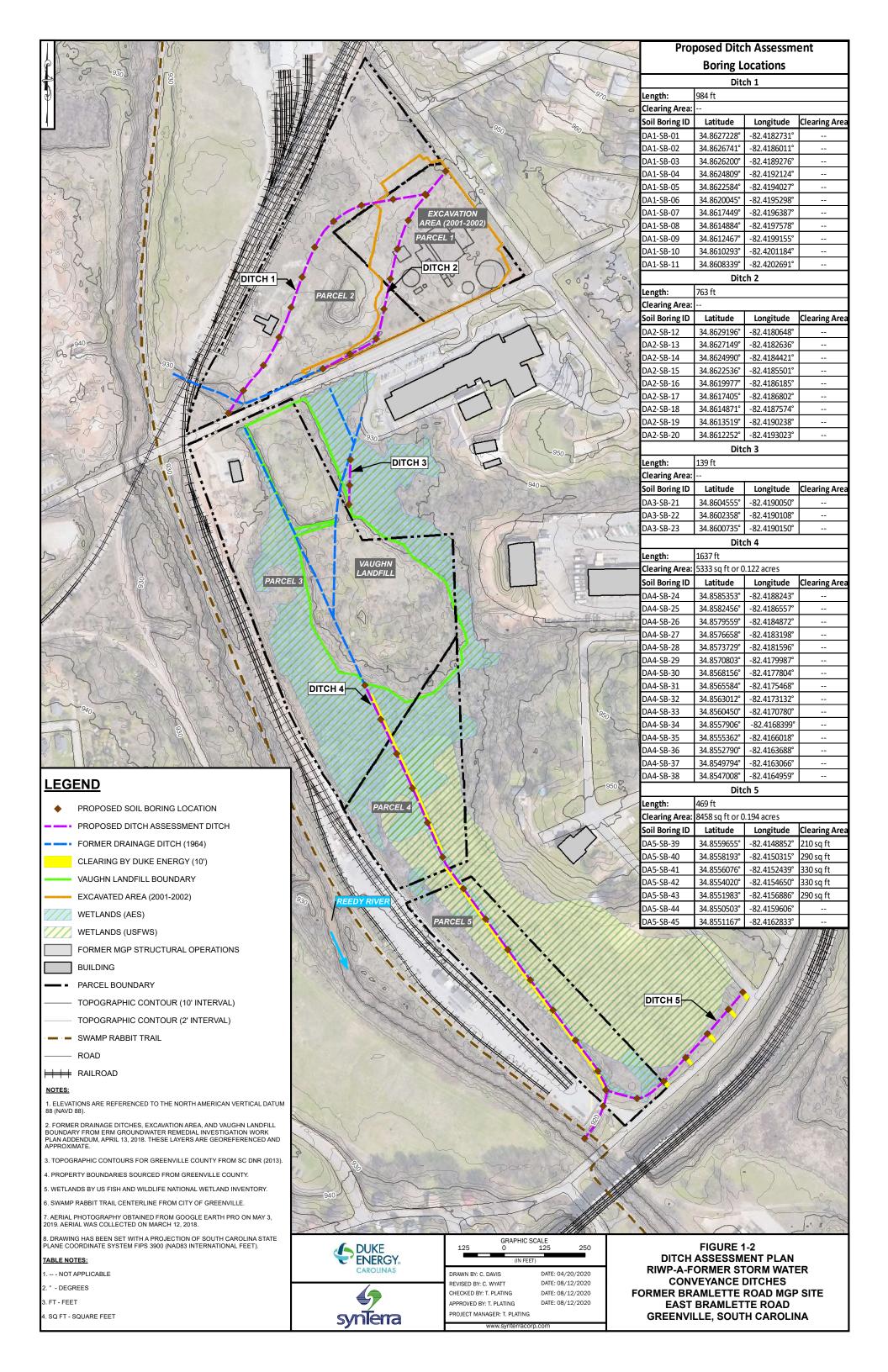
- Applied Engineering & Science, Inc. 1996. "Site Investigation Phase II: Vaughn Landfill/Duke Power Sites."
- Duke Energy Site Remediation Services Group. 2003. "Remedial Action Plan Final Report: CSXT/Vaughn Landfill and Bramlette Road MGP Sites."
- Gustafsson, Chan. MacFarlane and Gschwend. 1997. Quantification of the Dilute Sedimentary Soot Phase: Implications for PAH Speciation and Bioavailability. Environmental Science and Technology, 1997, Vol 31, pgs 203-209.
- South Carolina Department of Health and Environmental Control. 2016. "Regulation 61-71 Well Standards."
- South Carolina Department of Health and Environmental Control. 2016. "Voluntary Cleanup Contract in the Matter of CSXTF Bramlette Road Site, Greenville County and Duke Energy Carolinas, LLC."
- SynTerra Corporation. 2018. "Quality Assurance Project Plan (QAPP): Former Bramlette MGP Site."
- SynTerra Corporation. 2020. "Remedial Investigation Report (RI Report): Former Bramlette MGP Site."
- US EPA. 2009. "Evaluating Ecological Risk to Invertebrate Receptors from PAHs in Sediments at Hazardous Waste Sites."
- US EPA. 2013. "Science and Ecosystem Support Division (SESD) Operating Procedure SESDPROC-513-R2."
- US EPA. 2014. "Science and Ecosystem Support Division (SESD) Operating Procedure SESDPROC-200-R3."

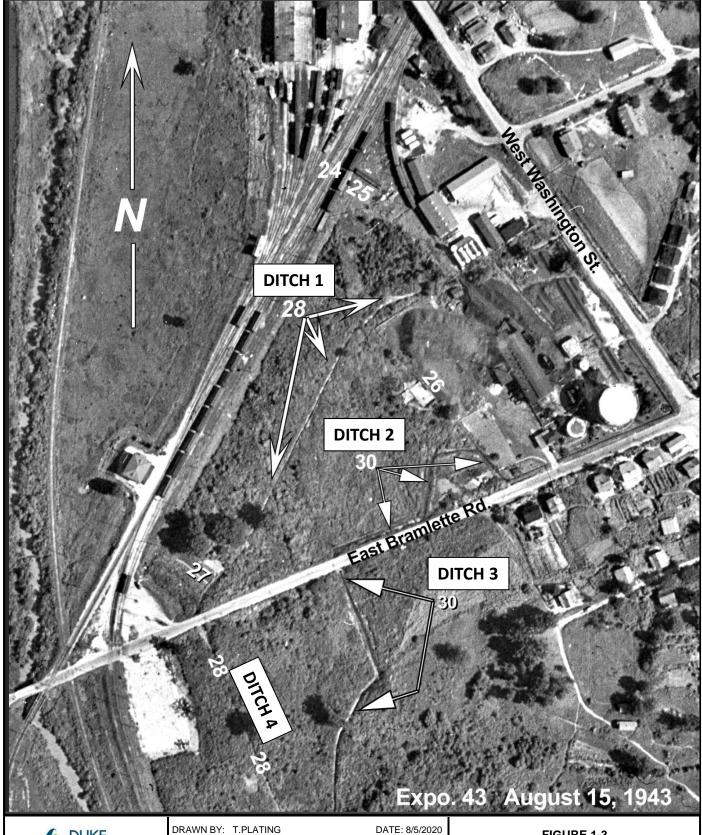
Remedial Investigation Work Plan Addendum – Former Storm Water Conveyance Ditches August 2020

Duke Energy Carolinas, LLC - Former Bramlette MGP Site SynTerra

FIGURES











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FIGURE 1-3 1943 AERIAL PHOTOGRAPH **RIWP-A - FORMER STORM WATER CONVEYANCE DITCHES** FORMER BRAMLETTE ROAD MGP SITE **EAST BRAMLETTE ROAD GREENVILLE, SOUTH CAROLINA**