Permit No.	Scan Date	DIN
6004-INDUS-1981	**April 7, 2014**	**20838**

RECEIVED
April 4, 2014
Solid Waste Section
Asheville Regional Office

Duke Energy
McGuire Nuclear Station
12700 Hagers Ferry Road
Huntersville, NC 28078

April 02, 2014

Mr. Larry Frost
Environmental Engineer
North Carolina Department of Environment and Natural Resources
Division of Waste Management, Solid Waste Section - Permitting Branch
Asheville Regional Office
2090 US Highway 70
Swannanoa, North Carolina 28778

Subject: **Duke Energy Carolinas, LLC**
McGuire Nuclear Station
Landfill No. 2, Permit No. 6004-INDUS
Permit Renewal

Certified Mail: 7011 0470 0000 9847 0389

Dear Mr. Frost:

Duke Energy Carolinas, LLC (Duke Energy) is providing the enclosed information for the permit renewal for the McGuire Nuclear Station Landfill No. 2, Permit No. 6004-INDUS. The landfill is located at Duke Energy's McGuire Nuclear Station, near Huntersville, NC in Mecklenburg County.

The current Permit to Operate was issued on July 7, 2009, revised August 17, 2009. Per the current permit:

> *The Permit to Operate shall expire July 7, 2014. Pursuant to 15A NCAC 13B .0201(e), no later than April 7, 2014, the owner or operator must submit a request to the Section for permit review and must update pertinent facility plans including, but not limited to, the facility operations and waste screening plans.*

In accordance with this permit requirement, the following information is submitted:

- Enclosure 1 – A revised landfill operations plan: *McGuire Nuclear Station Landfill No. 2, Operations Manual,* dated April 02, 2014, prepared by Duke Energy.
- Enclosure 2 – A revised Groundwater Sampling and Analysis Plan: *Groundwater Monitoring Program, Sampling and Analysis Plan, McGuire Nuclear Station Landfill #2, (Synthetically Lined) Permit No. 6004-INDUS,* dated March 28, 2014, prepared by HDR Engineering, Inc. of the Carolinas (HDR).

- Enclosure 3 – Financial Assurance Cost Estimate - The financial assurance cost estimate for the closure, post-closure care, and potential assessment and corrective action costs associated with the McGuire Nuclear Station Landfill No. 2, dated March 28, 2014, prepared by HDR.

Duke Energy plans to continue to operate the landfill as described in the enclosed documents and requests that a Permit to Operate be issued for an additional 5 years of operation.

If you have any questions or concerns, please contact Sean DeNeale at 704-382-4761/ Sean.DeNeale@duke-energy.com or John Williamson at 980-875-5894/John.Williamson@duke-energy.com

Sincerely,

Charles J. Morris III
Duke Energy
McGuire Nuclear Station
Station Manager

Enclosures (3)

cc via email: Mr. Sean DeNeale
Ms. Kim Hutchinson
Mr. Robert Sapp
Mr. Andy Tinsley
Mr. Tim Gibson
Mr. Tim Hunsucker
Mr. Bill Miller
Mr. Ed Sullivan

McGuire Nuclear Station

Landfill #2
Operations Manual

Permit No. 6004-INDUS

Prepared by:
DUKE ENERGY CAROLINAS, LLC
13339 Hagers Ferry Road
Huntersville, NC 28078

April 3, 2014

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1.0 Description and Responsibilities

1.1 Introduction

1.1.1 This Manual outlines processes and proper procedures for the operation of the McGuire Nuclear Station (MNS) Landfill #2, North Carolina Permit Number 6004 INDUS. This Manual is designed to assist personnel in performing various tasks assigned to them associated with landfill operations.

1.1.2 This is a working document and will be updated when necessary.

1.2 Description

1.2.1 General

The landfill site is located off Highway 73 in Huntersville, North Carolina. The access road is located across from the McGuire Nuclear Station entrance. The landfill footprint is approximately five (5) acres. The general function of the landfill is to contain sanitary, demolition, and other special wastes listed in Tables 2.1 and 2.2, and allow any leaching of wastes from the landfill to be monitored via a leachate collection system prior to discharging to a chemical treatment pond.

The MNS Landfill #2 has an expected useful life of approximately fifteen years (as of the date of this manual) based on the following annual volumes of waste disposal in the landfill:

- Dewatered, non-hazardous sludge: 600 cubic yards
- Non-hazardous wastes from petroleum spills and other releases: 3,700 cubic yards
- Construction debris, asbestos and normal trash: 800 cubic yards
- Non-hazardous obsolete, expired chemicals: 30 cubic yards

1.2.2 Landfill Proper

1.2.2.1 The landfill proper consists of approximately a five acre footprint. The landfill is lined with a high density polyethylene (HDPE) 60 mil liner. A layer of crushed gravel and sand compose a drainage blanket for the bottom and the side slopes of the landfill. Protecting the drainage blanket is a 16 oz. geotextile filter fabric that lies between the drainage blanket and one foot of operational cover.

1.2.2.2 The landfill is divided into four sub cells which function as independent disposal cells. Each cell is contained by a clay divider berm at the lowermost end of each basin

1.2.2.3 Inside each clay berm is a HDPE water stop which is fused to the liner to provide additional protection against contaminated leachate infiltration.

1.2.3 Leachate Collection System

1.2.3.1 The leachate collection system is designed to collect rainwater that falls directly onto the active landfill cell and other liquids which may percolate through the waste material. The rainfall and leachate collected in the landfill are routed to the leachate collection pond. To prevent runoff from large rainfall events from overflowing the leachate collection pond, flow

into the pond is controlled by throttling the valve in the leachate collection line.

1.2.3.2 From the leachate collection pond, the leachate is pumped to the Initial Holdup Pond at MNS, where it is included in the wastewater treatment process.

1.2.3.3 HDPE manholes separate each sub-cell of the leachate collection system within the landfill basin.

1.3 Responsibilities

1.3.1 The Manager of Landfill Operations for the McGuire Landfill is responsible for environmental compliance and operation (including but not limited to waste collection, erosion control, maintenance, and land management) and interfacing with Corporate Environmental Services support groups and regulatory agencies. The Manager of Landfill Operations will also provide up-to-date landfill regulatory information to other responsible groups and ensure adequate training for all landfill personnel is provided. The Manager of Landfill Operations will conduct monthly landfill inspections and document all remedial actions.

1.3.2 Corporate Environmental Services, Waste Programs (CESWP) is responsible for obtaining all needed permits, waste approvals and acting as an interface with regulatory agencies. Additionally, CESWP shall prepare required reports and permit renewals for submission to the state by Environmental Services, Nuclear Environmental Field Support (NEFS) personnel. CESWP will also interface with MNS Radiation Protection (RP) to obtain any regulatory approvals needed for low-level radioactive waste disposal in the Landfill. Submittal of reports associated with low-level radioactive waste will be submitted by NEFS following review and signature by the MNS Station Manager. Corporate Environmental Services, NPDES Compliance is responsible for entering MNS's non-hazardous waste shipments into the e-TRAC Waste Module.

1.3.3 Upper Catawba Hydro Maintenance is the current Operator for the McGuire Landfill and is responsible for all erosion control, grass mowing, land management, maintenance activities (including road maintenance), and waste collection as directed by the Manager of Landfill Operations for the McGuire Landfill. Upper Catawba Hydro Maintenance is also responsible for providing heavy equipment operators to conduct covering operations on an as needed basis.

1.3.4 Real Estate Services is responsible for providing the proper individuals to perform surveying at the landfill during the second quarter of each year to determine the waste capacity of the landfill. Surveying is also required during asbestos or sludge disposal. Additional surveying may be required as deemed necessary by CESWP or the McGuire Landfill Manager.

1.3.5 Environmental Support Services, Environmental Monitoring and the Analytical Lab is responsible for the collection and analysis of groundwater, surface water, and leachate samples. These samples must be analyzed for parameters listed in the operating permit. Results and recommendations from the sampling activities must be reported to the state or other appropriate regulatory agencies. CESWP is

also responsible for the development of any additional monitoring wells that may be necessary and providing updates as necessary to the Groundwater Sampling and Analysis Plan and the Post-Closure Groundwater Monitoring Plans.

1.3.6 MNS Radiation Protection (RP) is responsible for providing radiological surveys of all low-level radioactive waste material.

1.3.7 MNS Chemistry is responsible for adequately treating all leachate from the leachate collection system to meet the NPDES permit requirements through the plants Waste Collection (WC) System.

1.3.8 MNS Health & Safety is responsible for ensuring safe practices are employed in the operation and maintenance of the landfill. Other groups shall involve them as necessary and appropriate for operations, maintenance, training, sampling, and other activities to ensure compliance with various OSHA requirements.

1.3.9 MNS Security is responsible for ensuring overall security of the landfill. Security will not allow unauthorized personnel to enter the landfill without prior approval from the McGuire Manager of Landfill Operations or Landfill Operator. Security will include the landfill in their routine rounds at least once per shift. If anything appears out of the ordinary, they will immediately report the incident to the McGuire Manager of Landfill Operations.

Security will also inspect the level in the leachate collection pond during their rounds. If the level is above the high level mark, the McGuire Manager of Landfill Operations will be immediately notified.

2.0 Waste Collection

2.1 Waste Acceptance

2.1.1 Before any waste can be disposed in the landfill, it must be approved by Corporate Environmental Services, Waste Programs and/or MNS Manager of Landfill Operations. Wastes acceptable for disposal in the landfill are listed in Table 2.1. Non-hazardous waste listed in Table 2.2 will not be routinely disposed in the landfill but can be disposed of in the landfill if needed.

2.1.2 Other wastes, such as, asbestos, sludges, and demolition debris may be disposed of in the landfill. No liquid waste shall be disposed in the landfill.

2.1.3 The removal of waste from the landfill is prohibited unless the landfill manager approves and the removal is not performed on the working face.

2.2 Weighing Waste

2.2.1 Truck scales have been installed at the MNS Site Garage for the purpose of weighing all waste before disposal in the landfill.

2.2.2 On or before August 1 each year a report shall be submitted to the State, for the amount and type of solid waste disposed in the landfill the previous year beginning July 1 and ending June 30. A copy of the report shall also be submitted to Mecklenburg County Environmental Protection.

2.3 Transportation

Precautions must be taken to prevent spillage, leakage, or blowing of waste during transport and burial. If wind- blown waste is discovered, it shall be picked up immediately.

2.4 Disposal

2.4.1 The loaded truck must enter the landfill basin from the ramp. All drivers must use extreme caution due to the steepness of the ramp. Waste materials shall be placed against the active working face of the active cell in such a manner as to take the least amount of space..

2.4.2 As the waste is being removed from the truck, it should be closely inspected by appropriate landfill personnel or the Transporter to ensure no un-acceptable waste are disposed in the landfill. Should any un-acceptable waste be identified in a shipment, it shall be removed from the shipment and properly disposed elsewhere.

2.4.3 No waste shall be placed in standing water. Excessive surface water at the working face creates difficulties for maneuvering equipment and prevents the operator from achieving maximum compaction of waste.

2.5 Asbestos Disposal

Asbestos containing materials may be disposed of in the landfill. Asbestos must be packaged in accordance with 40 CFR 61, and shall be disposed of separately and apart from the working area.

2.5.1 Transportation

In N.C., an Asbestos Waste Manifest must accompany each truckload of asbestos. The manifest must be signed by the Landfill Operator. These completed forms must be forwarded to MNS Nuclear Environmental Field Support to be retained on file and routed accordingly.

2.5.2 Waste Disposal

2.5.2.1 If any amount of asbestos waste is received for disposal that is improperly enclosed, uncovered, not double bagged, or mislabeled, immediately inform the MNS Manager of Landfill Operations. Do not unload the truck.

2.5.2.2 The bags of asbestos must be placed together in the active landfill cell. Immediately after unloading the asbestos, it must be covered with six inches of soil in a manner so that the asbestos does not become airborne.

2.5.2.3 The Manager of Landfill Operations must arrange surveying of the disposal so that burial coordinates are recorded. This record shall include the station coordinates and elevations. These records shall be forwarded to MNS Nuclear Environmental Field Support for file retention.

2.6 Sludge Disposal

2.6.1 Dewatered sludge can be disposed in the landfill. This sludge may be slightly radioactive. Laboratory analysis of the sludge must be conducted prior to disposal into the landfill.

2.6.2 Low-level radioactive waste must have written approval from the North Carolina Department of Environment and Natural Resources (DENR), Division of Radioactive Protection prior to disposal in the landfill. The radioactive materials must then be disposed in accordance with the applicable permit and the current radioactive materials license.

2.6.3 The exact disposal location will be determined by the Manager of Landfill Operations. Before placement of the sludge into the landfill, a radiological survey will be performed by MNS Radiation Protection. After placing the dewatered sludge in the landfill, it must be covered with six inches of daily cover material. Ultimately, this sludge must possess a total of two feet of cover soil, including final cover. The final closure cap will satisfy this cover requirement.

2.7 Empty Container Disposal

2.7.1 All containers must be emptied as much as possible prior to disposal in the landfill. No "free liquids" or any liquids that can be poured can be placed in the landfill. All liquid materials must be removed from the container using the practices commonly employed to remove materials from that type of container, e.g., pouring, pumping, and aspirating.

2.7.2 All pesticide and herbicide containers must be triple rinsed, or as directed on the pesticide/herbicide container label, before they are discarded

2.7.3 Fifty-five gallon drums that are still in good condition will be collected and shipped to a drum re-conditioner. Any drums that cannot be recycled or disposed of as scrap metal, must be labeled

"empty" before being transporting to the landfill. Once they are located at the landfill, each drum must be crushed before placing it in the active cell. Then the crushed drum can be buried with the rest of the waste.

2.8 Petroleum Product Clean-Up Residue Disposal

2.8.1 Oil contaminated materials, such as oil contaminated soil, oil pads and booms, and oil absorbent material, can be disposed in the landfill. Materials contaminated with oil and diesel fuel which do not contain any free liquids may also be disposed in the landfill.

2.8.2 Petroleum product spill clean-up residues can be treated as loose materials and used to fill voids between other wastes. Oil contaminated soil has been approved for use as alternate daily cover as described in Section 3.3.

2.8.3 Spill clean-up residues other than oil or diesel must be evaluated by MNS Manager of Landfill Operations and/or Corporate Environmental Services, Waste Programs before being disposed in the landfill.

2.9 Spill Cleanup Residue other than petroleum.

Non-hazardous spill cleanup material; such as, from acid, base, and glycol spills must be approved by MNS Nuclear Environmental Field Support and/or Corporate Environmental Services, Waste Programs before being disposed of in the landfill.

2.10 Fish Waste

Periodic disposal of fish waste may occur with approval from the MNS Manager of Landfill Operations. Fish waste shall be covered the same day as disposed.

2.11 Insulation (Non-Asbestos)

All non-hazardous, non-asbestos insulation destined for disposal in the landfill must be approved by the MNS Manager of Landfill Operations and/or Corporate Environmental Services, Waste Programs.

2.12 Surplus Chemical Product Disposal

All non-hazardous excess, obsolete, or expired (surplus) chemical products destined for disposal in the landfill must have the approval of MNS Manager of Landfill Operations and/or Corporate Environmental Services, Waste Programs. . Generally, non-hazardous chemicals are limited to: activated carbon, desiccant, grout, salts, resins, sandblast material, and diatomaceous earth

Table 2.1

WASTES PERMITTED FOR MNS LANDFILL #2 DISPOSAL

0001 - Oil Spill Cleanup Material for Disposal
0002 - Oil Spill Clean Dirt for Cover
0003 - Acid Spill Cleanup Material
0004 - Activated Carbon
0005 - Asbestos - Non-Friable (MNS Only)
0006 - Base Spill Cleanup Material
0007 - Containment Materials
0008 - Desiccant (Used-Unused)
0009 - Diesel Fuel Cleanup Material
0010 - Resins (non-hazardous solid)
0011 - Non-Hazardous Gasoline Spill Cleanup Material
0012 - Grout - Mortar (Unused)
0013 - Insulation
0014 - Non-Hazardous Antifreeze Spill Cleanup Material
0015 - Non-Haz Salts (outdated products)
0016 - Paper Filters (Air, oil, parts washer, bag)
0017 - Paper Waste
0018 - Sandblast Material (Used-Unused)
0019 - Sludges (solidified)
0020 - Diatomaceous Earth
0021 - Asbestos - Friable (MNS Only)
0022 - Mud, Grease, Clam Shells
0023 - Dead Fish
0024 - Boric Acid

Table 2.2

WASTES NOT TO BE ROUTINELY DISPOSED BUT ALLOWED IN MNS LANDFILL #2

TYPE	COMMENTS
Non-treated Wood	Demolition Landfill
Metal	Scrap Metal Recycle Dealer
Concrete/Brick (used as road bed)	Demolition Landfill/Beneficial Fill
Asphalt (used as road bed)	Recycle/Beneficial Fill
Yard Waste	Composting
Land Clearing Debris	Demolition Landfill/Compost
Cardboard	Recycle
Office paper	Recycle
Sawdust	Recycle
Empty Containers	Metal Recycling / Reconditioned

3.0 Landfill Operation

3.1 General

This section describes the normal day-to-day operation of the MNS Landfill #2.

3.1.1 The operations described in this section will not supersede the N.C. Solid Waste Management Rules, 15A NCAC 13B, nor N.C. Permit Number 6004 INDUS. Landfill operation and maintenance activities shall be carried out in such a manner as not to have any adverse effects upon the landfill proper, nor the environment outside the landfill.

3.1.2 Safe working practices must be used at all times during operation, maintenance, monitoring or any other activities. The MNS Health & Safety group should be contacted concerning safe working practices or any unusual conditions.

3.1.3 Blowing paper and other debris must be controlled. All wind-blown trash must be collected and buried immediately. Previously landfilled wastes that have been uncovered must be recovered with suitable cover by the end of the working day on which it was discovered. In general, conditions must not be maintained that promote the habitation and production of insects or rodents.

3.1.4 Dust control measures will be implemented when necessary and will include at a minimum watering of dusty roads and exposed work areas. The landfill surface does not typically generate dust. Additionally, final cover will be vegetated as soon as is practical in order to minimize the blowing of dust on-site.

3.1.5 Litter, odors, and vectors are not anticipated to be a concern at the MNS No. 2 Landfill. The waste placed in the landfill does not attract vectors, and windblown material is not anticipated to be a problem. Odors have not typically been a problem at the MNS No. 2 landfill.

3.1.6 No open burning shall be permitted at the MNS Landfill # 2. If a fire occurs at the landfill, call the Site Emergency Number (980-875-4911). Equipment and stockpiled soil shall be provided to control accidental fires. MNS will notify the local fire department, which will be immediately dispatched to assist with fire control. Any fire that occurs at the landfill shall be reported to the state within 24 hours and a written notification will be submitted within 15 days.

3.2 Access and Security

3.2.1 The entire landfill site is enclosed with a six foot high chain-linked fence, with three strands of barbed wire. All gates must remain locked at all times except during operation, maintenance, monitoring and other necessary activities.

3.2.2 The warning signs, located on each gate must remain in good condition at all times. "No Trespassing" signs which are located along the fence perimeter must also remain in good condition. Access to the landfill is limited to authorized, personnel only. Those persons include the Manager of Landfill Operations, operators, maintenance personnel, monitoring personnel, and environmental

protection staff. Others may be granted access to the landfill, if accompanied by authorized persons.

3.2.3 A sign providing the landfill permit number is posted at the site entrance and shall be maintained in good condition. Edge-of-waste markers are installed to delineate the edge of waste. These markers shall be maintained in good condition and remain visible at all times.

3.3 Daily Cover

3.3.1 Waste materials shall be placed against the active working face of the active cell in such a manner as to take the least amount of space as directed by the Landfill Operator. The waste shall be restricted to the smallest area feasible and compacted as densely as practical using the landfill heavy equipment. Each day during operation, all waste must be covered with at least six (6) inches of soil and compacted. The slope of the waste must not exceed 3:1 ratio. It is very important not to use more than 6 inches of daily cover to conserve valuable landfill space.

3.3.2 In lieu of soil, two types of alternate daily cover have been approved and may be utilized: oil contaminated soil and a TYPAR blanket. The Landfill Operator will ensure that the oil contaminated soil contains no free liquids. The Landfill Operator will also ensure that no ignition sources are in close proximity to the oil contaminated soil. All oil contaminated soil that is used for cover will be properly staged while awaiting use.

3.3.3 The TYPAR blanket may be used as temporary cover. The use of the TYPAR blanket is not allowed to cover asbestos. The TYPAR blanket is to be secured to prevent the uncovering of the material in the landfill. The blanket shall be secured by placing weights or sandbags on top of the blanket. No solid waste shall be placed on top of the TYPAR blanket. Prior to adding more material to the landfill for disposal, the TYPAR blanket shall be pulled back to prevent inadvertent tearing. The Landfill Manager will inspect the TYPAR blanket for tears on a monthly basis and will initiate procurement of a new blanket as needed.

3.3.4 "Special" wastes, such as asbestos and sludge must be covered daily once it is placed in the landfill.

3.3.5 The equipment operators must inspect each cell riser pipe to ensure proper operation monthly

3.3.6 No equipment shall be driven directly on the geotextile fabric. At all times there should be a minimum of twelve (12) inches of operational cover on top of the geotextile fabric. The Landfill Operator should be contacted in the event of erosion problems inside the landfill.

3.3.7 Areas that have reached final waste grades or are not utilized for 12 months or more must be covered with at least one (1) foot of intermediate cover.

3.3.8 Covered areas shall be adequately sloped such that surface water is diverted from the operational area in a controlled manner. In addition, soil cover shall be uniformly graded and compacted to prevent the formation of erosion channels. In the event that erosion channels do form, the cover should be promptly repaired.

4.0 System Maintenance

To ensure proper operation of the landfill, a considerable amount of preventive maintenance is required. The Landfill Operator will ensure the necessary maintenance is conducted in a timely fashion. The Landfill Operator must also ensure that only qualified personnel conduct these maintenance activities.

4.1 Leachate Collection System

The following maintenance activities shall be performed:

4.1.1 Pumps (2)

The pumps must be inspected monthly and be properly maintained so ensure safe operation.

4.1.2 Clean Out of Leachate Lines

The leachate lines shall be video inspected at least once every five years to the extent practical. Flushing of the leachate lines shall occur as necessary to allow for proper function of the system.

4.1.3 Operation of Leachate Valve

The leachate collection system shut off valve is located near the leachate pond. This valve must be positioned open during routine operations and be closed only for emergency repairs to the leachate collection system.

4.2 Leachate Pond Pumps

A monthly inspection of the control panels and operating parameters of the leachate pond pumps must be performed to ensure proper operation.

4.3 Leachate Pond Pump Seal System

A monthly inspection of the water system valves in the pump house and pumps alarm system must be performed to ensure proper operation.

4.4 Alarm System

A monthly inspection of the alarms at the landfill must be performed to ensure proper operation.

Please refer to the ATTACHMENT 1 for a copy of the Monthly Inspection Sheet.

5.0 General Site Maintenance

To ensure proper operation of the landfill, general site maintenance will be required. The MNS Manager of Landfill Operations will ensure that all maintenance activities are completed as necessary and in a timely fashion. The Manager of Landfill Operations must also ensure that only qualified personnel conduct these maintenance activities.

5.1 Landfill Access Ramp

To maintain vehicle access inside the landfill for unloading waste, the access ramp must be maintained to permit access to the landfill in all weather conditions.

Extreme caution must be observed due to the slope of the access road.

5.2 Sediment Basins (3)

All sediment basins must be inspected monthly. When the basins become 50% filled with sediment, they must be cleaned out, stone replaced and new vegetation seeded.

5.3 Erosion Control

5.3.1 Diversion Control Ditches

The landfill site has diversion ditches to control erosion from the stockpile areas and around the landfill. The diversion ditches must be inspected monthly and repaired as necessary.

5.3.2 Creek Crossing

The landfill entrance road crosses a creek. This crossing must be maintained to prevent erosion, and must be inspected monthly.

5.4 Ground Cover Maintenance

5.4.1 Adequate ground cover must be maintained along the entrance road and inside the landfill basin to prevent erosion. The grass must be mowed at least once per month during the active growing season so that erosion can be easily detected and corrected as soon as possible.

5.4.2 A monthly inspection of the site is required to prevent and detect any erosion problems. Any problems found must be repaired as soon as possible.

5.4.3 Ground cover and roadway maintenance will be performed by the Landfill Operator or under his direction.

5.4.3.1 Mowing

The landfill site grass will be mowed as necessary.

5.4.3.2 Fertilizer and Lime Program

A semi-annual fertilizer and lime program is necessary to provide the adequate soil nutrients to maintain the grass. The Landfill Operators will make the necessary arrangements for the fertilizer and lime application. Fertilizer and lime shall not be applied within 20 feet of the groundwater monitoring wells.

5.4.3.3 Watering

The grass will be watered as needed.

5.4.3.4 Pesticide Applications

Prior to any pesticide/herbicide application, the MNS Manager of Landfill Operations must be notified. Pesticides shall not be applied within 20 feet of the groundwater monitoring wells.

5.5 Security Fence

5.5.1 The landfill basin, leachate pond, sedimentation ponds, and operational cover material is completely surrounded by a six feet high chain linked fence with three strains of barbed wire. The fence provides access with five double vehicle gates and one personnel gate. All gates must remain locked, except when work is being performed.

5.5.2 TRANSCO Pipe Company must have access to their right-of-way pipeline, by using a multiple locking system with Duke Energy locks.

5.5.3 "No Trespassing" and the landfill information signs must be maintained on the fence.

5.5.4 A monthly inspection is required to ensure the integrity of the fence. This inspection must also include the appropriate signage.

5.6 Roadways

5.6.1 The landfill entrance road and roads to the groundwater monitoring wells must be maintained.

5.6.2 The grass along the entrance must also be maintained in the same manner as the basin grass, including a fertilizer and lime program.

5.6.3 A monthly inspection of culverts, ditches, etc., is required and any problems shall be repaired.

6.0 Groundwater Sampling and Analysis Plan

All groundwater monitoring and sampling will be performed in accordance with the approved groundwater sampling and analysis plan.

7.0 Inspections

7.1 To ensure proper operation and maintenance, a monthly inspection will be conducted and documented by the Landfill Operator. Please see Attachment 1 for the Monthly Inspection Sheet.

7.2 Mecklenburg County Environmental Protection conducts periodic inspections of the landfill. The Manager of Landfill Operations or Landfill Operator must accompany any inspector(s) during inspections.

8.0 Closure Plan

8.1 Closure/Post Closure

Closure on the MNS landfill will be performed in accordance with the approved landfill closure and post closure care plans.

9.0 Required Regulatory Submittals

Submittal	Requiremen	Reporting/Action Frequency
Groundwater Monitoring Reports	Maintain a record of all monitoring events and analytical data in accordance with the Groundwater Monitoring Program. Reports of the analytical data for each water quality monitoring sampling event shall be submitted to DENR Division of Waste Management (DWM) in a timely manner.	Semiannually
Annual Landfill Report	Tons of waste received and disposed of in the landfill shall be reported to the DWM and to all counties from which waste was accepted on forms prescribed by the DWM. Refer to the Permit to Operate for annual reporting requirement information.	Annually Must submit no later than August 1 each year
10-Year Waste Management Plan	Per North Carolina G.S. 130A-309.09D (c), a 10-year waste management plan shall be developed for this landfill. The plan shall be updated at least every three years.	10-year plan updated every 3 years

ATTACHMENT I
MCGUIRE LINED LANDFILL / MONTHLY INSPECTION SHEET

Inspector's Name: _____

Date / Time: _____

1. Access

a. Access Road: Graded, No Significant Erosion _____

b. Access Road Ditches: Mowed, No Significant Erosion _____

c. Creek Crossing: Unobstructed, Mowed, No Significant Erosion _____

2. Leachate Pond

a. Access Road: Graded, No Significant Erosion _____

b. Gate Access: Locked and Secure _____

c. Pond Level: Below Stand Pipe Level _____

d. Liner Integrity: Secure and Free of Cracks _____

e. Life Preserver: Present, Good Condition _____

f. Information Signs: *DANGER, AUTHORIZED PERSONNEL ONLY*
In Place and In Good Condition _____

g. Leachate Inlet: Caps In Place _____

3. Main Entrance

a. Gate Access: Locked and Secure _____

b. Access Road: Graded, No Significant Erosion _____

c. Sediment Basin #2: Level _____
Erosion _____
Overflow Clear _____
General Appearance _____

d. Landfill Access Ramp: Access in Good Condition _____

e. Daily Cover: 6" Minimum _____
No Standing Water _____
Free of Blowing Trash _____

f. Alternate Cover: TYPAR Blanket Intact, Weighted _____
Oily Soil - No Free Liquids _____
No Ignition Sources _____
Cleanout Pipes: Free of Debris _____

g. Cell Berms: Trash Below Berm _____
No Significant Erosion and Grassed _____

4. **Basin**

a. Cell 1 Active / Closed General Appearance _____
b. Cell 2 Active / Closed General Appearance _____
c. Cell 3 Active / Closed General Appearance _____
d. Cell 4 Active / Closed General Appearance _____

5. **Manways** (When Applicable)

a. Covers: In Place and Secure _____
b. Piping: Free of Leaks _____

Note: #4 IS CONFINED SPACE ENTRY

6. **Sprinkler System:** Operational _____

7. **Sediment Basin #1:** Drainage Pipe _____
Free of Debris _____
Level _____
Erosion _____
Overflow Clear _____
General Appearance _____

8. **Fencing:** Integrity _____

9. **Signs:** In Place & Good Condition _____

10. **Soil Storage Area:** Erosion _____
Grassed _____

11. Sediment Basin #3: Level _____

Erosion _____

Overflow Clear _____

General Appearance _____

12. Edge of Waste Markers: Visible _____

In Good Condition _____

Comments:

_____

_____

_____

_____

_____

Corrective Actions: _____

Signature: _____

ATTACHMENT II

McGuire Landfill Waste Management Guidelines

NOTE:

If your waste matches one of MNS Landfill standard profiles, go to Section B.

Section A. Waste Not Previously Approved:

1. The waste generator/shipper:

- Determines the material cannot be re-used, recycled or disposed as construction/demolition waste.
- Submits the on-line MNS Solid Waste Approval / Disposal Form (Profile) or ATTACHMENT III or provides information through emails and phone calls, including, if available:
  - ⇒ SDS
  - ⇒ Chemical Fact sheets
  - ⇒ TCLP or other analytical data
- Submits requests to Corporate Environmental Services, Waste Programs.

2. Corporate Environmental Services, Waste Programs:

- Reviews the Solid Waste Disposal Form (profile) and evaluates the material using the following criteria:
  - ⇒ Is the material Hazardous?
  - ⇒ Does it contain free liquid?
  - ⇒ Will it affect leachate?
  - ⇒ Is it acceptable for MNS landfill?
  - ⇒ Is MNS landfill the lowest cost option for the generator?
  - ⇒ CESWP informs the generator whether or not the waste is approved for MNS Landfill disposal.
  - ⇒ If not approved, CESWP obtains approval for alternate disposal method.

Section B. Approved Waste:

⇒ **The waste generator/shipper:**

- Identifies the MNS Landfill profile number.
- Completes the non-hazardous waste manifest form (ATTACHMENT IV) or on-line form and ensures that the manifest accompanies the shipment to the Toddville Facility or directly to the MNS Landfill.
- Ensure the container contents are described on the container.
- Indicate on the container that the material is to be disposed of in the MNS Landfill.
- Mark the container as Non-Hazardous.

⇒ **Waste / Manifest received at the Toddville Facility**

- Toddville Waste Operator verifies that the non-hazardous waste manifest and materials match.
- Toddville Waste Operator loads non-hazardous waste in Toddville's secure roll-off container in a timely manner.
- Toddville Waste Operator ensures all non-hazardous manifests accompany the McGuire Landfill bound roll-off container.

⇒ **Corporate Environmental Services, NPDES Programs Support Personnel:**

- Enters non-hazardous waste shipments into the eTRAC Waste Module.

Section C: Specific Waste Streams

Oily Soil from Spill Crews:

⇒ **Oil Spill Crew**

- Inspects load to ensure all waste is acceptable
- separates clean soil from oil pads
- Completes the MNS Landfill Non-Hazardous Waste Manifest, ATTACHMENT IV
- Transports to MNS landfill
- Places absorbent material and trash under cover
- Places any clean soil in cover soil pile
- Places soil with debris into waste area

- Ensures gate is locked
- Places completed manifest in Manifest Drop Box next to the scales at the McGuire Garage

⇒ **Corporate Environmental Services, NPDES Programs Support Personnel:**

- Enters non-hazardous waste shipments into the eTRAC Waste Module.

ATTACHMENT III

MNS Landfill Profile Request

ATTACHMENT IV

McGuire Site Landfill #2
Permit # 6004 INDUS

NON-HAZARDOUS WASTE MANIFEST

NOTE: Please submit a separate manifest for multiple addresses if loads are in different counties.

SUBMITTED BY:_____ SECTION/DEPT: _____

PHONE NUMBER:_____ FACILITY:_____

DESCRIPTION OF WASTE	PROFILE NUMBER	NET WEIGHT	CONTAINER TYPE*

*Dump truck, drum, bag, etc.

_____ _____ _____
NAME (Driver's Name) SIGNATURE DELIVERY DATE

LOCATION NAME:_____

STREET ADDRESS:_____

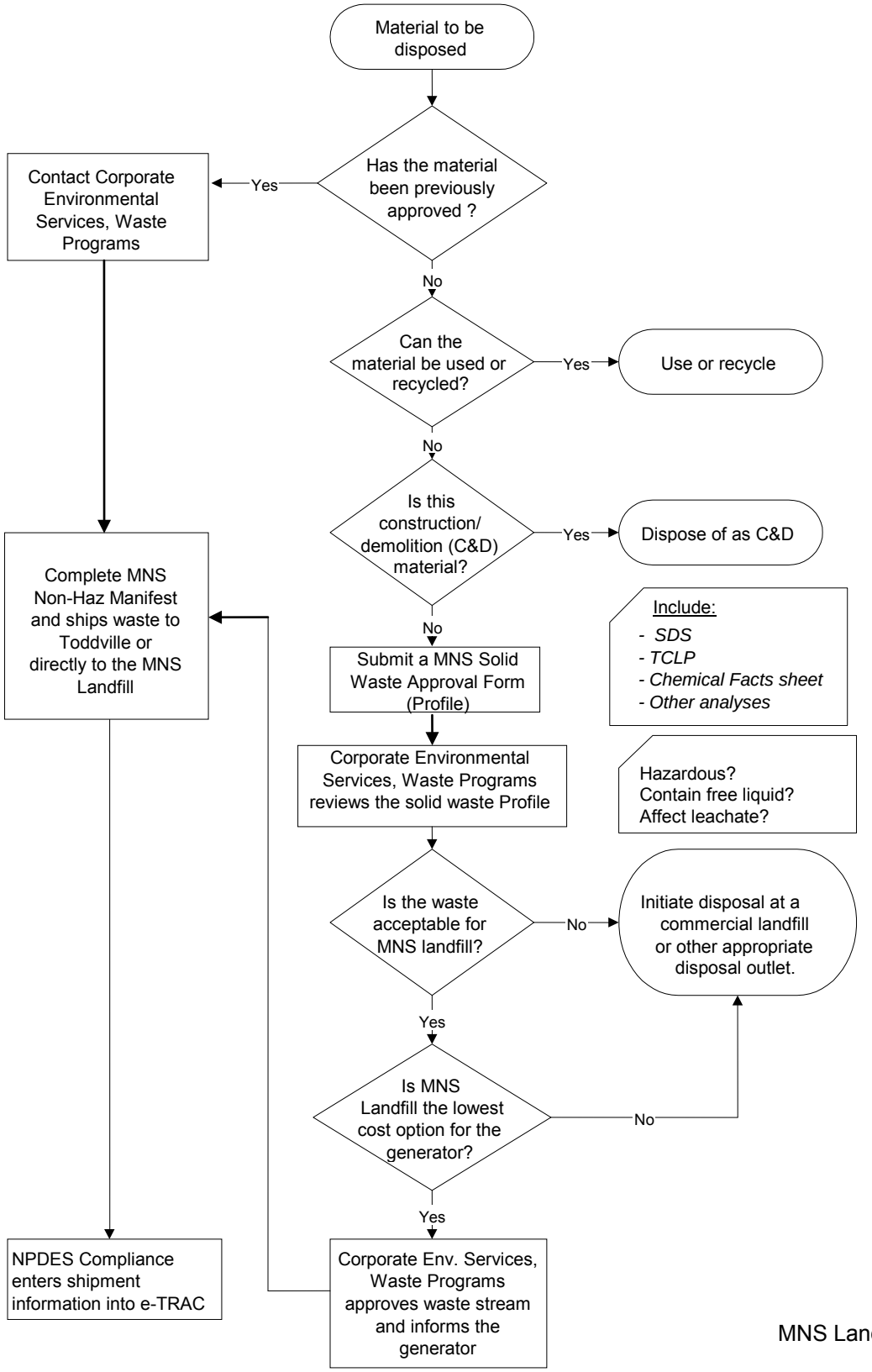
CITY AND STATE:_____

COUNTY:_____

COMMENTS:_____

_____

MANIFEST MUST BE FILLED OUT COMPLETELY BEFORE DISPOSAL



MNS Landfill Flowchart

ATTACHMENT VI
15A NCAC 13B .0505 Operational Requirement Cross-Reference Table

15A NCAC 13B .0505 - Operational Requirements for Sanitary Landfills	Section Reference in Operations Manual
1. Plan and Permit Requirements	
a. Construction plans shall be approved and followed.	Original Permit to Construct issued July 30, 1991. Attachment 1 - Permit to Operate: Phases 3 and 4, issued July 7, 2009
b. Specified monitoring and reporting requirements shall be met.	1.3.2 - Responsibilities 1.3.5 - Responsibilities 2.2.2 - Weighing Waste 6.0 - Groundwater Sampling and Analysis Plan 9.0 - Regulatory Required Submittals
2. Spreading and Compacting Requirements	
a. Solid waste shall be restricted into the smallest area feasible.	2.4.1 - Disposal 3.3.1 - Daily Cover
b. Solid waste shall be compacted as densely as practical into cells.	3.3.1 - Daily Cover
3. Cover Requirements	
a. Solid waste shall be covered after each day of operation, with a compacted layer of at least six inches of suitable cover or as specified by the Division.	3.3.1 - Daily Cover
b. Areas which will not have additional wastes placed on them for 12 months or more, but where final termination of disposal operations has not occurred, shall be covered with a minimum of one foot of intermediate cover.	3.3.7 - Daily Cover
c. After final termination of disposal operations at the site or a major part thereof, or upon revocation of a permit, the area shall be covered with at least two feet of suitable compacted earth.	Conceptual Design and Estimated Costs for Landfill Closure, McGuire Nuclear Station, Landfill #2, prepared by Altamont Environmental, Inc. dated October 11, 2011
4. Erosion Control Requirements	
a. Adequate erosion control measures shall be practiced to prevent silt from leaving the site.	5.3.1 - Erosion Control (Diversions Control Ditches) 5.4.1 - Ground Cover Maintenance 5.4.2 - Ground Cover Maintenance
b. Adequate erosion control measures shall be practiced to prevent excessive on-site erosion.	3.3.8 - Daily Cover 5.3.1 - Erosion Control (Diversion Control Ditches) 5.4.1 - Ground Cover Maintenance 5.4.2 - Ground Cover Maintenance
5. Drainage Control Requirements	
a. Surface water shall be diverted from the operational area.	3.3.8 - Daily Cover 5.3.1 - Erosion Control
b. Surface water shall not be impounded over or in waste.	2.4.3 - Disposal 3.3.8 - Daily Cover
c. Completed areas shall be adequately sloped to allow surface water runoff in a controlled manner.	3.3.10 - Daily Cover
6. Vegetation Requirements	
a. Within six months after final termination of disposal operations at the site or a major part thereof or upon revocation of a permit, the area shall be stabilized with native grasses.	Conceptual Design and Estimated Costs for Landfill Closure, McGuire Nuclear Station, Landfill #2, prepared by Altamont Environmental, Inc. dated October 11, 2011
b. Temporary seeding will be utilized as necessary to stabilize the site.	5.4.1 - Ground Cover Maintenance 5.4.3.2 - Ground Cover Maintenance (Fertilizer and Lime Program)
7. Water Protection Requirements	
a. The separation distance of four feet between waste and water table shall be maintained unless otherwise specified by the Division in the permit.	Not included in current Operations Plan
b. Solid waste shall not be disposed of in water.	2.4.3 - Disposal
c. Leachate shall be contained on site or properly treated prior to discharge. An NPDES permit may be required prior to the discharge of leachate to surface waters.	1.2.1 - Description (General) 1.2.3 - Description (Leachate Collection System)

15A NCAC 13B .0505 - Operational Requirements for Sanitary Landfills	Section Reference in Operations Manual
8. Access and Security Requirements	
a. The site shall be adequately secured by means of gates, chains, berms, fences, and other security measures approved by the Division, to prevent unauthorized entry.	3.2.1 - Access and Security 5.5 - Security Fence
b. An attendant shall be on duty at the site at all times while it is open for public use to ensure compliance with operational requirements.	1.3.9 - Responsibilities 3.2.2 - Access and Security
c. The access road to the site shall be of all-weather construction and maintained in good condition.	5.1 - Landfill Access Ramp 5.6.1 - Roadways
d. Dust control measures shall be implemented where necessary.	3.1.4 - General (Landfill Operation)
9. Sign Requirements	
a. Signs providing information on dumping procedures, the hours during which the site is open for public use, the permit number and other pertinent information shall be posted at the site entrance.	3.2.2 - Access and Security 3.2.3 - Access and Security
b. Signs shall be posted stating that no hazardous or liquid waste can be received without written permission from the Division.	2.1 - Waste Acceptance Table 2.1 Table 2.2
c. Traffic signs or markers shall be provided as necessary to promote an orderly traffic pattern to and from the discharge area and to maintain efficient operating conditions.	3.2.3 - Access and Security
10. Safety Requirements	
a. Open burning of solid waste is prohibited.	3.1.6 - General (Landfill Operation)
b. Equipment shall be provided to control accidental fires or arrangements shall be made with the local fire protection agency to immediately provide fire-fighting services when needed.	3.1.6 - General (Landfill Operation)
c. Fires that occur at a sanitary landfill shall be reported to the Division within 24 hours and a written notification shall be submitted within 15 days.	3.1.6 - General (Landfill Operation)
d. The removal of solid waste from a sanitary landfill is prohibited unless the owner/operator approves and the removal is not performed on the working face.	2.1.3 - Waste Acceptance
e. Barrels and drums shall not be disposed of unless they are empty and perforated sufficiently to ensure that no liquid or hazardous waste is contained therein.	2.7.1 - Empty Container Disposal 2.7.3 - Empty Container Disposal 2.7.4 - Empty Container Disposal
11. Waste Acceptance and Disposal Requirements	
a. A site shall only accept those solid wastes which it is permitted to receive. The landfill operator shall notify the Division within 24 hours of attempted disposal of any waste the landfill is not permitted to receive, including waste from outside the area the landfill is permitted to serve.	2.1.1 - Waste Acceptance 2.1.2 - Waste Acceptance Table 2.1 - Wastes Permitted for Landfill Disposal
b. No hazardous or liquid waste shall be accepted or disposed of in a sanitary landfill.	2.1.1 - Waste Acceptance 2.1.2 - Waste Acceptance Table 2.1
c. Spoiled foods, animal carcasses, abattoir waste, hatchery waste, and other animal waste delivered to the disposal site shall be covered immediately.	2.1.1 - Waste Acceptance 2.10 - Fish Waste Table 2.1
d. Asbestos waste that is packaged in accordance with 40 CFR 61, which is adopted by reference in accordance with G.S. 150B-14(c), may be disposed of separate and apart from other solid wastes at the bottom of the working face or in an area not contiguous with other disposal areas, in either case, in virgin soil. Separate areas shall be clearly marked so that asbestos is not exposed by future land-disturbing activities. The waste shall be covered immediately with soil in a manner that will not cause airborne conditions. Copies of 40 CFR 61 may be obtained and inspected at the Division.	2.5 - Asbestos Disposal 2.5.2.1 - Asbestos Disposal (Waste Disposal) 2.5.2.2 - Asbestos Disposal (Waste Disposal)
e. Wastewater treatment sludges may only be used as a soil conditioner and incorporated into the final two feet of cover. Sludges shall be examined for acceptance by Waste Determination procedures in Rule .0103(e) of this Subchapter.	2.6 Sludge Disposal
12. Miscellaneous Requirements	
a. Effective vector control measures shall be applied to control flies, rodents, and other insects or vermin when necessary.	3.1.5 - General (Landfill Operation)
b. Appropriate methods such as fencing and diking shall be provided within the area to confine solid waste subject to be blown by the wind. At the conclusion of each day of operation, all windblown material resulting from the operation shall be collected and returned to the area by the owner or operator.	3.1.3 - General 3.1.5 - General

GROUNDWATER MONITORING PROGRAM
SAMPLING AND ANALYSIS PLAN

MCGUIRE NUCLEAR STATION

LANDFILL #2 (SYNTHETICALLY LINED)
PERMIT NO. 6004-INDUS

Prepared for:
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Charlotte, North Carolina

March 28, 2014

REPORT VERIFICATION

PROJECT: **GROUNDWATER MONITORING PROGRAM**
MCGUIRE NUCLEAR STATION
LANDFILL #2 (SYNTHETICALLY LINED)
PERMIT NO. 6004-INDUS

TITLE: **SAMPLING AND ANALYSIS PLAN**

This document has been reviewed for accuracy and quality commensurate with the intended application.

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GROUNDWATER MONITORING PROGRAM
SAMPLING AND ANALYSIS PLAN
MCGUIRE NUCLEAR STATION
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1. Site Location Map
2. Sample Locations
3. Typical Monitoring Well Construction Details
4. Example Groundwater Monitoring Data Sheet
5. Example Field Sampling Calibration Form
6. Chain-of-Custody Record and Analysis Request Form
7. North Carolina Groundwater Sampling Site Checklist

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1. Monitoring Well Information
2. Sample Parameters, Analytical Methods, and Detection Limits
3. Radiological Sample Parameters
4. Sample Containers, Preservatives, and Holding Times

APPENDICES

A. Boring Logs and Monitoring Well Construction Records

Section 1
Program Description

1.1 Scope of Work

The McGuire Nuclear Station (MNS) Landfill #2 (Synthetically Lined)[1] is located at the Duke Energy Carolinas, LLC (Duke Energy) McGuire Nuclear Station near Huntersville in Mecklenburg County, North Carolina. The North Carolina Department of Environment and Natural Resources (NCDENR) Division of Waste Management (DWM) requires groundwater monitoring to determine the effects of the facility on groundwater in the area. In addition to the groundwater monitoring requirements of the DWM, radiological sampling and analyses will be conducted in accordance with requirements of the current Radioactive Materials License No. 060-0379-7 issued by the North Carolina Department of Health and Human Services Radiation Protection Section.

This Groundwater Monitoring Program Sampling and Analysis Plan (SAP) is designed to address the Duke Energy Permit to Operate requirement for groundwater monitoring around MNS Landfill #2 (Synthetically Lined), Permit Number 6004-INDUS. Duke Energy previously submitted a SAP for this landfill in February 2009. This revised and updated SAP supersedes the previously submitted SAP.

This SAP has been prepared according to the guidelines set forth by the North Carolina Water Quality Guidance Document for Solid Waste Facilities (SW-1001-87) and by the EPA, Region IV, in "Environmental Investigations, Standard Operating Procedures and Quality Assurance Manual." It documents the methodologies of field sampling, record-keeping protocols, data quality objectives, and data validation procedures that will be used in the MNS groundwater monitoring program.

[1] In response to the North Carolina Division of Public Health, Radiation Protection Section, November 17, 2006 letter to Duke Energy, LLC, Duke Energy offered to indicate the McGuire Nuclear Station Landfill #2 as "(Synthetically Lined)" in reports.

1.2 Background and Site Hydrogeological Description

The MNS Landfill #2 is permitted by the NCDENR DWM under Permit No. 6004-INDUS. The landfill is permitted to accept waste generated by Duke Energy as specified by the Operations Plan. In general, these wastes are:

- Asbestos
- Insulation (non-asbestos)
- Conventional wastewater sludge
- Empty containers
- Petroleum product spill cleanup materials
- Oil contaminated materials (filters, rags, brush, shrubs)
- Fish waste
- Non-hazardous excess, obsolete, expired chemicals

The landfill was constructed with a high-density polyethylene (HDPE) synthetic liner and leachate collection and removal system. Leachate and contact stormwater are collected in a lined leachate collection basin and pumped to the MNS wastewater treatment system. The landfill first accepted waste in 1999.

The limit of waste for the landfill has an area of approximately 5 acres. The landfill and nearby area are portrayed on Figure 1. The approximate limit of waste is shown on Figure 2.

The landfill is located south of North Carolina Highway 73, north of Cashion Road, and to the west of Linderman Road. Cashion Road runs along a surface water divide with surface flow draining to the northwest and to the southeast. A surface water drainage feature is located to the northeast of the landfill. This feature drains to the northwest, to a perennial unnamed stream, and then to the Catawba River.

Based on the well construction and boring logs (see Appendix A), the subsurface conditions in the landfill area consist of residual soils and partially to fully weathered rock (saprolite) which have formed by the in-place weathering of the parent rock.

The landfill site is located in the Piedmont physiographic province (Piedmont). The following generalizations on the site hydrogeology are taken from "A Master Conceptual Model for Hydrogeological Site Characterization in the Piedmont and Mountain Region of North Carolina" (LeGrand 2004).

Piedmont bedrock primarily consists of igneous and metamorphic bedrock. The fractured bedrock is overlain by a mantle of unconsolidated material known as regolith. The regolith includes, where present, the soil zone, a zone of weathered decomposed bedrock known as saprolite, and alluvium. Saprolite, the product of chemical and mechanical weathering of the underlying bedrock, is typically composed of clay and coarser granular material up to boulder size, and may reflect the texture of the rock from which it was formed. The weathering product of granitic rocks may be quartz-rich and sandy-textured, whereas rocks poor in quartz and rich in feldspar and other soluble minerals form a more clayey saprolite. The regolith serves as the principal storage reservoir for the underlying bedrock. (LeGrand 2004)

A transition zone may occur at the base of the regolith between the soil-saprolite and the unweathered bedrock. This transition zone of partially weathered rock is a zone of relatively high permeability compared to the overlying soil-saprolite and the underlying bedrock. (LeGrand 2004)

Groundwater flow paths in the Piedmont are almost invariably restricted to the zone underlying the topographic slope extending from a topographic divide to an adjacent stream. LeGrand describes this as the local slope aquifer system. Under natural conditions, the topography of the water table is similar to that of the land surface. (LeGrand 2004)

Groundwater recharge in the Piedmont is derived entirely from infiltration of local precipitation. Groundwater recharge occurs in areas of higher topography (i.e., hilltops) and groundwater discharge occurs in lowland areas bordering surface water bodies, marshes, and floodplains. (LeGrand 2004)

Groundwater flow in the area of the landfill is generally from the southeast end of the landfill toward the northwest and toward the unnamed stream. Groundwater flow on the east side of the

landfill is towards the northeast, toward wells MW-6, MW-6A, and MW-10A, and the surface water drainage feature located northeast of the wells.

1.3 Well Locations and Installation

The groundwater in the vicinity of the landfill is monitored through a series of 11 monitoring wells installed to determine groundwater quality in the vicinity of the landfill. With the exception of monitoring well MW-10A, the wells are installed as well pairs with one shallow well and one deeper well adjacent to one another. The monitoring well designated with an "A" is the deeper well in each well pair. Monitoring wells MW-5 and MW-5A are located up-gradient of the landfill area and monitoring wells MW-6, MW-6A, MW-7, MW7-A, MW-8, MW-8A, MW-9, MW-9A, and MW-10A are located down-gradient or cross-gradient of the landfill (Figure 2). In addition, leachate is sampled from the end of the in-flow pipe to the leachate collection pond and surface water is monitored at locations SW-1 and SW-2 (Figure 2). Well elevations and North Carolina State Plane Coordinates are shown in Table 1.

Each of the shallow monitoring wells is screened to intercept the water table and the deep monitoring wells are screened to monitor groundwater deeper in the aquifer above the top of bedrock. These wells are constructed of 2-inch-diameter polyvinyl chloride (PVC) well screen and casing. All wells are Type II monitoring wells installed by a North Carolina registered driller in accordance with applicable NCDENR regulations. A typical monitoring well construction detail is included as Figure 3. The wells screen lengths are shown in Table 1. Well construction records for the monitoring wells are included in Appendix A (Note: With the exception of MW-10A, the monitoring wells at MNS Landfill #2 were re-numbered after the installation of the monitoring wells at MNS Landfill #1. The boring logs and well construction records for monitoring wells MW-5/5A, MW-6/6A, MW-7/7A, MW-8/8A, and MW-9/9A are identified as MW-1/1A, MW-2/2A, MW-3/3A, MW-4/4A, and MW-5/5A, respectively). All wells are equipped with dedicated pump systems.

A brief description of the monitoring locations and their monitoring function is provided below.

Monitoring Wells MW-5 and MW-5A

Monitoring wells MW-5 and MW-5A are located to the south/southeast of the landfill at the approximate limit of waste and inside the Review Boundary. Monitoring well MW-5 is screened to monitor groundwater in the saprolite layer. Monitoring well MW-5A is screened to monitor groundwater in the partially weathered rock/bedrock layer (transition zone).

Monitoring Wells MW-6 and MW-6A

These monitoring wells are located northeast of the landfill at the approximate Review Boundary and within the Compliance Boundary. Monitoring well MW-6 is screened to monitor groundwater in the saprolite layer. Monitoring well MW-6A is screened to monitor groundwater in the transition zone.

Monitoring Wells MW-7 and MW-7A

These monitoring wells are located west/northwest of the landfill, at the approximate Compliance Boundary. Monitoring well MW-7 is screened to monitor groundwater in the saprolite layer. Monitoring well MW-7A is screened to monitor groundwater in the transition zone.

Monitoring Wells MW-8 and MW-8A

These monitoring wells are located north of the landfill between the limit of waste and the Review Boundary. Monitoring well MW-8 is screened to monitor groundwater in the saprolite layer. Monitoring well MW-8A is screened to monitor groundwater in the transition zone.

Monitoring Wells MW-9 and MW-9A

These monitoring wells are located west of the landfill outside of the Compliance Boundary and adjacent to and downgradient from the leachate collection basin. Monitoring well MW-9 is screened to monitor groundwater in the saprolite layer. Monitoring well MW-9A is screened to monitor groundwater in the transition zone.

Monitoring Well MW-10A

This monitoring well is located east of the landfill between the Review Boundary and the Compliance Boundary. Monitoring well MW-10A is screened to monitor groundwater in the transition zone.

1.4 Surface Water Sample Locations

Surface water samples will be collected from two locations, SW-1 and SW-2, as shown on Figure 2. Surface water sample location SW-1 is located in the unnamed stream north of the landfill and will be used as the background surface water sample location for this monitoring program. Surface water sample location SW-2 is also located in this unnamed stream downstream from SW-1 and west of the landfill. The unnamed stream drains to the west to the Catawba River. Analytical results from these locations will be compared to Title 15A, North Carolina Administrative Code, Subchapter 2B Standards (2B Standard).

1.5 Leachate Sample Location

The leachate sample is collected from the outfall of the leachate pipe which conveys leachate from the landfill to the leachate collection basin (Figure 2).

1.6 Monitoring Frequency

The monitoring wells, surface water sample locations, and leachate will be sampled semiannually in June and December. Sampling results will be submitted to the State within 90 days of sampling.

1.7 Sample Parameters and Methods

The parameters to be sampled, units of measure, analytical methods, and NCDENR Solid Waste Section Limits (SWSLs) are presented in Table 2. Radiological analyses and units of measure are shown in Table 3.

1.8 Data Quality Objectives

The overall Quality Assurance (QA) objective is to ensure that reliable data of known and acceptable quality are provided. All measurements will be documented to yield results that are representative of the groundwater and surface water quality. Data will be calculated and reported in units as required by NCDENR.

The analytical QA objectives for precision, accuracy, and completeness have been established by the laboratory(s) in accordance with EPA or other accepted agencies for each measurement variable where possible. The objectives are outlined in the Duke Energy Analytical Laboratory Procedures Manual and are available upon request.

As required by the Solid Waste Section Memorandum Regarding New Guidelines for Electronic Submittal of Environmental Data, dated October 27, 2006, data will be reported to laboratory-specific method detection limits and will be quantifiable at or below the Solid Waste Section Limit (SWSL) for both groundwater and surface water. Appropriate methods have been selected to meet applicable standards for groundwater quality. Instances may occur, however, in which the condition of the sample will not allow detection of the desired limits for various parameters either because of matrix interference or high analyte concentrations requiring sample dilution. The laboratory(s) will provide sufficient documentation with each data package to notify reviewers about any analytical problems with the data, if needed.

Section 2

Sampling Procedures

2.1 Sampling Equipment

Development, purging, and sampling equipment shall be selected to ensure materials are compatible with the sample parameters and comply with state and federal regulatory requirements for sampling. Positive-gas-displacement fluorocarbon resin bladder pumps are installed in each monitoring well as dedicated purging and sampling systems.

2.1.1 Equipment Cleaning Procedures

Dedicated sampling equipment has been installed in each monitoring well. In the event non-dedicated equipment is used between monitoring wells, equipment will be cleaned before and after use in each well in accordance with standard EPA-approved cleaning procedures for field equipment. This standard is outlined in the "Standard Operating Procedures and Quality Assurance Manual," Engineering Support Branch, EPA Region IV, February 1, 1991.

2.2 Groundwater Sampling

2.2.1 Development of Monitoring Wells

All 11 monitoring wells addressed in this sampling plan have been developed.

If new monitoring wells are installed, they will be developed prior to initial sampling. Development removes silt that has settled into the bottom of the well following installation and removes fine silt and clay particles from the well screen and sand-pack surrounding the screen. Well development is necessary to eliminate potential clogging and enhance well performance. Development involves removing an estimated ten or more well volumes from the well using a positive-gas-displacement fluorocarbon resin bladder pump with up-and-down agitation to

loosen particles from the well screen. After development of a well, a true well depth is recorded referenced to the well top of well casing (TOC).

2.2.2 Groundwater Level and Total Depth Measurements

Water level measurements shall be collected and recorded to determine the groundwater elevations and groundwater flow direction and to calculate the volume of standing water in the well. All monitoring wells have been surveyed to determine the elevation of the TOC. All depth and water level measurements shall be referenced to the TOC and recorded to the nearest one-hundredth of a foot.

Water level measurements shall be made with an electronic measuring device consisting of a spool of dual-conductor wire and sensor. When the sensor comes in contact with water, the circuit is closed and a meter light and/or buzzer is attached to the spool to signal the contact. The sensor is lowered further until it rests on the bottom of the well to determine the total depth of the well reference to the TOC. The depth and water level measurements shall be used to verify that the well has not filled with silt and to calculate the volume of water in the well.

The volume of well water (in gallons) is calculated using the following equation:

$$V = h * \pi r^2 * (7.48052 \text{ gal/ft}^3)$$

Where:

V = volume of water in the well screen and casing (gallons)

h = height of standing water (feet) = total well depth - water level

r = radius of well casing (feet)

For example, a 2-inch-diameter casing will have a volume of 0.1631 gallons/foot.

In dedicated sampling systems, an accurate well depth is determined, as indicated above, after development of the well and prior to installation of the dedicated bladder pump. The well depth will be re-measured any time the dedicated sampling system is removed for repair or

replacement. The well depth, water level measurement, and calculated well volume shall be recorded on the Groundwater Monitoring Data Sheet (Figure 4).

2.2.3 Well Purging and Sampling

The selection of purging technique is dependent on the hydrogeologic properties of the aquifer and hydraulic characteristics of each well. Hydraulic conductivity, water column, well volume, screen length, and other information are evaluated to select the purging technique to acquire groundwater representative of the aquifer conditions. The Groundwater Monitoring Data Sheet (Figure 4) is used to record purging methods and measurements.

A multi-parameter water quality monitoring instrument is used to measure field stabilization or indicator parameters for determining representative groundwater during purging. These instruments measure pH, specific conductance, temperature, dissolved oxygen (DO), and oxidation-reduction potential (ORP). Instrument calibration must be performed and documented before and after each sampling event. The pH subsystem will be calibrated with two pH standards (pH 7.0 and 4.0) bracketing the expected groundwater pH. The specific conductance subsystem will be calibrated using two standards bracketing the expected groundwater conductivity. Calibration results will be recorded on a Field Sampling Calibration Form (Figure 5).

Various well purging techniques are described below. The purging method utilized at any particular well will be selected after considering the characteristics of the well and the purging method(s) used during previous sampling events.

<u>Conventional Purging</u>

This technique entails removing one equivalent well volume and measuring the indicator parameters (temperature, pH, and specific conductance). When the parameters have stabilized to within ±0.2 pH units and ±10 percent for temperature and conductivity over three to five well volumes, representative groundwater has been achieved for sampling. It is acceptable to begin sampling after five complete well volumes have been removed, even when indicator parameters have not stabilized. Groundwater is pumped into a graduated container to measure the volume of

water purged. Under normal rates of recovery, samples should be collected immediately after purging in accordance with EPA guidelines.

For low-yield wells incapable of yielding three to five well volumes in a reasonable amount of time (e.g., 2 hours or less), groundwater is purged to the elevation of the pump intake while measuring indicator parameters. Typically, low-yield wells are evacuated to dryness one time and sampled when sufficient water level recovery occurs.

Low-Flow Purging

Low-flow purging and sampling are appropriate when the recharge rate of the well approximates or equals the discharge rate of the pump with minimal drawdown of the water column (≤ 1 foot). During low-flow purging and sampling, groundwater is pumped into a flow-through chamber at flow rates that minimize or stabilize water level drawdown within the well. Indicator parameters are measured over time (usually at 5-minute intervals). When parameters have stabilized within ±0.2 pH units and ±10 percent for temperature, conductivity, and DO, and ±10 millivolts (mV) for ORP over three consecutive readings, representative groundwater has been achieved for sampling. Turbidity is not included as a stabilization parameter, but turbidity levels of 10 nephelometric turbidity units (NTU) or less should be targeted.

Modified Low-Flow Purging

This technique is considered a viable option particularly in the Piedmont region due to the likely presence of fine-grained soils where water level drawdown cannot be stabilized while pumping. When the well recharge rate is less than the pump discharge rate, excessive drawdown (> 1 foot) of the water column occurs and mixes with stagnant water located above the screened interval. One equivalent well volume is removed initially before measuring indicator parameters. Frequently, removal of the initial well volume reduces the hydraulic head and allows for matching of the recharge rate with the pumping rate providing stabilization of drawdown. Indicator parameters should be measured at 5-minute intervals using a flow-through chamber attached to a multi-parameter water quality instrument. When parameters have stabilized to within ±0.2 pH units, ±10 percent for temperature, conductivity, and DO, and ±10 mV for ORP over three consecutive readings, representative groundwater has been achieved for sampling.

Turbidity is not included as a stabilization parameter, but turbidity levels of 10 NTU or less should be targeted.

Very Low Yield Well Purging

This technique provides the best option for monitoring wells that historically purge to dryness and do not sufficiently recharge to provide adequate volume for sample collection. The volume of the pumping system (i.e., the pump bladder, tubing, and flow-through chamber) is calculated for removal. Wells that yield less than 100 milliliters per minute (mL/min) frequently incur significant drawdown during well purging. Therefore, if the well yield is less than 100 mL/min, the volume of the pumping system (i.e., the pump bladder, tubing, and flow-through chamber) shall be calculated and two pumping system volumes shall be removed. Indicator parameters will be measured and recorded initially, and then sample collection will begin.

2.3 Surface Water Sampling

Surface water samples will be collected using techniques and equipment that preserve characteristics of the water body being investigated and minimize the chance for sample contamination. Typically, samples shall be collected by grab or peristaltic pump.

When filling a sample container by grab, always use new, clean, non-powdered nitrile gloves. Grasp the sample container by the lower half and position the container opening to face upstream. When using a peristaltic pump to collect a surface water sample, position the intake opening above the stream bottom to minimize the potential for collecting sediment. Run the pump for several minutes to ensure representative water is being collected after positioning the intake opening.

2.4 Sample Collection

Groundwater samples are collected after representative groundwater has been determined by purging and stabilizing the indicator parameters.

Surface water samples are "grab" samples collected to the extent possible at mid-depth in the middle of the stream in an area that exhibits the greatest degree of cross-sectional homogeneity. The leachate sample is collected from the outfall of the leachate pipe which conveys leachate from the landfill to the leachate collection basin

Sampling personnel wear clean, disposable, non-powdered nitrile gloves at each location. Samples are collected in the order of the volatilization sensitivity of the parameters:

- Volatile Organic Compounds (VOCs) and TPH
- Metals
- Sulfate, Chloride
- Radiological (gross alpha and beta, gamma spectroscopy, and tritium)

After collection, samples will be preserved and stored according to parameter specific methods and delivered to the laboratory under proper Chain-of-Custody procedures. All pertinent notations, water-level measurements, removed well volumes, and indicator parameters shall be documented on the Groundwater Monitoring Data Sheet (Figure 4).

2.5 Sample Containers, Volume, Preservation, and Holding Time

All sample containers supplied by the laboratory for the collection of groundwater, surface water, and leachate samples shall be new and pre-cleaned as approved by EPA procedures appropriate for the parameters of interest. Table 4 summarizes the sample containers, sample volume, preservation procedures, and holding times required for each type of sample and parameter. Sample containers will be kept closed until used. All sample containers will be provided by Duke Energy or vendor laboratories.

2.6 Sample Tracking

The Chain-of-Custody (COC) procedures allow for tracing the possession and handling of individual samples from the time of field collection through laboratory analysis and report

preparation. Samples shall be pre-logged prior to sample collection. This process assigns a unique tracking number for each sample and generates corresponding labels. An example of the COC Record is provided as Figure 6.

2.7 Sample Labeling

Sample containers shall be pre-labeled and organized prior to field activities as part of the pre-sampling staging process. As samples are collected, the sampling personnel shall write the following information directly on the label: sampling date and time, and initials of sample collector. This information is also recorded on the Groundwater Monitoring Data Sheet (Figure 4) and the COC Record (Figure 6).

2.8 Field Documentation

Field documentation from each sampling event is recorded on the Groundwater Monitoring Data Sheets (Figure 4), the Field Sampling Calibration Form (Figure 5), and the Chain-of-Custody Record (Figure 6). Additionally, a Groundwater Sampling Site Checklist (Figure 7) is completed indicating information of the monitoring well such as proper identification (ID) tag and condition of protective casing and pad. Field notations shall be made during the course of the field work to document the following information:

- Identification of well
- Well depth
- Static water level depth and measurement technique
- Presence of immiscible layers and detection method
- Well yield – high or low
- Purge volume or pumping rate
- Sample identification numbers
- Well evacuation procedure/equipment
- Sample withdrawal procedure/equipment
- Date and time of collection

- Types of sample containers used
- Identification of replicates or blind samples
- Preservative(s) used
- Parameters requested for analysis
- Field analysis data and methods
- Sample distribution and transporter
- Field observations during sampling event
- Name of sample collector(s)
- Climatic conditions including estimate of air temperature

This information will be entered on the Groundwater Monitoring Data Sheets (Figure 4), the Field Sampling Calibration Form (Figure 5), or the Chain-of-Custody Record and Analysis Request Form (Figure 6) which are filled out for each sampling event. These documents will be arranged and filed by project and date. Recorded entries will be made on electronic forms or on paper forms in indelible ink. Errors on paper documents will be corrected by drawing a line through the error, initialing and dating the correction, and starting a new entry on the next line (if necessary).

2.9 Chain-of-Custody Record

The COC record (Figure 6) accompanies the sample(s), traces sample possession from time of collection to delivery to the laboratory(s), and clearly identifies which sample containers have been designated for each requested analysis. The record includes the following types of information:

- Sample identification number
- Signature of collector
- Date and time of collection
- Sample type (e.g., groundwater, immiscible layer)
- Identification of well
- Number of containers
- Parameters requested for analysis

- Preservative(s) used
- Signature of persons involved in the chain of possession
- Inclusive dates of possession

2.10 Sample Custody, Shipment, and Laboratory Receipt

For the purpose of these procedures, a sample is considered in custody if it is:

- In actual possession of the responsible person
- In view, after being in physical possession
- Locked or sealed in a manner so that no one can tamper with it after having been in physical custody or in a secured area restricted to authorized personnel

All samples shall be maintained in the custody of the sampling crew during the sampling event. At the end of each sampling day and prior to the transfer of the samples off site, entries shall be completed on the COC for all samples. Upon transfer of custody, the COC form is signed by a sampling crew member, including the date and time. If outside vendor laboratories are utilized, samples shall be delivered to these facilities by Duke Energy personnel or courier.

All COC forms received by the laboratory(s) shall be signed and dated by the respective supervising scientist(s) or their designee (at the Duke Energy lab) or the laboratory sample custodian (at vendor labs) immediately following receipt by the laboratory.

The analysts at the laboratory(s) maintain a sample-tracking record that will follow each sample through all stages of laboratory processing. The sample tracking records show the date of sample extraction or preparation and analysis. These records are used to determine compliance with holding time limits during lab audits and data validation.

Custody procedures followed by Duke Energy laboratory personnel are described in detail in the Duke Energy Laboratory Services Procedures Manual.

Section 3
Analytical Procedures

The main analytical laboratory used in this program is the Duke Energy Laboratory Services Laboratory: N.C. Drinking Water (NC37804) and Wastewater (#248) Certifications. The organizational structure and staff qualifications of the laboratory are discussed in its generic Quality Assurance Program (QAP). The QAP and the Analytical Laboratory Procedures Manual are available for review upon request.

Vendor laboratories that meet EPA and North Carolina certification requirements may be used for analyses with approval by Duke Energy.

The analytical procedures used for this Groundwater Monitoring Program are listed in Table 3. Specific conductance, field pH, and temperature are measured in the field according to the Duke Energy Groundwater Monitoring and Sample Collection Procedure or the instrument manufacturer instructions.

Section 4
Internal Quality Control Checks

Internal laboratory quality control (QC) checks used by the laboratories are described in each laboratory's generic QAP and procedures manual. Using the internal laboratory QC checks, the laboratories demonstrate the ability to produce acceptable results using the methods specified.

Internal quality control checks for sampling procedures and laboratory analyses will be conducted with each sampling event. These checks will consist of the preparation and submittal of field blanks, trip (travel) blanks, and/or field replicates for analysis of all parameters at frequencies described in the laboratory(s) procedures manuals.

The field QC blanks and replicates that may be included as internal QC checks are described below. The specific type and number of blanks used may vary depending on the sampling event and will be determined by the Duke Energy field sampling personnel:

- **Field Blanks**: A field blank consists of a sample container filled in the field with organic-free, deionized, or distilled water prepared and preserved in the same manner as the samples. The field blank is transported to the laboratory with the samples and analyzed along with the field samples for the constituents of interest to check for contamination imparted to the samples by the sample container, preservative, or other exogenous sources. Field blanks are typically utilized for each sampling event. The Field Blanks are typically analyzed for major anions and cations and metals.
- **Trip Blanks**: A trip (travel) blank is a sample container filled with organic-free water in the laboratory that travels unopened with the sample bottles. Trip blanks are typically utilized when sampling for volatile organic compounds. The Trip Blank is returned to the laboratory with the field samples and analyzed along with the field samples for parameters of interest.
- **Equipment Blanks**: If non-dedicated equipment is used between wells, it is recommended that equipment blanks be collected. The field equipment is cleaned following documented cleaning protocols. An aliquot of the final control rinse water is passed over the cleaned equipment directly into a sample container and submitted for analyses.

- **Field Replicates**: A field replicate is a duplicate sample prepared at the sampling locations from equal portions of all sample aliquots combined to make the sample. Both the field replicate and the sample are collected at the same time, in the same container type, preserved in the same way, and analyzed by the same laboratory as a measure of sampling and analytical precision.

Section 5
Validation of Field Data Package

The field data package includes all of the field records and measurements developed by the sampling team personnel. The field data package validation will be performed by Duke Energy personnel. The procedure for validation consists of the following:

- A review of field data contained on the Groundwater Monitoring Data Sheets for completeness.
- Verification that equipment blanks, field blanks, and trip blanks were properly prepared, identified, and analyzed.
- A check of the Field Sampling Calibration Form for equipment calibration and instrument conditions.
- A review of the Chain-Of-Custody Record for proper completion, signatures of field personnel and the laboratory sample custodian, dates and times, and for verification that the correct analyses were specified.

Section 6
Validation of Laboratory Data

The laboratory will perform a validation review of the submitted samples and analytical results to ensure that the laboratory QA/QC requirements are acceptable.

Section 7

Report Submittal

7.1 Report Submittal to DWM

A report of monitoring results will be submitted to the DWM within 90 days following the date of sampling. The report submittal will consist of the following:

- Environmental Monitoring Reporting Form (DENR Form)
- Table of results and discussion of Title 15A, North Carolina Administrative Code, Subchapter 2L Standards (2L Standard) and 2B Standard Exceedances
- Generalized Groundwater Contour Map
- Electronic Data Deliverable (EDD) in Excel Format

DWM will be notified in the event that vendor lab analyses have not been completed within this time frame. All Groundwater Monitoring Data Sheets, Field Calibration Forms, Chain-of-Custody Records, Laboratory QA data, and Data Validation Checklists shall be kept on file by Duke Energy and are available upon request.

7.2 Report Submittal to Health and Human Services Radiation Protection Section

As described in Section 1.1, radiological sampling and analyses will be conducted in accordance with requirements of the current Radioactive Materials License No. 060-0379-7 issued by the North Carolina Department of Health and Human Services Radiation Protection Section.

A copy of the report containing the monitoring results will be submitted to the North Carolina Department of Health and Human Services Radiation Protection Section within 90 days following the date of the sampling event.

Section 8
References

LeGrand Sr., Harry E. 2004. A Master Conceptual Model for Hydrogeological Site Characterization in the Piedmont and Mountain Region of North Carolina, a Guidance Manual.

FIGURES

NOTES:
SOURCE: USGS TOPOGRAPHIC MAP - LAKE NORMAN SOUTH QUADRANGLE. CREATED 2011.

SCALE (FEET)
1,000 0 1,000 2,000

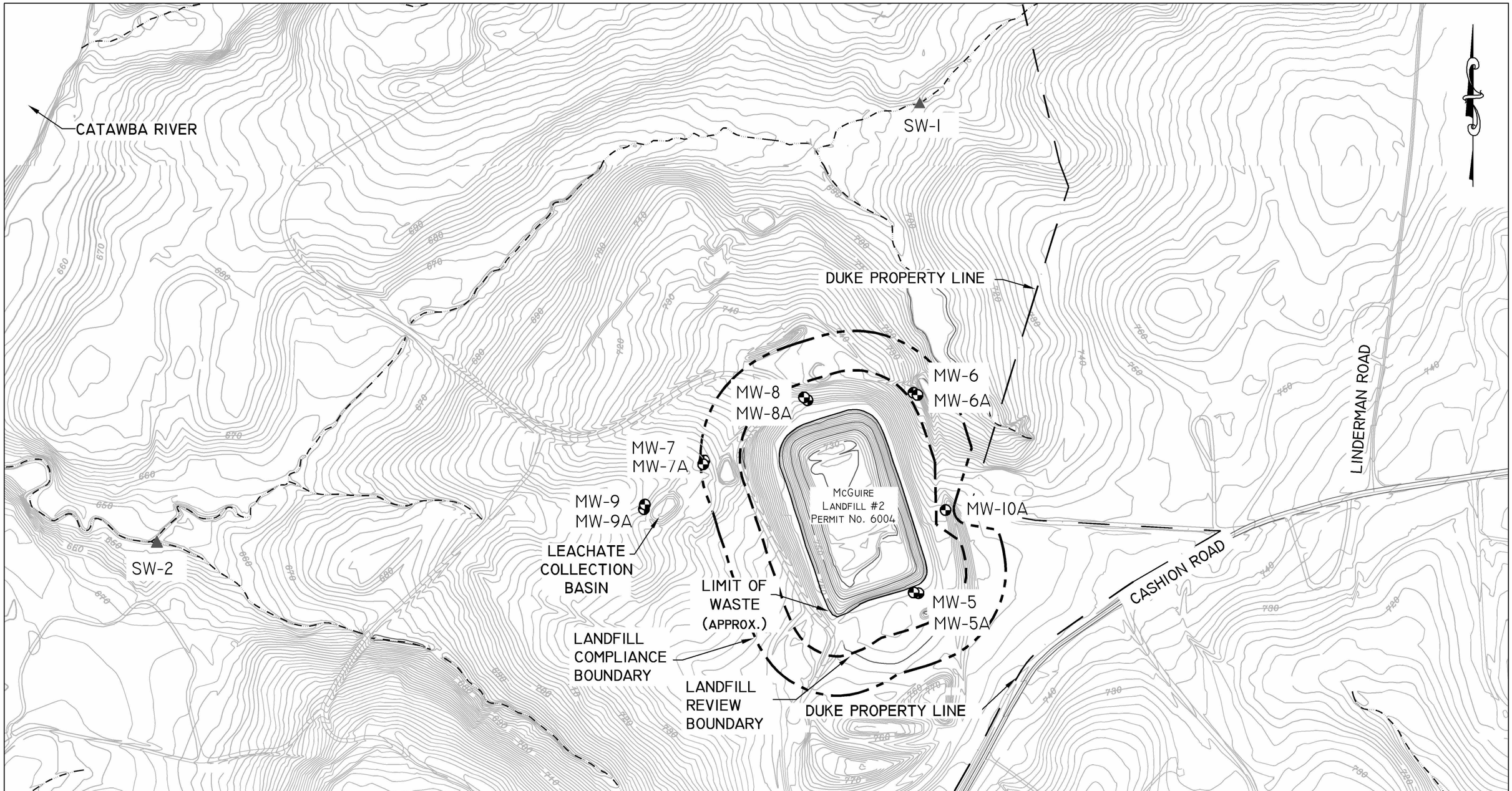
HDR
HDR Engineering, Inc. of the Carolinas
License Number: F-0116
440 South Church Street Charlotte, NC 28202

SITE LOCATION MAP
MCGUIRE NUCLEAR STATION
LANDFILL #2 (SYNTHETICALLY LINED)
PERMIT NO. 6004-INDUS

DATE
MARCH 28, 2014

FIGURE
1

C:\pwworking\tpa\d0388545\Site Location Map.dwg



BASE MAP AND STREAM DATA PROVIDED BY DUKE ENERGY CAROLINAS, LLC.

LEGEND

- GROUNDWATER MONITORING WELLS
- SURFACE WATER SAMPLE LOCATION
- APPROXIMATE LIMIT OF WASTE
- LANDFILL REVIEW BOUNDARY
- LANDFILL COMPLIANCE BOUNDARY
- DUKE PROPERTY BOUNDARY
- STREAM

SCALE (FEET)

150 0 150 300

HDR

HDR Engineering, Inc.
of the Carolinas

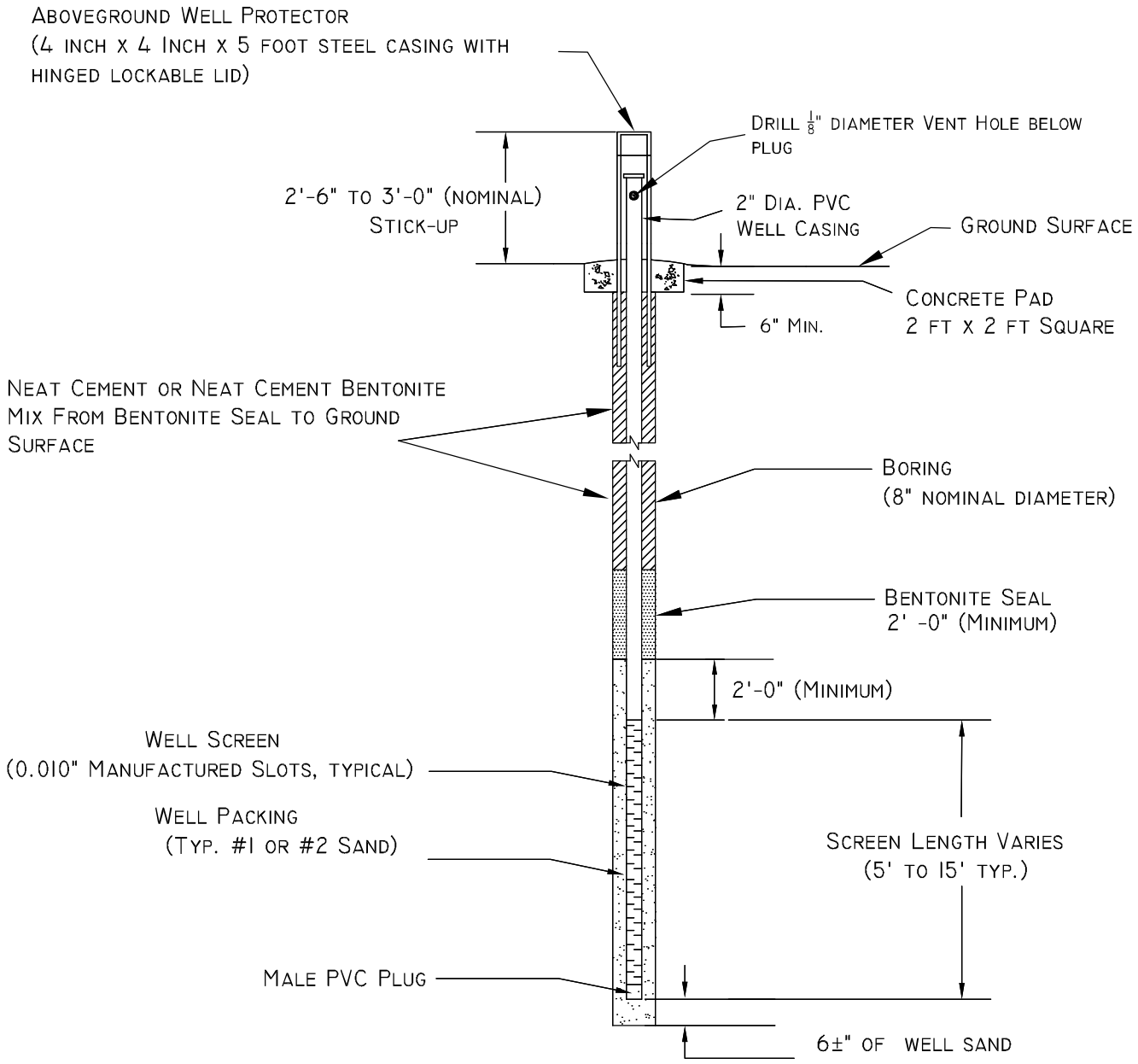
License Number: F-0116
440 S Church Street Charlotte, NC 28202

SAMPLE LOCATIONS
MCGUIRE NUCLEAR STATION
LANDFILL #2 (SYNTHETICALLY LINED)
PERMIT NO. 6004-INDUS

DATE
MARCH 28, 2014

FIGURE
2

C:\pwworking\tpa\d0388545\MNS LF #2.dwg



Typical Well Construction Details
(no scale)

INFORMATION PROVIDED BY DUKE ENERGY CAROLINAS, LLC

HDR

HDR Engineering, Inc.
of the Carolinas

License Number: F-0116
440 South Church Street Charlotte, NC 28202

TYPICAL MONITORING WELL CONSTRUCTION DETAILS

DATE
MARCH 28, 2014

FIGURE
3

C:\pwworking\tpa\d0548925\Figure 3 with HDR Title Block.dwg

DUKE ENERGY

GROUNDWATER MONITORING DATA SHEET
FOR CONVENTIONAL SAMPLING

PROCEDURE NO	3175.1

SITE NAME	McGUIRE NUCLEAR STATION	PERMIT #	6004-INDUS	SITE ID	N/A
PROJECT NAME	LANDFILL 2 GROUNDWATER MONITORING	FIELD CREW	LDC		
SAMPLING DATE(s)	☑ 11-Dec-2013 ☐ 12-Dec-2013 ☐ ☐	WELL/LOCATION NAME			

MONITORING WELL INFORMATION

WELL DIAMETER (in)	2	TOC ELEV (ft msl)	768.31	MIDDLE OF WETTED SCREEN (ft toc)	56.90
WELL DEPTH (ft TOC)	63.90	GS ELEV (ft msl)		PUMP INTAKE DEPTH (ft TOC)	62.90
SCREEN LENGTH (ft)	14.00	ELEV REF	NAVD 88	SCREEN INTERVAL (ft TOC)	49.90 TO 63.90

EQUIPMENT INFORMATION

LEVEL METER SERIAL#		SAMPLING EQUIPMENT	QED T1200	PURGE METHOD	
		TUBING DIAMETER (in)	1/2 OD	Conventional	

PUMP CONTROLLER SETTINGS								
PRESSURE	38	(psi)	RECHARGE	10	(sec)	DISCHARGE	5	(sec)

SAMPLING INFORMATION

INITIAL DEPTH TO WATER (ft TOC)		WATER COLUMN (ft)	
WATER ELEVATION (ft msl)		WELL VOLUME (gal)	
DETECTED ODOR	None	CONVERSION FACTOR	0.1631
APPEARANCE	Normal		

Well Volume = water column X conversion factor
(Conversion factor dependent on well diameter and selected well volume units)

PURGE VOLUME (gal)	WATER LEVEL AFTER PURGE * (ft)	COMPLETE EVACUATION (YES/NO)	☑ TEMP (deg C)	☑ SPECIFIC COND. (umho/cm)	☑ pH (SU)	☑ TURBIDITY (NTU)	☐ ORP (mV-NHE)	☐ DISSOLVED OXYGEN (mg/L)	☐ (gal) WELL VOL (recalculates on current water level)
							N/A	N/A	

TOTAL PURGE VOLUME	* Optional measurement to recalculate well volume when purging results in substantial drawdown of water column	SAMPLE COLLECTED BY	DATE	TIME	CHLORINE (mg/l)
0.00			12/11/2013	@	0

QC By:	

WELL CONDITION

PROTECTIVE CASING	Good Condition	
WELL PAD	Good Condition	
WELL CASING	Good Condition	
WELL TAG	Good Tag	

ADDITIONAL WELL CONDITION NOTES

SAMPLING NOTES

Figure 4: Example Groundwater Monitoring Data Sheet

FIELD SAMPLING CALIBRATION FORM

STUDY: McGUIRE NUCLEAR STATION - LANDFILL 2 GROUNDWATER MONITORING

DATE (s): | **SURFACE UNIT READER:**

COLLECTORS: | **SURFACE UNIT SERIAL #:**

ANALYZER MODEL#: | **ANALYZER SERIAL #:**

OTHER EQUIPMENT: TURBIDIMETER NO.1 - 3260.2 | **WEATHER CONDITIONS:**

PROCEDURE #: HYDROLAB 3210.5 **VALIDATED BY:**

Calibration Date / Time		DATE:		TIME:		DATE:		TIME:	
		BP (mmHg)				BP (mmHg)			
Parameter	**Calibation Standard**	**Instrument Value**		**Standard Value**	**Calibration Results**	**Instrument Value**		**Standard Value**	**Calibration Results**
SPEC. COND. (uS/cm)	SS SS SS	0.0	—/—▶ —▶ —/—▶	0.0 227 75	Instrument Zeroed	0.0	—/—▶ —▶ —/—▶	0.0 227 75	Zero Pass
pH (units)	B (7.00) B (4.00) B (10.00)		—▶ —▶ —/—▶ Buffer Temp.				—▶ —▶ —/—▶ Buffer Temp.		
Mid-Day Ck Time:	B (7.00)		—▶ Buffer Temp.						
☑ ORP (mV)	SS (7.00) SS (4.00)	N/A	—▶ —/—▶ ORP Temp.	285 462 25.00		N/A	—▶ —/—▶ ORP Temp.	285 462 25.00	
☑ DO (mg/L)	W W AW		—▶				—▶		
☑ TURB (ntu)	SS		—/—▶				—/—▶		
Temp Cert Device #									
TEMP (deg C)	NIST	N/A	—/—▶	N/A	Adjustment Not Available	N/A	—/—▶	N/A	Adjustment Not Available
AMMONIUM (mg/L)	SS SS	N/A N/A	—/—▶ —/—▶	N/A N/A		N/A N/A	—/—▶ —/—▶	N/A N/A	

INSTRUMENT MAINTENANCE	DATE / TIME
Conductance Subsystem	*pH Subsystem*
☐ Cleaned Electrodes ☐ Tested - OK ☐ See Notes	☐ Cleaned Electrodes ☐ Replaced ref Electrode KCL ☐ Replaced Ref. Electrode Tip ☐ Tested - OK ☐ See Notes
Dissolved Oxygen Subsystem	*Ammonium Subsystem*
☐ Replaced Teflon Membrane ☐ Replaced DO electrolyte ☐ Cleaned Electrode ☐ See Notes	☐ Cleaned Electrode Tip ☐ Installed New Electrode ☐ Removed Electrode / Installed Plug ☐ Tested - OK ☐ See Notes
Oxidation Reduction Subsystem	*Turbidity Subsystem*
☐ Cleaned Electrode ☐ Tested - OK ☐ See Notes	☐ Cleaned Electrode & Wiper ☐ Tested - OK ☐ See Notes
Temperature Subsystem	*Depth Subsystem*
☐ Cleaned Electrode ☐ Tested - OK ☐ See Notes	☐ Reset / Calibrated ☐ Tested - OK ☐ See Notes

KEY: B = Buffer; SS = Standard solution; W = Winkler; AW = Average Winkler; —▶ = Adjusted To; —/—▶ = Not Adjusted To; N/A = Not Applicable

NOTES:

FIGURE 5 - EXAMPLE FIELD SAMPLING CALIBRATION FORM

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST FORM

Duke Energy

For Detailed Instructions, see:
http://dewww/essenv/coc/

Duke Energy Analytical Lab Services
Mail Code MGO3A2 (Building 7405)
13339 Hagers Ferry Rd
Huntersville, N. C. 28078
(704) 875-5245
Fax: (704) 875-5038

Analytical Laboratory Use Only

LIMS #		Samples Originating From NC_√_ SC___
Logged By	Date & Time	SAMPLE PROGRAM: Groundwater _√_ NPDES ____ Drinking Water ____ UST ____ RCRA Waste
Vendor	Cooler Temp (C)	
PO #	[15]Preserv.:1=HCL 2=H_2SO_4 3=HNO_3 4=Ice 5=None	
MR #		

[19]Page __1__ of __1__

DISTRIBUTION
ORIGINAL to LAB,
COPY to CLIENT

Customer must Complete

1)Project Name		2)Phone No:
3)Client		4)Fax No:
5)Business Unit: 20036	6)Process:	7)Resp. To:
8)Project ID:	9)Activity ID:	10)Mail Code:

Customer to complete all appropriate NON-SHADED areas.

Customer to complete appropriate columns to right

LAB USE ONLY [11]Lab ID	[12]Chem Desktop No.	[13]Sample Description or ID	[14]Collection Information Date	Time	Signature	[17]Comp.	[18]Grab	[16]Analyses Required	[20]Total # of Containers
									6

Customer to sign & date below

21)Relinquished By	Date/Time	Accepted By	Date/Time
Relinquished By	Date/Time	Accepted By	Date/Time
Relinquished By	Date/Time	Accepted By	Date/Time
23)Seal/Locked By	Date/Time	Sealed/Lock Opened By	Date/Time
24)Comments			

Customer, important please indicate desired turnaround

[22]Requested Turnaround

14 Days ____√____

*7 Days _____

* 48 Hr _____

*Other _____

* Add. Cost Will Apply

FIGURE 6

NORTH CAROLINA GROUNDWATER SAMPLING SITE CHECKLIST

LOCATION / SITE McGuire Nuclear Station - Landfill #2 Groundwater Monitoring PERMIT # 6004-INDUS **SAMPLE DATE**
SITE CONTACT Robert Sapp, Eric Shook **FIELD CREW**
WEATHER
PAGE 1 OF 1

		MW-5	MW-5A	MW-6	MW-6A	MW-7	MW-7A	MW-8	MW-8A	MW-9	MW-9A	MW-10A	SW-1	SW-2	Leachate Pond		
ACCESS TO WELLS																	
Access cleared into well																	
Access cleared around well																	
Tall grass or weeds - needs mowing																	
Road washing out / muddy / needs grading																	
Fallen tree blocking access																	
WELL SECURITY																	
Well found locked																	
Well found unlocked																	
WELL LOCK CONDITION																	
Lock in good condition																	
Lock rusted, difficult to open / needs replacing																	
Replaced damaged lock																	
WELL CASINGS																	
Casing in good condition																	
Damaged casing / still functional																	
Damaged casing / repair required																	
CONCRETE PADS																	
Pad in good condition																	
Minor cracks																	
Major cracks / broken / repair required																	
Undermined / washing out																	
Fire ants around concrete pad																	
WELL PROTECTIVE CASINGS																	
Casing in good condition																	
Damaged casing / still functional																	
Damaged casing / repair required																	
Broken hinge on protective lid																	
Wasp nest inside protective casing																	
Ants inside protective casing																	
WELL CAPS																	
Well cap in good conditon																	
Damaged / needs replacement																	
Replaced damaged well cap																	
FLUSH MOUNT WELLS																	
Vault in good condition																	
Water inside vault																	
Vault bolt holes broken or stripped																	
Bolts stripped																	
Vault lid cracked or broken																	
WELL ID TAGS																	
Well tag in good condition																	
Well tag missing																	
Well tag damaged / illegible																	
Lacks required information - Driller Reg #																	
Lacks required information - Completion date																	
Lacks required information - Total well depth																	
Lacks required information - Depth to screen																	
Lacks required information - Non potable tag																	

NOTE:

FIGURE 7

TABLES

Table 1
Monitoring Well Information
McGuire Nuclear Station, Landfill #2 (Synthetically Lined)

	MW-5	MW-5A	MW-6	MW-6A	MW-7	MW-7A	MW-8	MW-8A	MW-9	MW-9A	MW-10A
North (ft)	611,642.31	611,644.34	612,271.37	612,278.33	612,063.38	612,051.31	612,263.68	612,254.57	611,923.74	611,908.90	611,971.66
East (ft)	1,420,461.37	1,420,446.26	1,420,457.57	1,420,444.96	1,419,781.91	1,419,778.04	1,420,098.39	1,420,109.01	1,419,593.17	1,419,589.67	1,420,622.03
Top of PVC Casing Elevation (ft)	768.31	768.42	728.45	728.98	725.86	724.66	759.60	759.68	711.87	712.13	755.78
Well Diameter	2"	2"	2"	2"	2"	2"	2"	2"	2"	2"	2"
Well Stick-up (ft)	1.9	2.0	1.7	1.4	2.1	1.9	2.3	2.1	1.6	1.8	2.0
Type of Casing	PVC	PVC	PVC	PVC	PVC	PVC	PVC	PVC	PVC	PVC	PVC
Total Depth below TOC (ft)	63.9	96.0	37.2	47.9	37.3	59.4	71.5	84.4	30.8	47.8	59.23
Screen Length (ft)	14	14	13.5	14	14	14	14	14	14	14	15
Screen Interval (ft below TOC)	49.9 to 63.9	82.0 to 96.0	23.7 to 37.2	33.9 to 47.9	23.3 to 37.3	45.4 to 59.4	57.5 to 71.5	70.4 to 84.4	16.8 to 30.8	33.8 to 47.8	44.23 to 59.23

Notes:

1. ft indicates feet.
2. TOC indicates top of casing.
3. As-built well coordinates (assumed to be NAD 27) and top of PVC casing elevations (assumed to be NVGD 29) provided by Duke Energy.
4. Well diameter and type of casing were obtained from Well Construction Records provided by Duke Energy.
5. Well stick-up length was calculated based on top of PVC casing and ground surface elevations provided by Duke Energy except monitoring well MW-10A which was obtained from the Well Construction Record for this well.
6. Well total depth below TOC measurements provided by Duke Energy.
7. Screen lengths and screen intervals provided by Duke Energy.

Table 2
Sample Parameters, Analytical Methods, and Detection Limits
McGuire Nuclear Station, Landfill #2 (Synthetically Lined)

PARAMETER	UNITS	ANALYTICAL METHOD	SWSL
In Situ Parameters			
Field pH	pH Units	Hydrolab	NE
Specific Conductance	µmhos/cm	Hydrolab	NE
Temperature	^{o}C	Hydrolab	NE
Water Level	ft	Water Level Meter	0.010 ft
Laboratory Analyses			
Arsenic	µg/L	TRM / EPA 200.8	10
Barium	µg/L	TRM / EPA 200.7	100
Cadmium	µg/L	TRM / EPA 200.8	1
Chromium	µg/L	TRM / EPA 200.8	10
Lead	µg/L	TRM / EPA 200.8	10
Mercury	µg/L	EPA 245.1	0.2
Selenium	µg/L	TRM / EPA 200.8	10
Silver	µg/L	TRM / EPA 200.8	10
Sulfate	µg/L	EPA 300.0	250,000
Chloride	µg/L	EPA 300.0	250,000
Volatile Organic Compounds	µg/L	EPA 8260	Varies
TPH (DRO)	µg/L	EPA 8015/3520	NE
Gross Alpha	pCi/l	EPA 900/SM7110B	NE
Gross Beta	pCi/l	EPA 900/SM7110B	NE
Tritium	pCi/l	EPA 906.0 Modified	NE

Notes:

1. µmhos/cm indicates micro-ohms per centimeter.
2. ft indicates feet.
3. µg/L indicates micrograms per liter.
4. pCi/L indicates picocuries per liter.
5. SWSL indicates Solid Waste Section Limit.
6. TRM indicates total recoverable metals.
7. NE indicates not established.
8. TPH (DRO) indicates total petroleum hydrocarbons diesel range organics.

Table 3
Radiological Sample Parameters
McGuire Nuclear Station, Landfill #2 (Synthetically Lined)

Parameter	Units
Gross Alpha	pCi/L
BaLa-140	pCi/L
Be-7	pCi/L
Gross Beta	pCi/L
Co-58	pCi/L
Co-60	pCi/L
Cs-134	pCi/L
Cs-137	pCi/L
Fe-59	pCi/L
H3GW (Tritium)	pCi/L
I-131	pCi/L
K-40	pCi/L
Mn-54	pCi/L
Nb-95	pCi/L
Zn-65	pCi/L
Zr-95	pCi/L

Notes:

1. pCi/L indicates picocuries per liter.
2. Radiological sampling and analyses will be conducted in accordance with requirements of current Radioactive Materials License No. 060-0379-7 and submitted to the North Carolina Department of Health and Human Services Radiation Protection Section.

Table 4
Sample Containers, Preservatives, and Holding Times
McGuire Nuclear Station, Landfill #2 (Synthetically Lined)

PARAMETER	CONTAINERS	PRESERVATIVES	HOLDING TIMES
In Situ Parameters			
Field pH	In Situ	None	Analyze Immediately
Specific Conductance	In Situ	None	Analyze Immediately
Temperature	In Situ	None	Analyze Immediately
Laboratory Analyses			
Arsenic	500 ml HDPE	pH<2 HNO_3	6 months
Barium	500 ml HDPE	pH<2 HNO_3	6 months
Cadmium	500 ml HDPE	pH<2 HNO_3	6 months
Chromium	500 ml HDPE	pH<2 HNO_3	6 months
Lead	500 ml HDPE	pH<2 HNO_3	6 months
Mercury	500 ml HDPE	pH<2 HNO_3	6 months
Selenium	500 ml HDPE	pH<2 HNO_3	6 months
Silver	500 ml HDPE	pH<2 HNO_3	6 months
Sulfate	500 ml HDPE	Cool 4°C	28 days
Chloride	500 ml HDPF	Cool 4°C	28 Days
Volatile Organic Compounds	40 ml Glass	HCL, Cool 4°C	14 days
TPH (DRO)	1000 ml Glass	H_2SO_4,Cool 4°C	7 days (Extraction)
Gross Alpha & Beta	4l cubitainer	10 ml 50%HNO_3	NA
Tritium	50 ml polybottle	None	NA

Notes:

1. ml HDPE indicates milliliter high density polyethylene.
2. HNO_3 indicates nitric acid.
3. NA indicates not applicable.
4. TPH (DRO) indicates total petroleum hydrocarbons diesel range organics.

APPENDICES

APPENDIX A

BORING LOGS AND MONITORING WELL CONSTRUCTION RECORDS

North Carolina - Department of Environment and Natural Resources - Division of Water Quality - Groundwater Section
1636 Mail Service Center - Raleigh, N.C. 27699-1636-Phone (919) 733-3221

[redacted]L CONSTRUCTION RECORD

WELL CONTRACTOR: S+ME, Inc
WELL CONTRACTOR CERTIFICATION #: NC 2251
STATE WELL CONSTRUCTION PERMIT #: Verbal

1. **WELL USE (Check Applicable Box)**: Residential _____ Municipal _____ Industrial _____ Agricultural _____ Monitoring X
Recovery _____ Heat Pump Water Injection _____ Other _____ If Other, List Use: _____

2. WELL LOCATION: (Show sketch of the location below)
Nearest Town: Charlotte County: Mecklenburg
NC Route 73
(Road Name and Numbers, Community, or Subdivision and Lot No.)

3. OWNER: Duke Power - Environment, Health, + Safety
Address: P.O. Box 1006; Mail Code: EC 12ZB
(Street or Route No.)
Charlotte (City or Town) NC (State) 28201-1006 (Zip Code)

4. DATE DRILLED: 1/16/01
5. TOTAL DEPTH: 57'
6. CUTTINGS COLLECTED YES _____ NO X
7. DOES WELL REPLACE EXISTING WELL? YES _____ NO X
8. STATIC WATER LEVEL Below Top of Casing: 50 FT
(Use "+" if Above Top of Casing)
9. TOP OF CASING IS 2 FT. Above Land Surface*
*** Top of casing terminated at/or below land surface requires a variance in accordance with 15A NCAC 2C.0118**
[redacted]IELD (gpm): _____ METHOD OF TEST _____
[redacted]ATER ZONES (depth): 50'

DEPTH From	To	DRILLING LOG Formation Description
0'	5'	Fill - dense, red, slightly micaceous, cl-si, fn-med sand
5'	30'	Saprolite - medium dense, red, tan, + black, silty fn-med sand
30'	40'	Saprolite - medium dense, tan, red, black, + white mi, si, fn-med sand
40'	45'	Saprolite - medium dense, white, tan, + black, mi, fn-med sand
45'	57'	Saprolite - medium dense, white, black, + tan, mi, fn-med sand w/ some crs qtz sand

If additional space is needed use back of form

12. CHLORINATION: Type _____ Amount _____
13. CASING:

Depth From	To	Ft.	Diameter	Wall Thickness or Weight/Ft	Material
-2	42		2"		PVC

14. GROUT

Depth From	To	Ft.	Material	Method
0	38		Portland Cement	

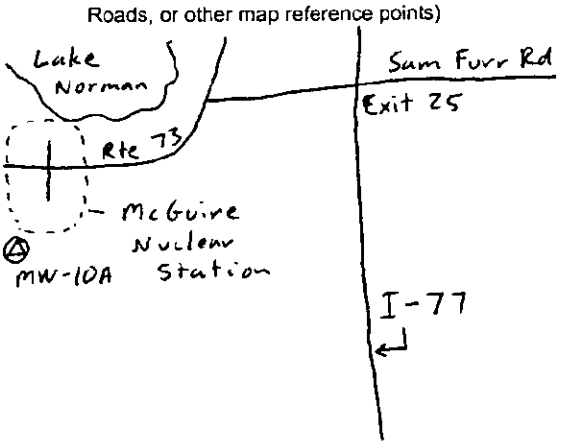
15. SCREEN:

Depth From	To	Ft.	Diameter	Slot Size	Material
42	57		2 in.	.01 in.	PVC
			in.	in.	
			in.	in.	

16. SAND/GRAVEL PACK:

Depth From	To	Ft.	Size	Material
40	57		#2	well sand

LOCATION SKETCH
(Show direction and distance from at least two State Roads, or other map reference points)



17. REMARKS: _____

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Travis Cattle 3-16-01
SIGNATURE OF PERSON CONSTRUCTING THE WELL DATE
Submit original to Division of Water Quality, Groundwater Section within 30 days

FOR OFFICE USE ONLY
Quad No. _____
[redacted] No. _____

LOG OF BORING NO. MW-10A

PROJECT: McGuire Nuclear Station
PROJECT NO: 1264-00-715
PROJECT LOCATION: Charlotte, NC

DATE COMPLETED: 1/16/01
DRILLING CONTRACTOR: S&ME, Inc. (Cert. #1209)
DRILLER: Costello
DRILLING METHOD: Hollow Stem Augers
SAMPLING METHOD: Split Spoon

WATER LEVEL: Approximately 48' BLS at TOB

GROUND SURFACE ELEVATION: Not Measured
DATUM:
WEATHER: Sunny, cool
LOGGED BY: M. O'Connell

This log is part of the report prepared for the named project and should be read together with that report for complete interpretation. This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.

SAMPLE NUMBER	SAMPLE ADVANCE (ft.)	SAMPLE RECOVERY (ft.)	N-VALUE (blows / foot)	% RQD	OVA (ppm)	ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
							0			Fill - dense, red, slightly micaceous, clayey silty fine to medium **SAND**	
1	1.5		34				5			Saprolite - medium dense, red, tan and black, silty fine to medium **SAND**	
2	1.5		15				10				
3	1.5		19				15				
4	1.5		20				20				
5	1.5		18				25				
6	1.5		19				30			Saprolite - medium dense, tan, red, black and white, micaceous, silty fine to medium **SAND**	
7	1.5		16				35				
8	1.5		23				40			Medium dense white, tan and black, micaceous fine to medium **SAND**	
9	1.5		11				45			Saprolite - medium dense, white, black and tan, micaceous fine to medium **SAND** with some coarse quartz sand	
10	1.5		13				50				
11	1.5		50/4"				55				
										Auger refusal at 57 feet.	

NOTES:

S&ME
ENGINEERING • TESTING
ENVIRONMENTAL SERVICES

LOG OF BORING MW-10A

ENV BORI 6400715.GPJ S&ME.GDT 1/29/01

COMPLETION REPORT OF WELL No. MW-10A

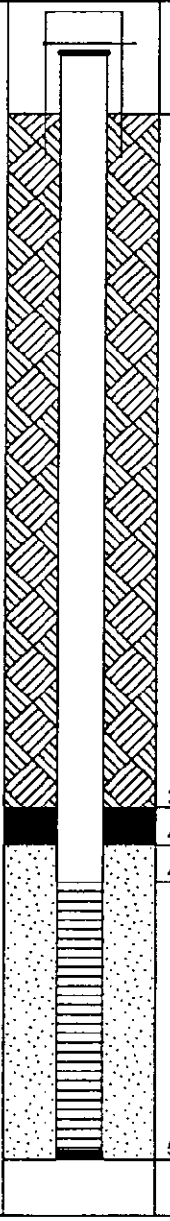
PROJECT: McGuire Nuclear Station
PROJECT NO: 1264-00-715
PROJECT LOCATION: Charlotte, NC

WATER LEVEL: Approximately 48' BLS at TOB

LATITUDE: N 35° 25'
LONGITUDE: W 80° 56.5'
TOP OF CASING ELEVATION: Not Measured
DATUM:
LOGGED BY: M. O'Connell

DRILLING CONTRACTOR: S&ME, Inc. (Cert. #1209)
DRILLING METHOD: Hollow Stem Augers
DATE COMPLETED: 1/16/01

STRATA DESCRIPTION	SYMBOL	DEPTH (ft.)
Fill - dense, red, slightly micaceous, clayey silty fine to medium SAND		0 – 5
Saprolite - medium dense, red, tan and black, silty fine to medium SAND		5 – 30
Saprolite - medium dense, tan, red, black and white, micaceous, silty fine to medium SAND		30 – 40
Medium dense white, tan and black, micaceous fine to medium SAND		40 – 45
Saprolite - medium dense, white, black and tan, micaceous fine to medium SAND with some coarse quartz sand		45 – 55
Auger refusal at 57 feet.		55



DEPTH (ft.)	LEGEND	ELEVATION (ft.)
0.00	GS	
38.00	CG	
40.00	BS	
42.00	TSC	
57.00	TD	

WELL CONSTRUCTION DETAILS

PROTECTIVE CASING
Diameter: 4 inch
Type: Above Ground Steel Casing
Interval: 24" ALS to 12" BLS

RISER CASING
Diameter: 2 inch
Type: Sch 40 PVC
Interval: 2' ABS to 42' BLS

GROUT
Type: Portland Cement
Interval: 0 to 38' BLS

SEAL
Type: Bentonite
Interval: 38' BLS to 40' BLS

FILTERPACK
Type: #2 Well Sand
Interval: 40' BLS to 57' BLS

SCREEN
Diameter: 2 inch
Type: Sch 40 PVC, 0.01 Slot
Interval: 42' BLS to 57' BLS

LEGEND

- FILTER PACK
- BENTONITE
- CEMENT GROUT
- CUTTINGS / BACKFILL
- STATIC WATER LEVEL
- WATER LEVEL AT TOB

ALS	ABOVE LAND SURFACE
BLS	BELOW LAND SURFACE
TOC	TOP OF CASING
GS	GROUND SURFACE
BS	BENTONITE SEAL
BOC	BASE OF OUTER CASING
TSC	TOP OF SCREEN
BSC	BOTTOM OF SCREEN
TD	TOTAL DEPTH
CG	CEMENT GROUT

S&ME
ENGINEERING · TESTING
ENVIRONMENTAL SERVICES

COMPLETION REPORT OF WELL No. MW-10A

MONITORING WELL 6400715.GPJ S&ME.GDT 1/29/01

Duke Power Company
422 South Church Street
Charlotte, NC 28242-0001

(704)373-4011

New Landfill

DUKE POWER

March 30, 1992

North Carolina Department of Environment, Health
and Natural Resources
Attn: Brenda J. Smith, DEM Regional Supervisor
P.O. Box 950
Mooresville, NC 28115

Re: Duke Power Company, McGuire Nuclear Station
Sanitary Landfill
Driller's Records for Monitor Wells
Well Construction Permit # 59-1105-WM-0785
File: MG-LANDFILL/00, GAH-0401

Dear Ms. Smith:

Please find attached the well driller's records for the installation of the McGuire Sanitary Landfill groundwater monitoring wells. Installation was done by Duke Power Company's Geotechnical Center personnel in compliance with all conditions of the construction permit. The landfill is expected to be made operational in the early summer.

If you have any questions or need further information, please contact me at (704) 382-1580.

Sincerely,

Timothy L. Huffman

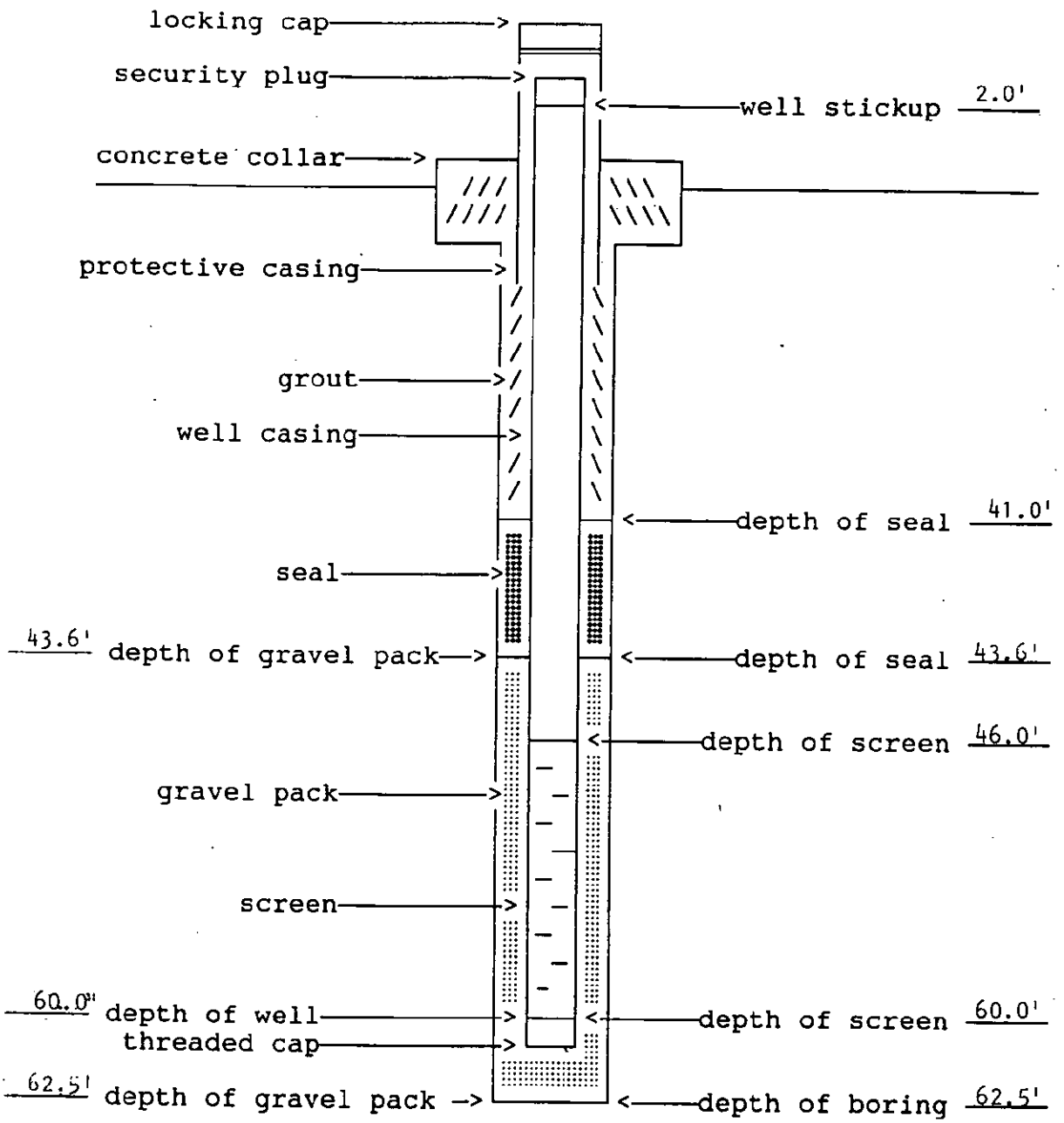
Timothy L. Huffman, Design Engineer
GS Environmental Division
Generation Services Department

cc w/att: P. R. Simpson, D. W. Phillips, P. A. Clawson

cc w/o att: J. S. Carter, J. R. Hendricks, J. T. Estridge
C. N. Davis, L. D. Evans, Central Records

MONITORING WELL INSTALLATION RECORD

JOB NAME: MNS LANDFILL



DATE INSTALLED: 1-16-92 INSPECTOR: J Meaders	DUKE POWER COMPANY GEOTECHNICAL CENTER	MONITORING WELL NUMBER: MW-1 new # → MW-5

DIVISION OF ENVIRONMENTAL MANAGEMENT – GROUNDWATER SECTION
P.O. BOX 27687 – RALEIGH, N.C. 27611, PHONE (919) 733-5083

FOR OFFICE USE ONLY
Quad. No. _____ Serial No. _____
Lat. _____ Long. _____ Pc.
Minor Basin _____
Basin Code _____
Header Ent. _____ GW-1 Ent. _____

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR DUKE POWER COMPANY
DRILLER REGISTRATION NUMBER 921

STATE WELL CONSTRUCTION PERMIT NUMBER: 59-1105-wm-0785

1. WELL LOCATION: (Show sketch of the location below)
Nearest Town: CORNELIUS N.C.
(Road, Community, or Subdivision and Lot No.)
County: MECKLENBURG

2. OWNER DUKE POWER COMPANY
ADDRESS P.O. BOX 1006 (Street or Route No.)
CHARLOTTE (City or Town) N.C. (State) 28201 (Zip Code)

3. DATE DRILLED 1-16-92 USE OF WELL MONITORING
4. TOTAL DEPTH 62.5' CUTTINGS COLLECTED ☐ Yes ☒ No
5. DOES WELL REPLACE EXISTING WELL? ☐ Yes ☒ No
6. STATIC WATER LEVEL: 51.7 FT. ☐ above ☒ below TOP OF CASING,
TOP OF CASING IS 2.0 FT. ABOVE LAND SURFACE.
7. YIELD (gpm): N/A METHOD OF TEST N/A
8. WATER ZONES (depth): N/A
9. DECONTAMINATION: Type N/A Amount N/A
10. CASING:

	Depth From	Depth To	Diameter	Wall Thickness or Weight/Ft.	Material
	+2.0'	41.0'	2"	SCH.40	PVC

11. GROUT:

	Depth From	Depth To	Material	Method
	0.0'	41.0	PORTLAND CEMENT	PUMP

12. SCREEN:

	Depth From	Depth To	Diameter	Slot Size	Material
	46.0'	60.0'	2"	.010 in.	PVC

13. GRAVEL PACK:

	Depth From	Depth To	Size	Material
	43.6'	62.5	UC = 3.5 ES = .014	SAND

14. REMARKS: BENTONITE SEAL 41.0' – 43.6'

DRILLING LOG

Depth From	Depth To	Formation Description
		SEE ATTACHED Soil TEST BORING FIELD R ALSO WELL INSTALLATION RECORD.
		MW-1
		New # MW-5

If additional space is needed use back of form.

LOCATION SKETCH
(Show direction and distance from at least two State Roads or other map reference points)

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15 NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Jeff Mead 1-16-92
SIGNATURE OF CONTRACTOR OR AGENT DATE

Submit original to Division of Environmental Management and copy to well owner.

W-1 Revised 11/84

Form 25630 (R3-87)

FORM M-26C	REVISION 2
	PAGE 1 OF 1

DUKE POWER COMPANY
CONSTRUCTION DEPARTMENT
PROJECT McGUIRE

SOIL TEST BORING FIELD REPORT

JOB NO. N/A
JOB NAME McGUIRE LANDFILL
DATE 1-16-92 WEATHER P.C. MILD INSPECTOR J.W. Meaders BORING NO. MW-1 MW-5

STARTING TIME N/A
GROUND SURFACE ELEV. 766.42
HRS. DRILLING N/A HRS. MOVING N/A

SAMPLING				SCALE	UD	SOIL CLASSIFICATION AND REMARKS
	1ST 6"	2ND 6"	3RD 6"			
				0		
						NO SAMPLING REQUIRED
				5		
				0		
				5		BORING TERMINATED @ 62.5'
				0		
				5		
				0		
				5		
				0		

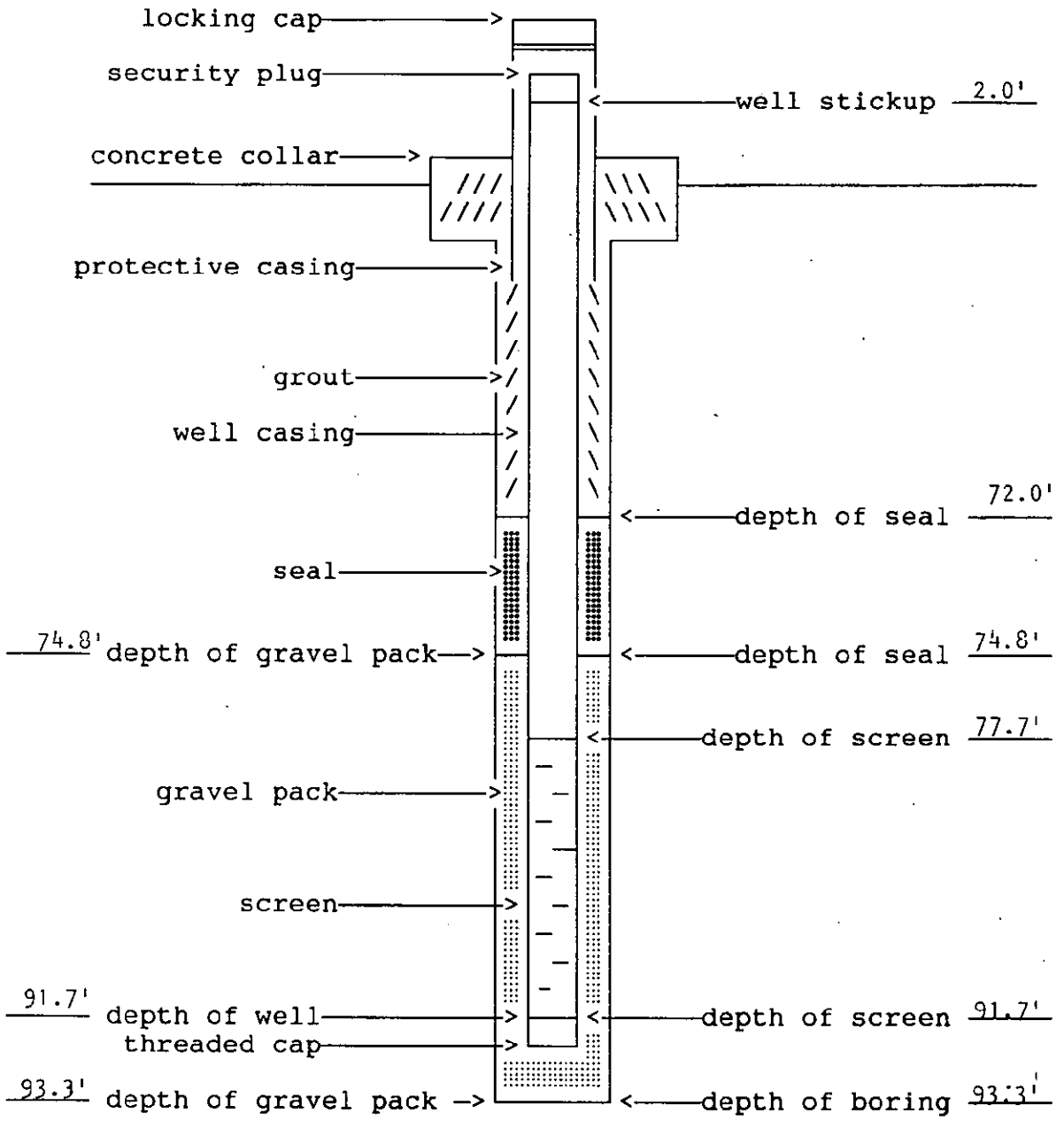
+ STANDARD PENETRATION RESISTANCE IS SUM OF BLOWS FOR 2ND 6" AND 3RD 6" TO DRIVE 1-3/8" I.D., 2" O.D. SPLIT BARREL SAMPLER WITH 140 POUND HAMMER FALLING 30 INCHES

BORING TERMINATED 62.5
BORING REFUSAL N/A
WATER TOB DEPTH 50.6
WATER 24 HR: DEPTH 49.7'
WATER LOSSES N/A
CASING SIZE N/A LENGTH N/A

METHOD OF ADVANCING BORING	DEPTH
POWER AUGER	0 TO 62.5'
HAND CHOP: W/MUD: W/WATER	TO
ROTARY DRILL: W/MUD: W/WATER	TO
DIAMOND CORE	TO

MONITORING WELL INSTALLATION RECORD

JOB NAME: MNS LANDFILL



DATE INSTALLED: 1-14-92	DUKE POWER COMPANY	MONITORING WELL
INSPECTOR: J Meaders	GEOTECHNICAL CENTER	NUMBER: MW-1A
		MW-5A

NORTH CAROLINA DEPARTMENT OF NATURAL RESOURCES AND COMMUNITY DEVELOPMENT
DIVISION OF ENVIRONMENTAL MANAGEMENT - GROUNDWATER SECTION
P.O. BOX 27687 - RALEIGH, N.C. 27611, PHONE (919) 733-5083

FOR OFFICE USE ONLY
Quad. No. _____ Serial No. _____
Lat. _____ Long. _____ Pc
Minor Basin _____
Basin Code _____
Header Ent. _____ GW-1 Ent. _____

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR DUKE POWER COMPANY
DRILLER REGISTRATION NUMBER 921

STATE WELL CONSTRUCTION PERMIT NUMBER: 59-1105-wm-0785

1. WELL LOCATION: (Show sketch of the location below)
Nearest Town: CORNELIUS N.C. County: MECKLENBURG
(Road, Community, or Subdivision and Lot No.)
2. OWNER DUKE POWER COMPANY
ADDRESS P.O. BOX 1006 (Street or Route No.)
CHARLOTTE (City or Town) N.C. (State) 28201 (Zip Code)
3. DATE DRILLED 1-14-92 USE OF WELL MONITORING
4. TOTAL DEPTH 93.3' CUTTINGS COLLECTED ☐ Yes ☒ No
5. DOES WELL REPLACE EXISTING WELL? ☐ Yes ☒ No
6. STATIC WATER LEVEL: 53.9' FT. ☐ above ☒ below TOP OF CASING,
TOP OF CASING IS 2.0' FT. ABOVE LAND SURFACE.
7. YIELD (gpm): N/A METHOD OF TEST N/A
8. WATER ZONES (depth): N/A
9. DISINFECTANT: Type N/A Amount N/A
10. CASING:

	Depth From	Depth To	Diameter	Wall Thickness or Weight/Ft.	Material
	+2'	77.7'	2"	SCH 40	PVC

11. GROUT:

	Depth From	Depth To	Material	Method
	0.0	72	PORTLAND CEMENT W/BENTONITE	PUMP

12. SCREEN:

	Depth From	Depth To	Diameter	Slot Size	Material
	77.7	91.7	2"	.010	PVC

13. GRAVEL PACK:

	Depth From	Depth To	Size	Material
	74.8	92.8	VC = 3.5 ES = .014	SAND

14. REMARKS: BENTONITE SEAL 72.0' - 74.8'

Depth From	Depth To	DRILLING LOG Formation Description
		SEE ATTACHED SOILS TEST BORING FIELD REPORT ALSO INSTALLATI RECORD.
		MW-1A
		New # MW-5A

If additional space is needed use back of form.

LOCATION SKETCH
(Show direction and distance from at least two State Roads or other map reference points)

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15 NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

SIGNATURE OF CONTRACTOR OR AGENT _____ DATE 1-14-92

GW-1 Revised 11/84

Submit original to Division of Environmental Management and copy to well owner.

Form 25630 (R3-87)

FORM M–26C	REVISION 2
	PAGE 1 OF 1

DUKE POWER COMPANY
CONSTRUCTION DEPARTMENT
PROJECT McGUIRE

SOIL TEST BORING FIELD REPORT

JOB NO. N/A
JOB NAME McGUIRE LANDFILL
DATE 1-14-92 WEATHER P.C. COOL

STARTING TIME N/A
GROUND SURFACE ELEV. 766.45
HRS. DRILLING N/A HRS. MOVING N/A
INSPECTOR J.W. Meeders BORING NO. MW-1A

New # MW-5A

SAMPLING				SCALE	UD	SOIL CLASSIFICATION AND REMARKS
	1ST 6"	2ND 6"	3RD 6"			
				N/A		
						NO SAMPLING REQUIRED.
				5		
				0		
				5		AUGER REFUSAL @ 93.3'
						BORING TERMINATED @ 93.3
				0		
				5		
				0		
				5		
				0		

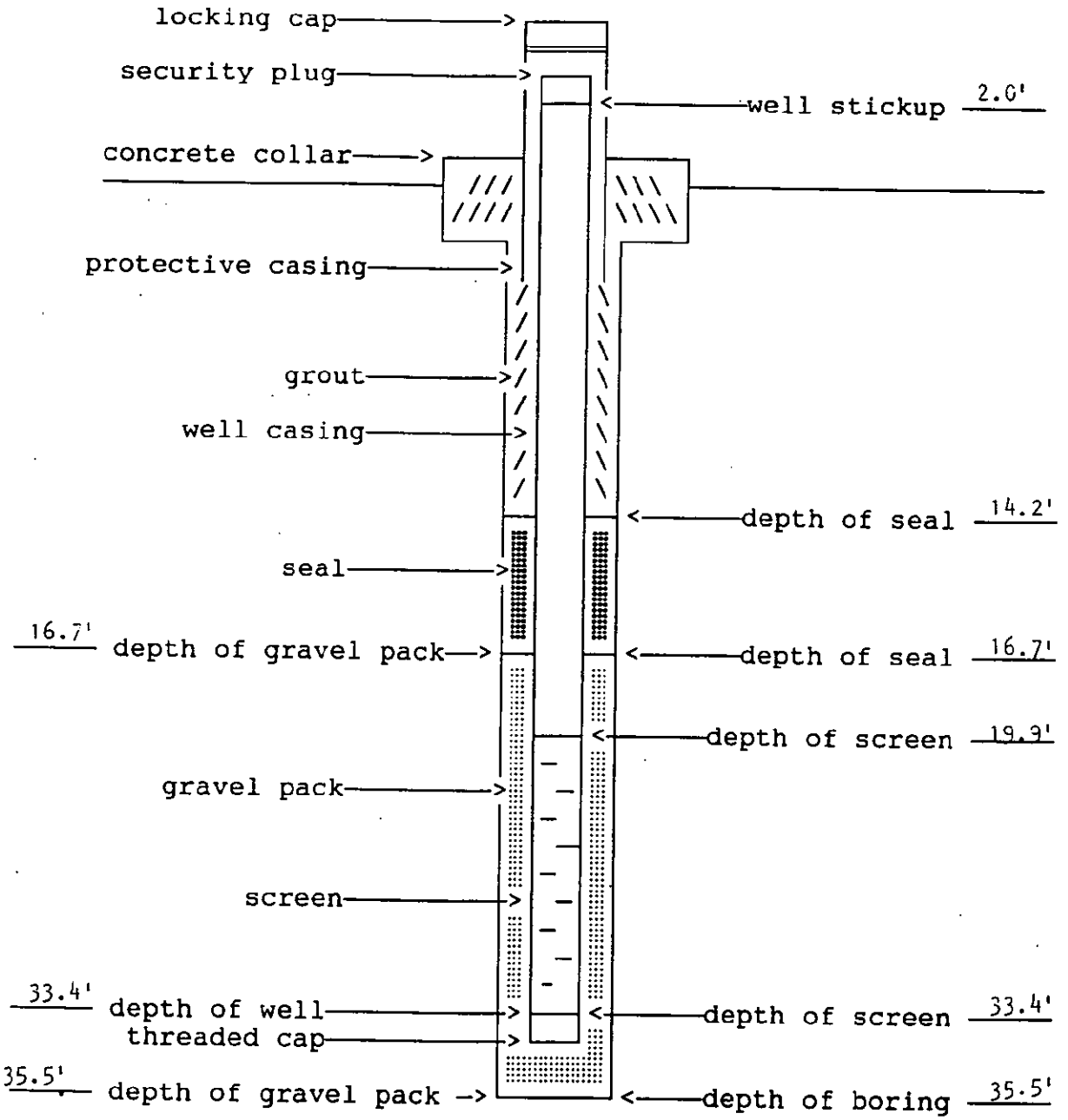
+ STANDARD PENETRATION RESISTANCE IS SUM OF BLOWS FOR 2ND 6" AND 3RD 6" TO DRIVE 1-3/8" I.D., 2" O.D. SPLIT BARREL SAMPLER WITH 140 POUND HAMMER FALLING 30 INCHES

BORING TERMINATED 93.3
BORING REFUSAL 93.3
WATER TOB DEPTH 50.6'
WATER 24 HR: DEPTH 51.9
WATER LOSSES N/A
CASING SIZE N/A LENGTH N/A

METHOD OF ADVANCING BORING	DEPTH
POWER AUGER	0 TO 93.3'
HAND CHOP: W/MUD: W/WATER	TO
ROTARY DRILL: W/MUD: W/WATER	TO
DIAMOND CORE	TO

MONITORING WELL INSTALLATION RECORD

JOB NAME: MNS LANDFILL



DATE INSTALLED: 2-21-92 INSPECTOR: J Meaders	DUKE POWER COMPANY GEOTECHNICAL CENTER	MONITORING WELL NUMBER: MW-2 MW-6

NORTH CAROLINA DEPARTMENT OF NATURAL RESOURCES AND COMMUNITY DEVELOPMENT
DIVISION OF ENVIRONMENTAL MANAGEMENT - GROUNDWATER SECTION
P.O. BOX 27687 - RALEIGH,N.C. 27611, PHONE (919) 733-5083

FOR OFFICE USE ONLY
Quad. No. _____ Serial No. _____
Lat. _____ Long. _____ Pc.
Minor Basin _____
Basin Code _____
Header Ent. _____ GW-1 Ent. _____

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR DUKE POWER COMPANY

DRILLER REGISTRATION NUMBER 921

STATE WELL CONSTRUCTION PERMIT NUMBER: 59-1105-wm-0785

1. WELL LOCATION: (Show sketch of the location below)
Nearest Town: CORNELIUS N.C. County: MECKLENBURG
(Road, Community, or Subdivision and Lot No.)

2. OWNER DUKE POWER COMPANY
ADDRESS P.O. BOX 1006 (Street or Route No.)
CHARLOTTE (City or Town) N.C. (State) 28201 (Zip Code)

3. DATE DRILLED 2-21-92 USE OF WELL MONITORING
4. TOTAL DEPTH 35.5' CUTTINGS COLLECTED ☐ Yes ☒ No
5. DOES WELL REPLACE EXISTING WELL? ☐ Yes ☒ No
6. STATIC WATER LEVEL: 25.4 FT. ☐ above ☒ below TOP OF CASING.
TOP OF CASING IS 2.0 FT. ABOVE LAND SURFACE.
7. YIELD (gpm): N/A METHOD OF TEST N/A
8. WATER ZONES (depth): N/A
9. DECORINATION: Type N/A Amount N/A
10. CASING:

	Depth		Diameter	Wall Thickness or Weight/Ft.	Material
From	+2.0'	To 19.9'	Ft. 2"	SCH 40	PVC
From		To	Ft.		
From		To	Ft.		

11. GROUT:

	Depth		Material	Method
From	0.0	To 14.2	Ft. PORTLAND CEMENT W/BENTONITE	PUMP
From		To	Ft.	

12. SCREEN:

	Depth		Diameter	Slot Size	Material
From	19.9'	To 33.4	Ft. 2" in.	.010 in.	PVC
From		To	Ft. in.	in.	
From		To	Ft. in.	in.	

13. GRAVEL PACK:

	Depth		Size	Material
From	16.7	To 35.5	Ft. ES = .014 UC = 3.5	SAND
From		To	Ft.	

14. REMARKS: BENTONITE SEAL 14.2' - 16.7'

DEPTH From	DEPTH To	DRILLING LOG Formation Description
		SEE ATTACHED ~~SOIL~~ SOIL TEST
		BORING FIELD REPORT.
		ALSO WELL INSTALLATI
		RECORD.
		MW-2
		New # MW-6

If additional space is needed use back of form.

LOCATION SKETCH
(Show direction and distance from at least two State Roads or other map reference points)

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15 NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Jeff Meade 2-21-92
SIGNATURE OF CONTRACTOR OR AGENT DATE

GW-1 Revised 11/84
Submit original to Division of Environmental Management and copy to well owner.

Form 25630 (R3-87)

FORM M–26C	REVISION 2
	PAGE 1 OF 1

DUKE POWER COMPANY
CONSTRUCTION DEPARTMENT
PROJECT McGUIRE LANDFILL

SOIL TEST BORING FIELD REPORT

JOB NO. N/A
JOB NAME LANDFILL MONITOR WELL
DATE 2-2092 WEATHER P.C. MILD

STARTING TIME N/A
GROUND SURFACE ELEV. 726.79
HRS. DRILLING N/A HRS. MOVING N/A
INSPECTOR A.W. Meadors BORING NO. MW-2

	SAMPLING		1ST 6"	2ND 6"	3RD 6"	SCALE	UD	SOIL CLASSIFICATION AND REMARKS New # MW-6
						0		* NOTE: JAR SAMPLES TAKEN. NO S.P.T. TAKEN UNTIL 35.5
*	1	4.5	N/A	N/A	N/A	5		RED, MICA, CLAYEY, FINE SANDY SILT.
*	2	9.5	N/A	N/A	N/A	0		REDISH YELLOW MICA, SILTY FINE/MED. SAND.
*	3	14.5	N/A	N/A	N/A	5		YELISH BRN. MICA, SILTY, FINE/MED. SAND.
*	4	19.5	N/A	N/A	N/A	0		YELISH BRN/ST. BRN, MICA, SILTY, FINE/MED. SAND
*	5	24.5	N/A	N/A	N/A	5		BRN/YELISH BRN, MICA, SILTY FINE/MED. SAND.
*	6	29.5	N/A	N/A	N/A	0		BRNISH YEL/YELLOW, MICA, SILTY, FINE/MED. SAND
	7	35.5 37.0	3	3	7	5		OLIVE/OLIVE BRN, MICA, VERY SILTY, FINE/MED. SAND.
								BORING TERMINATED @ 35.5
						0		

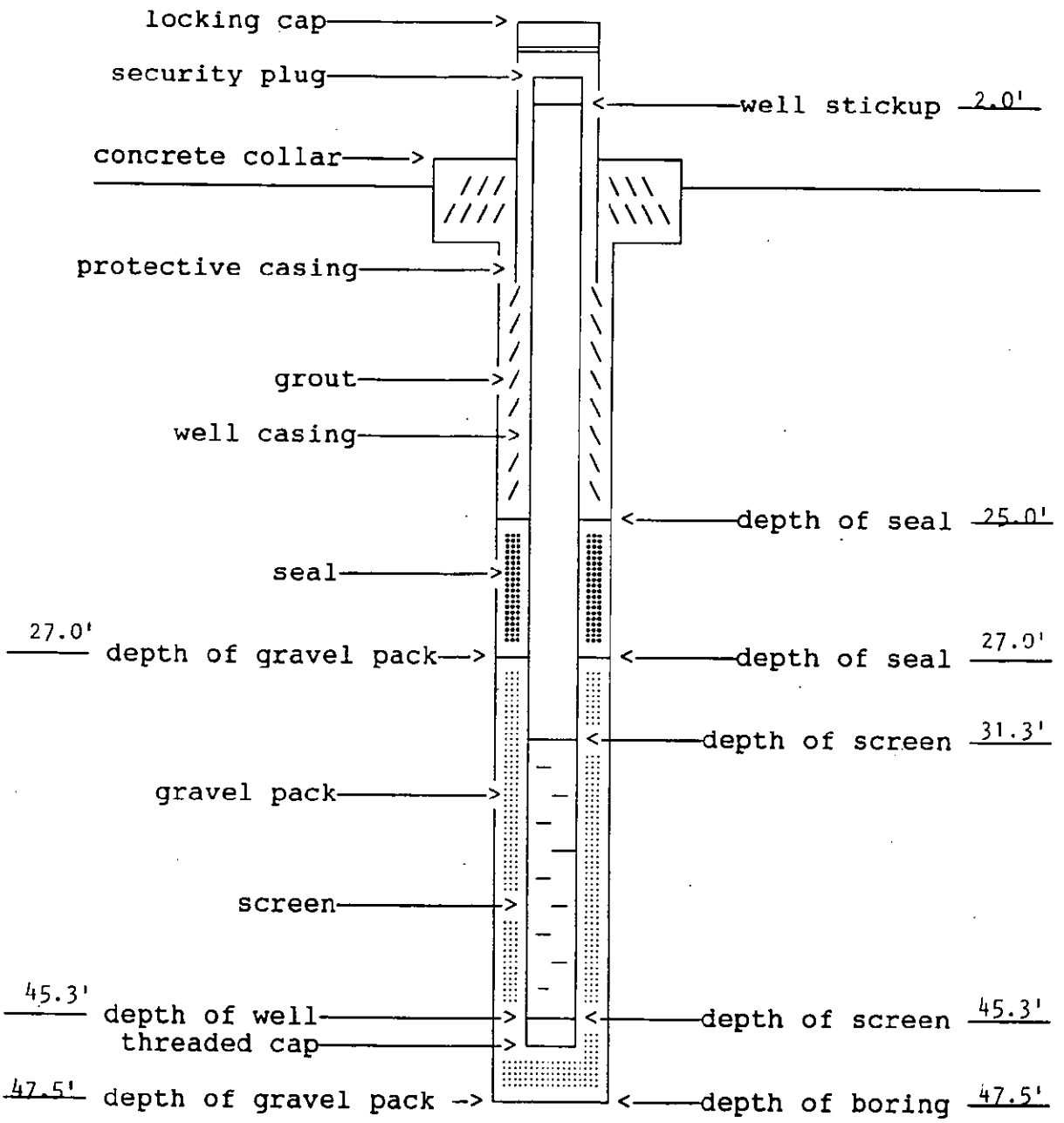
BORING TERMINATED 35.5
BORING REFUSAL N/A
WATER TOB DEPTH 30.3
WATER 24 HR: DEPTH 23.4
WATER LOSSES N/A
CASING SIZE N/A LENGTH N/A

METHOD OF ADVANCING BORING	DEPTH
POWER AUGER	0 TO 35.5
HAND CHOP: W/MUD: W/WATER	TO
ROTARY DRILL: W/MUD: W/WATER	TO
DIAMOND CORE	TO

+ STANDARD PENETRATION RESISTANCE IS SUM OF BLOWS FOR 2ND 6" AND 3RD 6" TO DRIVE 1-3/8" I.D., 2" O.D. SPLIT BARREL SAMPLER WITH 140 POUND HAMMER FALLING 30 INCHES

MONITORING WELL INSTALLATION RECORD

JOB NAME: MNS LANDFILL



DATE INSTALLED: 2-20-92 INSPECTOR: J Meaders	DUKE POWER COMPANY GEOTECHNICAL CENTER	MONITORING WELL NUMBER: MW-2A MW6A

NORTH CAROLINA DEPARTMENT OF NATURAL RESOURCES AND COMMUNITY DEVELOPMENT
DIVISION OF ENVIRONMENTAL MANAGEMENT - GROUNDWATER SECTION
P.O. BOX 27687 - RALEIGH, N.C. 27611, PHONE (919) 733-5083

FOR OFFICE USE ONLY
Quad. No. _____ Serial No. _____
Lat. _____ Long. _____ Pc
Minor Basin _____
Basin Code _____
Header Ent. _____ GW-1 Ent. _____

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR DUKE POWER COMPANY

DRILLER REGISTRATION NUMBER 921

STATE WELL CONSTRUCTION PERMIT NUMBER: 59-1105-wm-0785

1. WELL LOCATION: (Show sketch of the location below)

Nearest Town: CORNELIUS N.C. County: MECKLENBURG

(Road, Community, or Subdivision and Lot No.)

2. OWNER DUKE POWER COMPANY

ADDRESS P.O. BOX 1006 (Street or Route No.)

CHARLOTTE (City or Town) N.C. (State) 28201 (Zip Code)

3. DATE DRILLED 2-20-92 USE OF WELL MONITORING

4. TOTAL DEPTH 47.5 CUTTINGS COLLECTED ☐ Yes ☒ No

5. DOES WELL REPLACE EXISTING WELL? ☐ Yes ☒ No

6. STATIC WATER LEVEL: 26.0 FT. ☐ above ☒ below TOP OF CASING,
TOP OF CASING IS 2.0 FT. ABOVE LAND SURFACE.

7. YIELD (gpm): N/A METHOD OF TEST N/A

8. WATER ZONES (depth): N/A

9. DISINFECTANT: Type N/A Amount N/A

10. CASING:

	Depth From	To	Diameter	Wall Thickness or Weight/Ft.	Material
1	+2	31.3 Ft.	2"	SCH.40	PVC
		Ft.			
		Ft.			

11. GROUT:

	Depth From	To	Material	Method
	0.0	25.0' Ft.	PORTLAND CEMENT W/BENTONITE	PUMP
		Ft.		

12. SCREEN:

	Depth From	To	Diameter	Slot Size	Material
	31.3	45.3 Ft.	2" in.	.010 in.	PVC
		Ft.	in.	in.	
		Ft.	in.	in.	

13. GRAVEL PACK:

	Depth From	To	Size	Material
	27.0	47.5 Ft.	ES = .014 UC = 3.5	SAND
		Ft.		

14. REMARKS: BENTONITE SEAL 25.0' - 27.0'

Drilling Log: Depth From	To	Formation Description
		SEE ATTACHED SOILS TEST BORING FIELD REPORT, AND WELL INSTALLATION RECORD
		MW-2A
		New # MW-6A

If additional space is needed use back of form.

LOCATION SKETCH
(Show direction and distance from at least two State Roads or other map reference points)

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15 NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Jeff Meash 2-20-92
SIGNATURE OF CONTRACTOR OR AGENT DATE

GW-1 Revised 11/84

Submit original to Division of Environmental Management and copy to well owner

Form 25630 (R3-87)

FORM M--26C	REVISION 2
	PAGE 1 OF 2

DUKE POWER COMPANY
CONSTRUCTION DEPARTMENT
PROJECT McGUIRE

SOIL TEST BORING FIELD REPORT

JOB NO. N/A
JOB NAME McGUIRE LANDFILL
DATE 2-20-91 WEATHER P.C. MILD INSPECTOR [illegible] BORING NO. MW-2A

STARTING TIME N/A
GROUND SURFACE ELEV. 727.54
HRS. DRILLING N/A HRS. MOVING N/A

New # MW-6A

	SAMPLING	1ST 6"	2ND 6"	3RD 6"	SCALE	UD	SOIL CLASSIFICATION AND REMARKS
					0	*	NOTE: NO SPT TAKEN UNTIL 46.4' JAR SAMPLES TAKEN AS SHOWN BELOW.
* 1	5.5	N/A	N/A	N/A	5		RED/REDISH BRN, MICA, FINE SANDY SILT
* 2	10.5	N/A	N/A	N/A	0		REDDISH YELLOW, MICA, FINE SANDY SILT
* 3	15.5	N/A	N/A	N/A	5		REDDISH YELLOW/REDDISH BRN, MICA, SILTY FINE/MED. SAND.
* 4	20.5	N/A	N/A	N/A	0		STRONG BRN. MICA, FINE SANDY SILT.
* 5	25.5	N/A	N/A	N/A	5		ST. BRN/REDDISH YEL., MICA, FINE SANDY SILT
* 6	30.5	N/A	N/A	N/A	0		YELISH BRN./ST. BRN, MICA, SILTY, FINE/MED. SAND
* 7	35.5	N/A	N/A	N/A	5		BRN./REDISH BRN. MICA, SILTY, FINE/MED. SAND
* 8	40.5	N/A	N/A	N/A	0		OLIVE YELLOW, MICA, FINE SANDY SILT

BORING TERMINATED [redacted] 47.5
BORING REFUSAL ~~[illegible]~~ 47.5
WATER TOB DEPTH 26.3
WATER 24 HR: DEPTH 24.0
WATER LOSSES N/A
CASING SIZE N/A LENGTH N/A

METHOD OF ADVANCING BORING	DEPTH
POWER AUGER	0 TO 47.5
HAND CHOP: W/MUD: W/WATER	TO
ROTARY DRILL: W/MUD: W/WATER	TO
DIAMOND CORE	TO

+ STANDARD PENETRATION RESISTANCE IS SUM OF BLOWS FOR 2ND 6" AND 3RD 6" TO DRIVE 1-3/8" I.D., 2" O.D. SPLIT BARREL SAMPLER WITH 140 POUND HAMMER FALLING 30 INCHES

Form 25630 (R3-87)

FORM M-26C | REVISION 2

DUKE POWER COMPANY
CONSTRUCTION DEPARTMENT
PROJECT McGUIRE LANDFILL

SOIL TEST BORING FIELD REPORT

STARTING TIME N/A
GROUND SURFACE ELEV.
JOB NO. N/A
JOB NAME LANDFILL MONITOR WELLS
HRS. DRILLING N/A HRS. MOVING N/A
DATE 3-20-92 WEATHER P.C. MILD INSPECTOR J.W. Meadors BORING NO. ~~B~~ MW-2A

New # MW-6A

SAMPLING		1ST 6"	2ND 6"	3RD 6"	SCALE	UD	SOIL CLASSIFICATION AND REMARKS
					40		
					45		
* 9	45.5	N/A	N/A	N/A			PALE BRN, MICA, SILTY, FINE/MED. SAND.
10	47.5	21	31	33			DK. OLIVE, MICA, SILTY, FINE/MED. SAND.
	49.0						
					50		AUGER REFUSAL @ 47.5
					55		
					60		
					65		
					70		
					75		
					80		

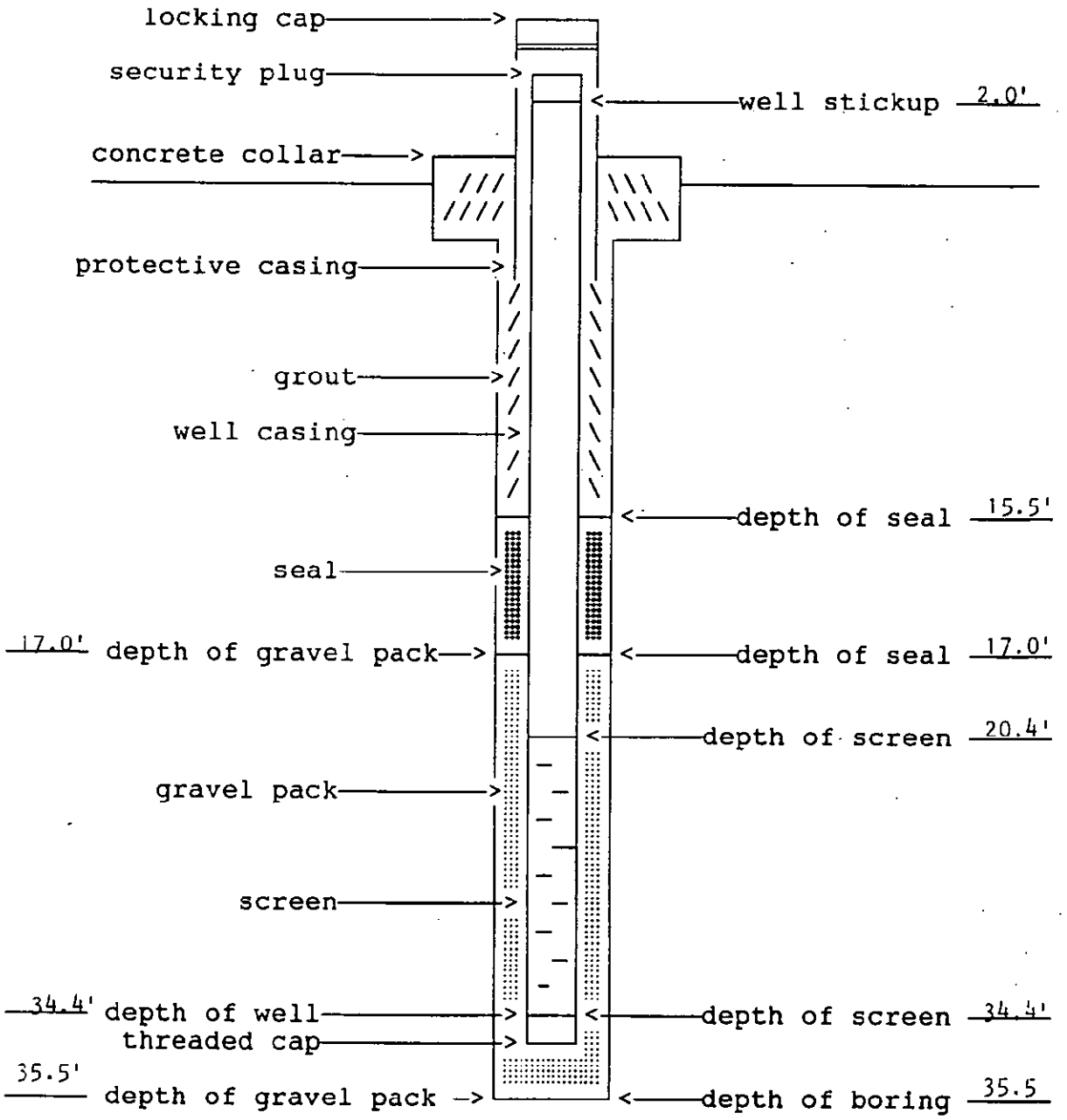
+ STANDARD PENETRATION RESISTANCE IS SUM OF BLOWS FOR 2ND 6" AND 3RD 6" TO DRIVE 1-3/8" I.D., 2" O.D. SPLIT BARREL SAMPLER WITH 140 POUND HAMMER FALLING 30 INCHES

BORING TERMINATED [redacted] 47.5
BORING REFUSAL 47.5
WATER TOB DEPTH 26.3
WATER 24 HR: DEPTH 24.0
WATER LOSSES N/A
CASING SIZE N/A LENGTH N/A

METHOD OF ADVANCING BORING	DEPTH
POWER AUGER	0 TO 47.5
HAND CHOP: W/MUD: W/WATER	TO
ROTARY DRILL: W/MUD: W/WATER	TO
DIAMOND CORE	TO

MONITORING WELL INSTALLATION RECORD

JOB NAME: MNS LANDFILL



DATE INSTALLED: 2-13-92 INSPECTOR: J Meaders	DUKE POWER COMPANY GEOTECHNICAL CENTER	MONITORING WELL NUMBER: MW-3 New # MW-7

NORTH CAROLINA DEPARTMENT OF NATURAL RESOURCES AND COMMUNITY DEVELOPMENT
DIVISION OF ENVIRONMENTAL MANAGEMENT – GROUNDWATER SECTION
P.O. BOX 27687 – RALEIGH, N.C. 27611, PHONE (919) 733-5083

FOR OFFICE USE ONLY
Quad. No. _____ Serial No. _____
Lat. _____ Long. _____ Pc. _____
Minor Basin _____
Basin Code _____
Header Ent. _____ GW-1 Ent. _____

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR DUKE POWER COMPANY

DRILLER REGISTRATION NUMBER 921

STATE WELL CONSTRUCTION PERMIT NUMBER: 59-1105-wm-0785

1. WELL LOCATION: (Show sketch of the location below)
Nearest Town: CORNELIUS N.C. County: MECKLENBURG
(Road, Community, or Subdivision and Lot No.)

2. OWNER DUKE POWER COMPANY
ADDRESS P.O. BOX 1006 (Street or Route No.)
CHARLOTTE (City or Town) N.C. (State) 28201 (Zip Code)

3. DATE DRILLED 2-12-92 USE OF WELL MONITORING
4. TOTAL DEPTH 35.5' CUTTINGS COLLECTED ☐ Yes ☒ No
5. DOES WELL REPLACE EXISTING WELL? ☐ Yes ☒ No
6. STATIC WATER LEVEL: 27.5 FT. ☐ above ☒ below TOP OF CASING,
TOP OF CASING IS 2.0 FT. ABOVE LAND SURFACE.
7. YIELD (gpm): N/A METHOD OF TEST N/A
8. WATER ZONES (depth): N/A
9. CONTAMINATION: Type N/A Amount N/A
10. CASING:

	Depth From	To	Diameter	Wall Thickness or Weight/Ft.	Material
	+2.0	20.4	2"	SCH. 40	PVC

11. GROUT:

	Depth From	To	Material	Method
	0.0	15.5'	CEMENT W/BENTONITE	PUMP

12. SCREEN:

	Depth From	To	Diameter	Slot Size	Material
	20.4	34.4	2"	.010 in.	PVC

13. GRAVEL PACK:

	Depth From	To	Size	Material
	17.0	35.5	ES: .014 UC: 3.5	SAND

14. REMARKS: BENTONITE SEAL 15.5'–17.0'

Depth From	To	DRILLING LOG Formation Description
		SEE ATTACHED SOIL TEST BORING FIELD REPORT, ALSO WELL INSTALLATION REC
		MW-3
		New # MW-7

If additional space is needed use back of form.

LOCATION SKETCH
(Show direction and distance from at least two State Roads, or other map reference points)

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15 NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

SIGNATURE OF CONTRACTOR OR AGENT _____ DATE 2-13-92

GW-1 Revised 11/84

Submit original to Division of Environmental Management and copy to well owner

Form 25630 (R3-87)

FORM M-26C	REVISION 2
	PAGE 1 OF 1

DUKE POWER COMPANY
CONSTRUCTION DEPARTMENT
PROJECT McGUIRE

SOIL TEST BORING FIELD REPORT

JOB NO. N/A
JOB NAME McGUIRE LANDFILL
DATE 2-12-92 WEATHER P.C. MILD INSPECTOR A.W. Meeders BORING NO. MW-3

STARTING TIME N/A
GROUND SURFACE ELEV. 723.72
HRS. DRILLING N/A HRS. MOVING N/A

New # MW-7

	SAMPLING	1ST 6"	2ND 6"	3RD 6"	SCALE	UD	SOIL CLASSIFICATION AND REMARKS
					0	*	NOTE: NO S.P.T. TAKEN UNTIL 35.5', JAR SAMPLES TAKEN AS SHOWN BELOW.
* 1	4.5	N/A	N/A	N/A	5		RED, MICA, SILTY, FINE/MEDIUM SAND.
* 2	9.5	N/A	N/A	N/A	10		RED, MICA, SILTY, CLAYEY, FINE/MEDIUM SAND.
* 3	14.5	N/A	N/A	N/A	15		REDDISH BRN, MICA, FINE SANDY SILT
* 4	19.5	N/A	N/A	N/A	20		REDDISH YELLOW, MICA, FINE SANDY SILT.
* 5	24.5	N/A	N/A	N/A	25		BRNISH YELLOW, MICA, SILTY, FINE/MED. SAND
* 6	29.5	N/A	N/A	N/A	30		BRNISH YELLOW MICA, SILTY, FINE/MED. SAND
7	35.5 37.0	4	9	13	35		OLIVE BRN, MICA, SILTY, FINE/MEDIUM SAND BORING TERMINATED @ 35.5'
					40		

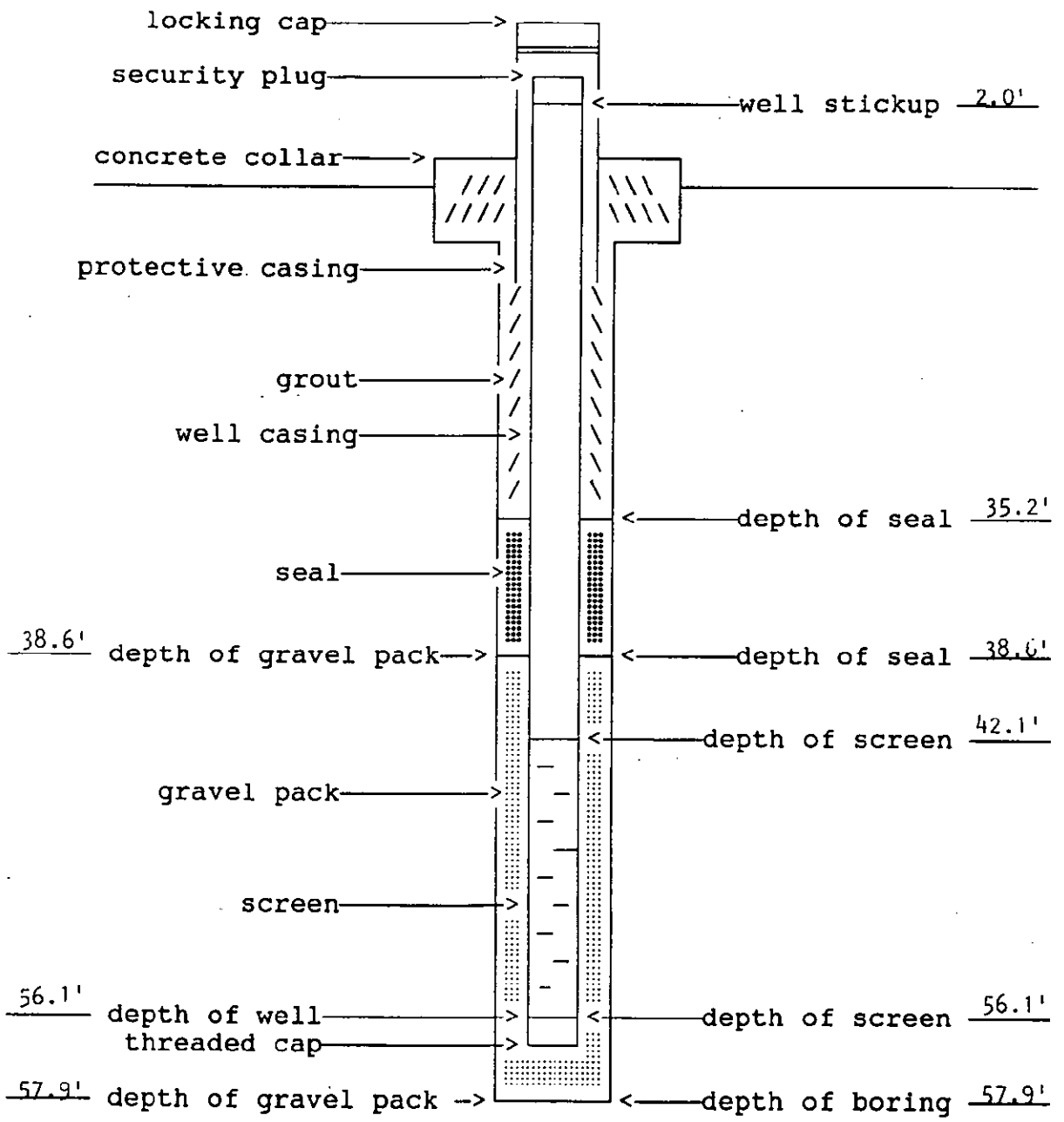
+ STANDARD PENETRATION RESISTANCE IS SUM OF BLOWS FOR 2ND 6" AND 3RD 6" TO DRIVE 1-3/8" I.D., 2" O.D. SPLIT BARREL SAMPLER WITH 140 POUND HAMMER FALLING 30 INCHES

BORING TERMINATED 35.5
BORING REFUSAL N/A
WATER TOB DEPTH 33.2
WATER 24 HR: DEPTH 25.5
WATER LOSSES N/A
CASING SIZE N/A LENGTH N/A

METHOD OF ADVANCING BORING	DEPTH
POWER AUGER	0 TO 35.5
HAND CHOP: W/MUD: W/WATER	TO
ROTARY DRILL: W/MUD: W/WATER	TO
DIAMOND CORE	TO

MONITORING WELL INSTALLATION RECORD

JOB NAME: MNS LANDFILL



DATE INSTALLED: 2-12-92 INSPECTOR: J Meaders	DUKE POWER COMPANY GEOTECHNICAL CENTER	MONITORING WELL NUMBER: MW-3A New # MW-7A

NORTH CAROLINA DEPARTMENT OF NATURAL RESOURCES AND COMMUNITY DEVELOPMENT
DIVISION OF ENVIRONMENTAL MANAGEMENT - GROUNDWATER SECTION
P.O. BOX 27687 - RALEIGH, N.C. 27611, PHONE (919) 733-5083

FOR OFFICE USE ONLY
Quad. No. _____ Serial No. _____
Lat. _____ Long. _____ Pc _____
Minor Basin _____
Basin Code _____
Header Ent. _____ GW-1 Ent. _____

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR DUKE POWER COMPANY
DRILLER REGISTRATION NUMBER 921

STATE WELL CONSTRUCTION PERMIT NUMBER: 59-1105-wm-0785

1. WELL LOCATION: (Show sketch of the location below)
Nearest Town: CORNELIUS N.C.
(Road, Community, or Subdivision and Lot No.)
County: MECKLENBURG

2. OWNER DUKE POWER COMPANY
ADDRESS P.O. BOX 1006 (Street or Route No.)
CHARLOTTE (City or Town) N.C. (State) 28201 (Zip Code)

3. DATE DRILLED 2-11-92 USE OF WELL MONITORING
4. TOTAL DEPTH 57.9 CUTTINGS COLLECTED ☐ Yes ☒ No
5. DOES WELL REPLACE EXISTING WELL? ☐ Yes ☒ No
6. STATIC WATER LEVEL: 28.3 FT. ☒ above ☒ below TOP OF CASING,
TOP OF CASING IS 2.0' FT. ABOVE LAND SURFACE.
7. YIELD (gpm): N/A METHOD OF TEST N/A
8. WATER ZONES (depth): N/A
9. CONTAMINATION: Type N/A Amount N/A
10. CASING:

	Depth From	To	Diameter	Wall Thickness or Weight/Ft.	Material
	+2.0	42.1	2"	SCH 40	PVC

11. GROUT:

	Depth From	To	Material	Method
	0.0	35.2	CEMENT/BENTONITE	PUMP

12. SCREEN:

	Depth From	To	Diameter	Slot Size	Material
	42.1	56.1	2"	.010	PVC

13. GRAVEL PACK:

	Depth From	To	Size	Material
	38.6	57.9	ES = .014 UC = 3.5	SAND

14. REMARKS: BENTONITE SEAL 35.2' - 38.6'

Depth From	To	DRILLING LOG Formation Description
		SEE ATTACHED SOIL TES
		BORING FIELD REPORT, AL
		WELL INSTALLATION RECO
		MW-3A
		New # MW-7A

If additional space is needed use back of form.

LOCATION SKETCH
(Show direction and distance from at least two State Roads, or other map reference points)

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15 NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Jeff Mead 2-12-92
SIGNATURE OF CONTRACTOR OR AGENT DATE

GW-1 Revised 11/84
Submit original to Division of Environmental Management and copy to well owner.

Form 25630 (R3-87)

FORM M-26C	REVISION 2
	PAGE 1 OF 2

DUKE POWER COMPANY
CONSTRUCTION DEPARTMENT
PROJECT McGUIRE

SOIL TEST BORING FIELD REPORT

STARTING TIME N/A
JOB NO. N/A
GROUND SURFACE ELEV. 722.74
JOB NAME McGUIRE LANDFILL
HRS. DRILLING N/A HRS. MOVING N/A
DATE 2-11-92 WEATHER P.C. MILD INSPECTOR A.W. Meders BORING NO. MW-3A

New # MW-7A

	SAMPLING	1ST 6"	2ND 6"	3RD 6"	SCALE	UD	SOIL CLASSIFICATION AND REMARKS
					0	*	NOTE: NO S.P.T. TAKEN UNTIL 48.4', JAR SAMPLES TAKEN AS SHOWN BELOW
* 1	4.8	N/A	N/A	N/A	5		RED / DARK RED, MICA, CLAYEY, SILTY, FINE/MEDIUM SAND.
* 2	9.8	N/A	N/A	N/A	10		RED / DARK RED, MICA., CLAYEY, SILTY, FINE/MEDIUM SAND.
* 3	14.8	N/A	N/A	N/A	15		DARK RED / REDDISH BROWN, MICA, SILTY, FINE/MEDIUM SAND.
* 4	19.8	N/A	N/A	N/A	20		STRONG BROWN, MICA, SILTY, FINE/MEDIUM SAND.
* 5	24.8	N/A	N/A	N/A	25		YELISH-BROWN, MICA, FINE SANDY SILT.
* 6	29.8	N/A	N/A	N/A	30		YELISH. BRN, MICA, FINE SANDY SILT.
* 7	34.8	N/A	N/A	N/A	35		STRONG BROWN, MICA, FINE SANDY SILT
* 8	39.8	N/A	N/A	N/A	40		STRONG BROWN, MICA, FINE SANDY SILT

+ STANDARD PENETRATION RESISTANCE IS SUM OF BLOWS FOR 2ND 6" AND 3RD 6" TO DRIVE 1-3/8" I.D., 2" O.D. SPLIT BARREL SAMPLER WITH 140 POUND HAMMER FALLING 30 INCHES

BORING TERMINATED 57.9
BORING REFUSAL 57.9
WATER TOB DEPTH 28.7
WATER 24 HR: DEPTH 26.3
WATER LOSSES N/A
CASING SIZE N/A LENGTH N/A

METHOD OF ADVANCING BORING	DEPTH
POWER AUGER	0 TO 57.9
HAND CHOP: W/MUD: W/WATER	TO
ROTARY DRILL: W/MUD: W/WATER	TO
DIAMOND CORE	TO

Form 25630 (R3-87)

FORM M-26C | REVISION 2

DUKE POWER COMPANY
CONSTRUCTION DEPARTMENT
PROJECT McGUIRE

SOIL TEST BORING FIELD REPORT

JOB NO. N/A
JOB NAME McGUIRE LANDFILL
DATE 2-11-92 WEATHER P.C. MILD INSPECTOR A.W. Meadors BORING NO. MW-3A

STARTING TIME N/A
GROUND SURFACE ELEV.
HRS. DRILLING N/A HRS. MOVING N/A

New # MW-7A

SAMPLING		1ST 6"	2ND 6"	3RD 6"	SCALE	UD	SOIL CLASSIFICATION AND REMARKS
					40		
9	44.8 43.6	4	10	11	45		WHITE/OLIVE, MICA, SILTY, FINE/MEDIUM SAND
10	50.5 52.0	9	14	22	50		WHITE/ DARK OLIVE, MICA, SILTY, FINE/MEDIUM SAND.
#11	55.5 57.0	9	16	30	55		WHITE/OLIVE BROWN, MICA, SILTY, FINE/MEDIUM SAND
							AUGER REFUSAL @ ~~57.4~~ 57.9'
							BORING TERMINATED @ 57.9
					60		
					65		
					70		
					75		
					80		

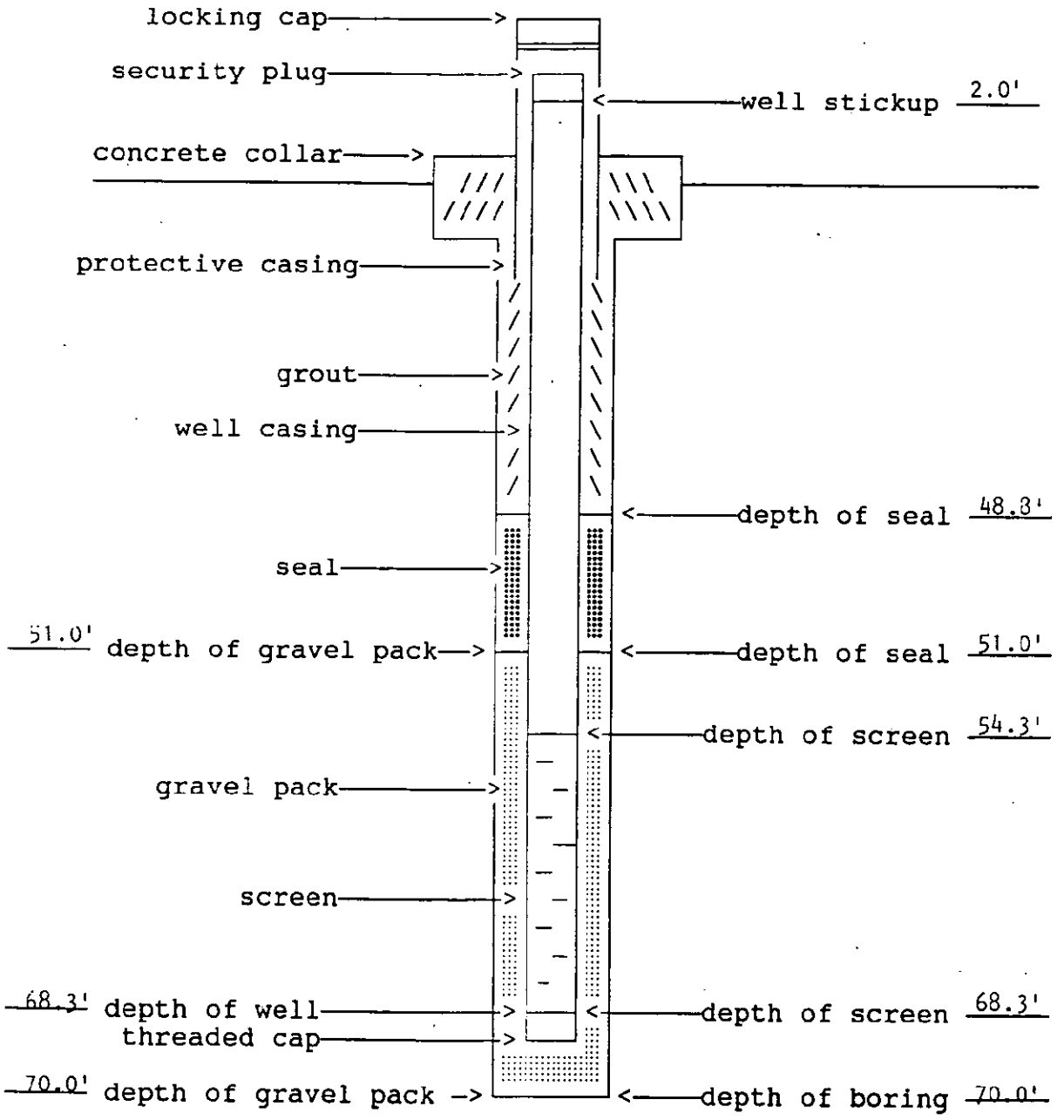
+ STANDARD PENETRATION RESISTANCE IS SUM OF BLOWS FOR 2ND 6" AND 3RD 6" TO DRIVE 1-3/8" I.D., 2" O.D. SPLIT BARREL SAMPLER WITH 140 POUND HAMMER FALLING 30 INCHES

BORING TERMINATED 57.9
BORING REFUSAL 57.9
WATER TOB DEPTH 28.7
WATER 24 HR: DEPTH 26.3 TOP.
WATER LOSSES N/A
CASING SIZE N/A LENGTH N/A

METHOD OF ADVANCING BORING	DEPTH
POWER AUGER	0 TO 57.9
HAND CHOP: W/MUD: W/WATER	TO
ROTARY DRILL: W/MUD: W/WATER	TO
DIAMOND CORE	TO

MONITORING WELL INSTALLATION RECORD

JOB NAME: MNS LANDFILL



DATE INSTALLED: 2-3-92 INSPECTOR: J Meaders	DUKE POWER COMPANY GEOTECHNICAL CENTER	MONITORING WELL NUMBER: MW-4 New # MW-8

NORTH CAROLINA DEPARTMENT OF NATURAL RESOURCES AND COMMUNITY DEVELOPMENT
DIVISION OF ENVIRONMENTAL MANAGEMENT - GROUNDWATER SECTION
P.O. BOX 27687 - RALEIGH, N.C. 27611, PHONE (919) 733-5083

FOR OFFICE USE ONLY
Quad. No. _____ Serial No. _____
Lat. _____ Long. _____ Pc.
Minor Basin _____
Basin Code _____
Header Ent. _____ GW-1 Ent. _____

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR DUKE POWER COMPANY

DRILLER REGISTRATION NUMBER 921

STATE WELL CONSTRUCTION PERMIT NUMBER: 59-1105-wm-0785

1. WELL LOCATION: (Show sketch of the location below)
Nearest Town: CORNELIUS N.C.
(Road, Community, or Subdivision and Lot No.)
County: MECKLENBURG

2. OWNER DUKE POWER COMPANY
ADDRESS P.O. BOX 1006 (Street or Route No.)
CHARLOTTE (City or Town) N.C. (State) 28201 (Zip Code)

3. DATE DRILLED 1-29-92 USE OF WELL MONITORING
4. TOTAL DEPTH 70.0' CUTTINGS COLLECTED ☐ Yes ☒ No.
5. DOES WELL REPLACE EXISTING WELL? ☐ Yes ☒ No
6. STATIC WATER LEVEL: 57.0 FT. ☐ above ☒ below TOP OF CASING.
TOP OF CASING IS 2.0 FT. ABOVE LAND SURFACE.
7. YIELD (gpm): N/A METHOD OF TEST N/A
8. WATER ZONES (depth): N/A
9. DISINFECTANT: Type N/A Amount N/A
10. CASING:

	Depth From	To	Diameter	Wall Thickness or Weight/Ft.	Material
	+2.0	54.3 Ft.	2"	SCH. 40	PVC
		Ft.			
		Ft.			

11. GROUT:

	Depth From	To	Material	Method
	0.0	48.8 Ft.	CEMENT W/BENTONITE,	PUMP
		Ft.		

12. SCREEN:

	Depth From	To	Diameter	Slot Size	Material
	54.3	68.3 Ft.	2" in.	.010 in.	PVC
		Ft.	in.	in.	
		Ft.	in.	in.	

13. GRAVEL PACK:

	Depth From	To	Size	Material
	51.0	70.0 Ft.	ES: .014 UC: 3.5	SAND
		Ft.		

14. PACKS: BENTONITE SEAL 48.8'-51.0'

DRILLING LOG

Depth From	To	Formation Description
		SEE ATTACHED SOIL TEST BORING FIELD REPORT, ALSO WELL INSTALLATI RECORD
		MW-4
		New # MW-8

If additional space is needed use back of form.

LOCATION SKETCH
(Show direction and distance from at least two State Roads or other map reference points)

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15 NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

SIGNATURE OF CONTRACTOR OR AGENT _____ DATE 2-3-92

GW-1 Revised 11/84

Submit original to Division of Environmental Management and copy to well owner.

Form 25630 (R3-87)

FORM M-26C	REVISION 2
	PAGE 1 OF 2

DUKE POWER COMPANY
CONSTRUCTION DEPARTMENT
PROJECT MCGUIRE LANDFILL

SOIL TEST BORING FIELD REPORT

STARTING TIME N/A
JOB NO. N/A
GROUND SURFACE ELEV. 757.30 ~~N/A~~
JOB NAME LANDFILL MONITOR WELLS
HRS. DRILLING N/A HRS. MOVING N/A
DATE 1-29-92 WEATHER P.C. COOL INSPECTOR J.W. Meaders BORING NO. MW-4

New # MW-8

	SAMPLING		1ST 6"	2ND 6"	3RD 6"	SCALE	UD	SOIL CLASSIFICATION AND REMARKS
						0	*	NOTE: NO SPT TAKEN UNTIL 62.5' JAR SAMPLES TAKEN AS SHOWN BELOW
*	1	4.5	N/A	N/A	N/A	5		RED/REDDISH YELLOW. MICA, CLAYEY, FINE SANDY SILT
*	2	9.5	N/A	N/A	N/A	10		REDDISH YELLOW, MICA, SILTY, FINE/MED. SAND
*	3	14.5	N/A	N/A	N/A	15		ST. BRN. /DK. YELLOW. BRN, MICA, SILTY, GRAVELY, FINE/COARSE SAND.
*	4	19.5	N/A	N/A	N/A	20		BRN/YELLOW, MICA, SILTY, FINE/MED. SAND.
*	5	24.5	N/A	N/A	N/A	25		ST. BRN, MICA, FINE SANDY SILT.
*	6	29.5	N/A	N/A	N/A	30		YELLOW BRN, MICA VERY SILTY FINE/MED. SAND
*	7	34.5	N/A	N/A	N/A	35		YELLOW BRN, MICA, FINE SANDY SILT.
*	8	39.5	N/A	N/A	N/A	40		YELLOW BRN, MICA, SILTY, FINE/MED. SAND

BORING TERMINATED 70.0
BORING REFUSAL N/A
WATER TOB DEPTH ~~50/6in~~ 59.5
WATER 24 HR: DEPTH 55.0
WATER LOSSES N/A
CASING SIZE N/A LENGTH N/A

METHOD OF ADVANCING BORING	DEPTH
POWER AUGER	0 TO 70.0
HAND CHOP: W/MUD: W/WATER	TO
ROTARY DRILL: W/MUD: W/WATER	TO
DIAMOND CORE	TO

+ STANDARD PENETRATION RESISTANCE IS SUM OF BLOWS FOR 2ND 6" AND 3RD 6" TO DRIVE 1-3/8" I.D., 2" O.D. SPLIT BARREL SAMPLER WITH 140 POUND HAMMER FALLING 30 INCHES

Form 25630 (R3-87)

FORM M-26C	REVISION 2
	PAGE 2 OF 2

DUKE POWER COMPANY
CONSTRUCTION DEPARTMENT
PROJECT MCGUIRE LANDFILL

SOIL TEST BORING FIELD REPORT

JOB NO. N/A
JOB NAME LANDFILL MONITOR WELLS
DATE 1-29-92 WEATHER PC. MCD

STARTING TIME N/A
GROUND SURFACE ELEV.
HRS. DRILLING N/A HRS. MOVING N/A
INSPECTOR J. W. Masters BORING NO. MW-4

	SAMPLING				SCALE	UD	SOIL CLASSIFICATION AND REMARKS New # MW-8
		1ST 6"	2ND 6"	3RD 6"	40		
* 9	44.5	N/A	N/A	N/A	45		BRNISH YEL., MICA, VERY SILTY, FINE/MEDIUM SAND.
* 10	49.5	N/A	N/A	N/A	50		YELISH BRN, MICA, SILTY, GRAVELY, FINE/COARSE SAND
* 11	54.5	N/A	N/A	N/A	55		OLIVE BRN., MICA, SILTY, FINE/COARSE SAND.
* 12	59.5	N/A	N/A	N/A	60		OLIVE BRN, MICA, SILTY, FINE/COARSE SAND.
13	62.5 64.0	28	21	22	65		OLIVE/OLIVE BRN, MICA, SILTY, FINE/COARSE SAND
14	70.0 70.1	50 = 1 1/4"			70		NO RECOVERY BORING TERMINATED @ 70.0'
					75		
					80		

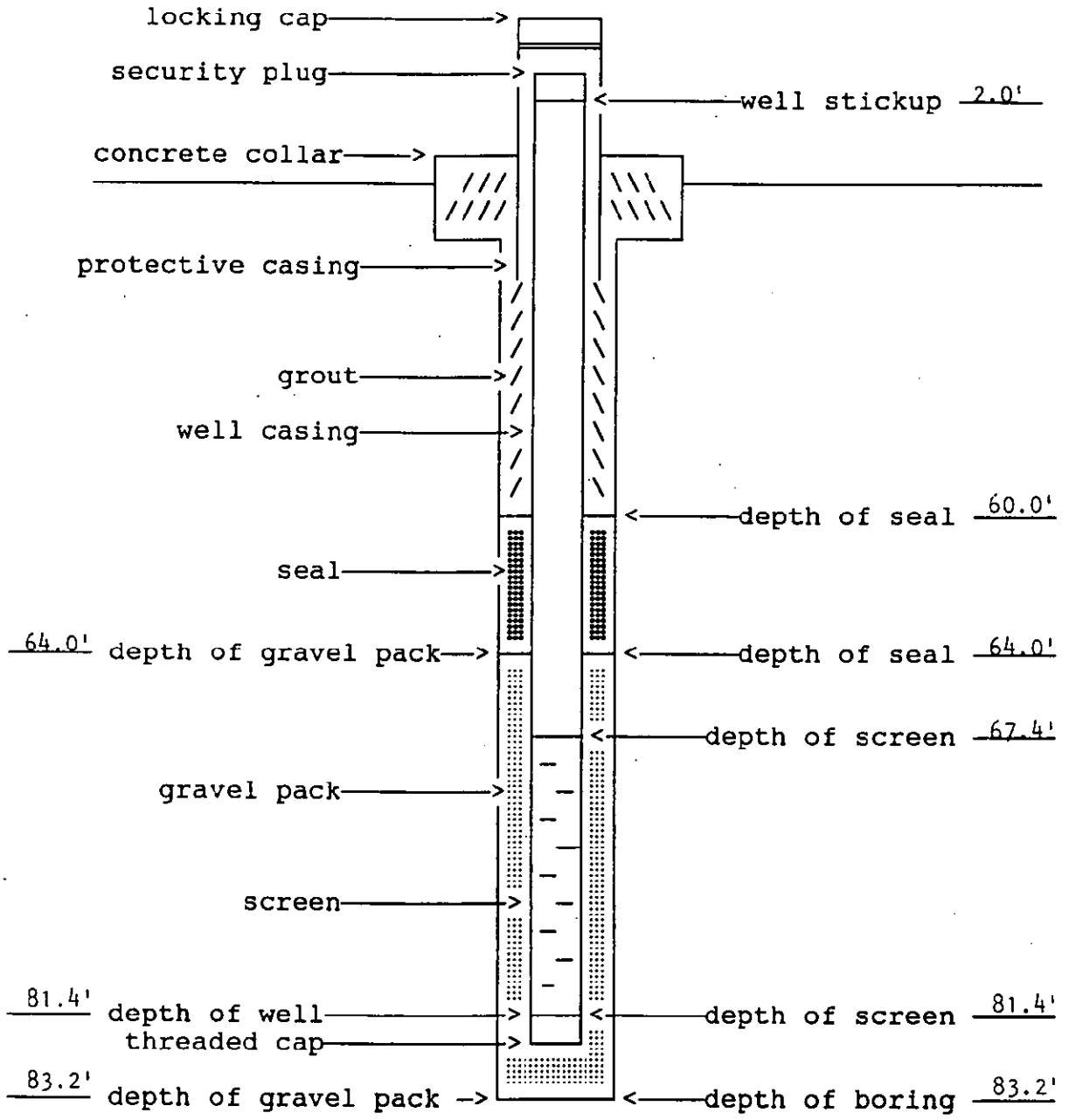
BORING TERMINATED 70.0
BORING REFUSAL N/A
WATER TOB DEPTH 59.5
WATER 24 HR: DEPTH 55.0
WATER LOSSES N/A
CASING SIZE N/A LENGTH N/A

METHOD OF ADVANCING BORING	DEPTH
POWER AUGER	0 TO 70.0
HAND CHOP: W/MUD: W/WATER	TO
ROTARY DRILL: W/MUD: W/WATER	TO
DIAMOND CORE	TO

+ STANDARD PENETRATION RESISTANCE IS SUM OF BLOWS FOR 2ND 6" AND 3RD 6" TO DRIVE 1-3/8" I.D., 2" O.D. SPLIT BARREL SAMPLER WITH 140 POUND HAMMER FALLING 30 INCHES

MONITORING WELL INSTALLATION RECORD

JOB NAME: MNS LANDFILL



DATE INSTALLED: 2-11-92 INSPECTOR: J Meaders	DUKE POWER COMPANY GEOTECHNICAL CENTER	MONITORING WELL NUMBER: MW-4A New # MW-8A

DEPARTMENT OF NATURAL RESOURCES AND COMMUNITY DEVELOPMENT
DIVISION OF ENVIRONMENTAL MANAGEMENT - GROUNDWATER SECTION
P.O. BOX 27687 - RALEIGH,N.C. 27611, PHONE (919) 733-5083

FOR OFFICE USE ONLY
Quad. No. _____ Serial No. _____
Lat. _____ Long. _____ Pc _____
Minor Basin _____
Basin Code _____
Header Ent. _____ GW-1 Ent. _____

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR DUKE POWER COMPANY
DRILLER REGISTRATION NUMBER 921

STATE WELL CONSTRUCTION PERMIT NUMBER: 59-1105-wm-0785

1. WELL LOCATION: (Show sketch of the location below)
Nearest Town: CORNELIUS N.C.
(Road, Community, or Subdivision and Lot No.)

County: MECKLENBURG

2. OWNER DUKE POWER COMPANY
ADDRESS P.O. BOX 1006 (Street or Route No.)
CHARLOTTE (City or Town) N.C. (State) 28201 (Zip Code)

3. DATE DRILLED 1-28-92 USE OF WELL MONITORING
4. TOTAL DEPTH 83.2' CUTTINGS COLLECTED ☐ Yes ☒ No
5. DOES WELL REPLACE EXISTING WELL? ☐ Yes ☒ No
6. STATIC WATER LEVEL: 57.2 FT. ☐ above ☒ below TOP OF CASING,
TOP OF CASING IS 2.0 FT. ABOVE LAND SURFACE.
7. YIELD (gpm): N/A METHOD OF TEST N/A
8. WATER ZONES (depth): N/A
9. CONTAMINATION: Type N/A Amount N/A
10. CASING:

	Depth From	To	Diameter	Wall Thickness or Weight/Ft.	Material
	+2.0	67.4	2"	SCH. 40	PVC

11. GROUT:

	Depth From	To	Material	Method
	0.0	60.0	CEMENT W/BENTONITE	PUMP

12. SCREEN:

	Depth From	To	Diameter	Slot Size	Material
	67.4	81.4	2"	.010 in.	PVC

13. GRAVEL PACK:

	Depth From	To	Size	Material
	64.0	83.2	ES = .014 UC = 3.5	SAND

14. REMARKS: BENTONITE SEAL 60.0'-64.0'

Depth From	To	DRILLING LOG Formation Description
		SEE ATTACHED SOIL TEST BORI
		FIELD REPORT, ALSO WELL
		INSTALLATION RECORD.
		MW-4A
		New # MW-8A

If additional space is needed use back of form.

LOCATION SKETCH
(Show direction and distance from at least two State Roads, or other map reference points)

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15 NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

SIGNATURE OF CONTRACTOR OR AGENT — DATE 2-11-92

Submit original to Division of Environmental Management and copy to well owner.

W-1 Revised 11/84

Form 25630 (R3-87)

FORM M-26C | REVISION 2

DUKE POWER COMPANY
CONSTRUCTION DEPARTMENT
PROJECT McGUIRE

SOIL TEST BORING FIELD REPORT

STARTING TIME N/A
GROUND SURFACE ELEV. 757.61
HRS. DRILLING N/A HRS. MOVING N/A

JOB NO. N/A
JOB NAME McGUIRE LAND FILL
DATE 1-28-92 WEATHER P.C. MILD INSPECTOR A.W. Meadors BORING NO. MW-4A

SAMPLING	1ST 6"	2ND 6"	3RD 6"	SCALE	UD	SOIL CLASSIFICATION AND REMARKS New # MW-8A
				40		
						NO SOIL SAMPLING REQUIRED
				45		
				50		
RUN = 2.2						AUGER REFUSAL @ 52.0
REC = 2.2 = 100%						SLIGHT / FRESH WEATHERING
RQD = 2.2 = 100%						HARD / VERY HARD, MOD. CLOSE JOINTS
				55		END RUN 54.2
RUN = 5.0						SLIGHT / FRESH WEATHERING
REC = 4.0 = 80%						HARD / VERY HARD.
RQD = 4.0 = 80%						MOD. CLOSE JOINTS
				60		END RUN @ 59.2
RUN = 5.0						
REC = 0 = 0%						NO RECOVERY
RQD = 0 = 0%						
				65		END RUN @ 64.2
RUN = 5.0						
REC = 0 = 0%						NO RECOVERY
RQD = 0 = 0%						
				70		END RUN @ 69.2
RUN = 5.0						
REC = 0%						NO RECOVERY
RQD = 0%						
				75		END RUN @ 74.2
RUN = 5.0						VERY SLIGHT / COMPLETE WEATHERING
REC = 4.3						HARD / VERY SOFT
RQD = 1.5						VERY CLOSE / CLOSE JOINTS
				80		END RUN @ 79.2

BORING TERMINATED 83.2
BORING REFUSAL 52.0
WATER TOB DEPTH DRY @ 52.0'
WATER 24 HR: DEPTH 58.2
WATER LOSSES NONE
CASING SIZE N/A LENGTH N/A

METHOD OF ADVANCING BORING	DEPTH
POWER AUGER	0 TO 52.0
HAND CHOP: W/MUD: W/WATER	TO
ROTARY DRILL: W/MUD: W/WATER	TO
DIAMOND CORE	52 TO 83.2

+ STANDARD PENETRATION RESISTANCE IS SUM OF BLOWS FOR 2ND 6" AND 3RD 6" TO DRIVE 1-3/8" I.D., 2" O.D. SPLIT BARREL SAMPLER WITH 140 POUND HAMMER FALLING 30 INCHES

Form 25630 (R3-87)

FORM M-26C | REVISION 2 | PAGE 2 OF 2

DUKE POWER COMPANY
CONSTRUCTION DEPARTMENT
PROJECT McGUIRE

SOIL TEST BORING FIELD REPORT

STARTING TIME N/A
GROUND SURFACE ELEV.
JOB NO. N/A
JOB NAME McGUIRE LANDFILL
HRS. DRILLING N/A HRS. MOVING N/A
DATE 2-3-92 WEATHER P.C. MILD INSPECTOR J.W. Meadows BORING NO. MW-4A

New # MW-8A

SAMPLING	1ST 6"	2ND 6"	3RD 6"	SCALE	UD	SOIL CLASSIFICATION AND REMARKS
RUN = 4.0				80		VERY SEVERE / SLIGHT WEATHERING
REC = 2.5 = 60%						SOFT / HARD
RQD = 1.3 = 32.5%						VERY CLOSE / CLOSE JOINTS
				85		END RUN @ 83.2'
						BORING TERMINATED @ 83.2'
				90		
				95		
				100		
				105		
				110		
				115		
				120		

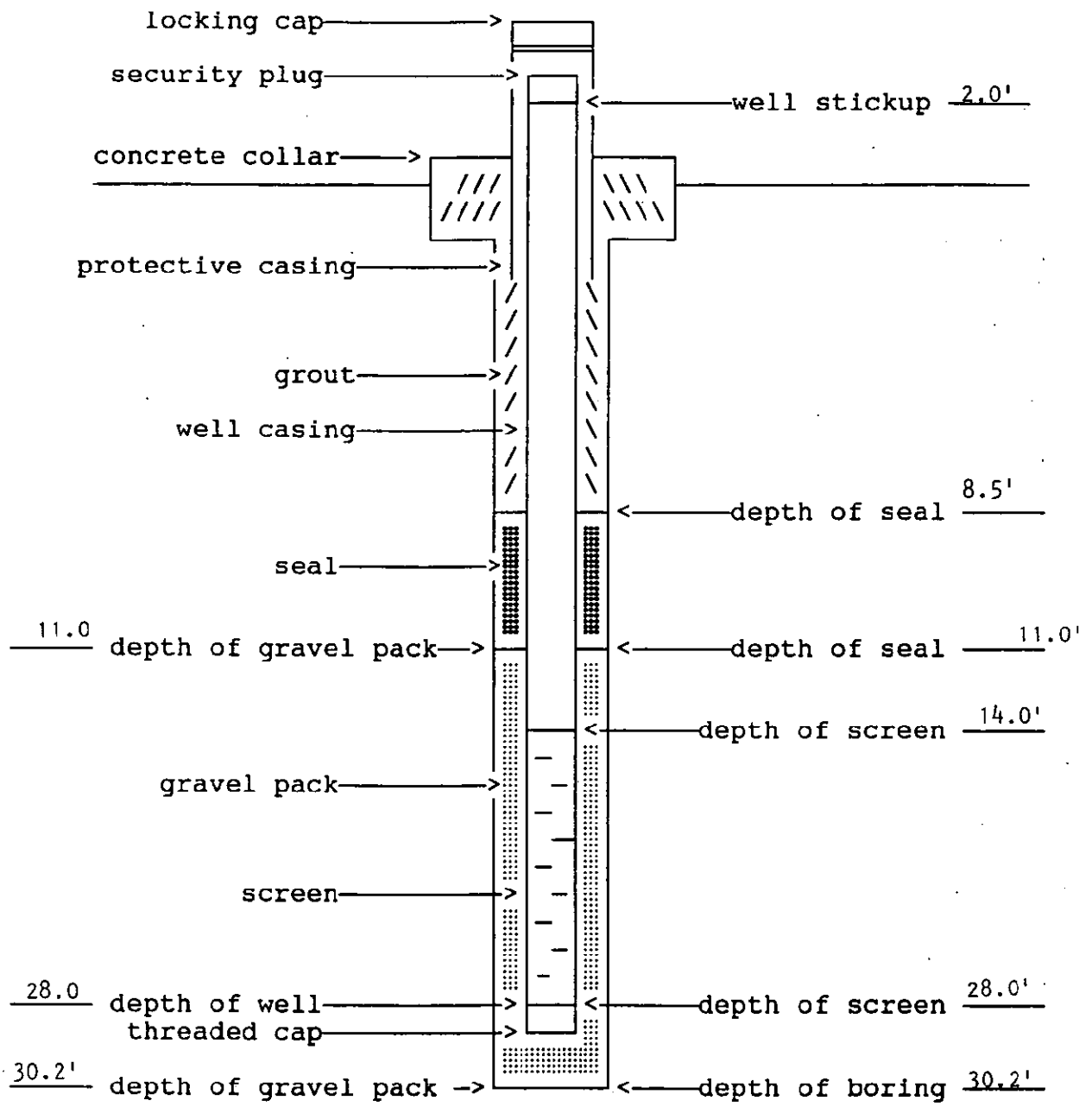
+ STANDARD PENETRATION RESISTANCE IS SUM OF BLOWS FOR 2ND 6" AND 3RD 6" TO DRIVE 1-3/8" I.D., 2" O.D. SPLIT BARREL SAMPLER WITH 140 POUND HAMMER FALLING 30 INCHES

BORING TERMINATED 83.2
BORING REFUSAL 52.0
WATER TOB DEPTH DRY @ 52.0'
WATER 24 HR: DEPTH 55.2
WATER LOSSES NONE
CASING SIZE N/A LENGTH N/A

METHOD OF ADVANCING BORING	DEPTH
POWER AUGER	0 TO 52.0
HAND CHOP: W/MUD: W/WATER	TO
ROTARY DRILL: W/MUD: W/WATER	TO
DIAMOND CORE	52 TO 83.2

MONITORING WELL INSTALLATION RECORD

JOB NAME: MNS LANDFILL



DATE INSTALLED: 2-19-92 INSPECTOR: J Meaders	DUKE POWER COMPANY GEOTECHNICAL CENTER	MONITORING WELL NUMBER: MW-5 New # MW-9

NORTH CAROLINA DEPARTMENT OF NATURAL RESOURCES AND COMMUNITY DEVELOPMENT
DIVISION OF ENVIRONMENTAL MANAGEMENT – GROUNDWATER SECTION
P.O. BOX 27687 – RALEIGH, N.C. 27611, PHONE (919) 733-5083

FOR OFFICE USE ONLY
Quad. No. _____ Serial No. _____
Lat. _____ Long. _____ Pc. _____
Minor Basin _____
Basin Code _____
Header Ent. _____ GW-1 Ent. _____

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR DUKE POWER COMPANY
DRILLER REGISTRATION NUMBER 921

STATE WELL CONSTRUCTION PERMIT NUMBER: 59-1105-wm-0785

1. WELL LOCATION: (Show sketch of the location below)
Nearest Town: CORNELIUS N.C. County: MECKLENBURG
(Road, Community, or Subdivision and Lot No.)

2. OWNER DUKE POWER COMPANY
ADDRESS P.O. BOX 1006 (Street or Route No.)
CHARLOTTE (City or Town) N.C. (State) 28201 (Zip Code)

3. DATE DRILLED 2-19-92 USE OF WELL MONITORING
4. TOTAL DEPTH 30.2' CUTTINGS COLLECTED ☐ Yes ☒ No
5. DOES WELL REPLACE EXISTING WELL? ☐ Yes ☒ No
6. STATIC WATER LEVEL: 19.4 FT. ☐ above ☒ below TOP OF CASING,
TOP OF CASING IS 2.0 FT. ABOVE LAND SURFACE.
7. YIELD (gpm): N/A METHOD OF TEST N/A
8. WATER ZONES (depth): N/A
9. CHLORINATION: Type N/A Amount N/A
10. CASING:

	Depth		Diameter	Wall Thickness or Weight/Ft.	Material
From	±2.0'	To 14.0 Ft.	2"	SCH. 40	PVC
From		To Ft.			
From		To Ft.			

11. GROUT:

	Depth		Material	Method
From	0.0	To 8.5 Ft.	CEMENT/W/BENTONITE	PUMP
From		To Ft.		

12. SCREEN:

	Depth		Diameter	Slot Size	Material
From	14.0	To 28.0 Ft.	2 in.	.010 in.	PVC
From		To Ft.	in.	in.	
From		To Ft.	in.	in.	

13. GRAVEL PACK:

	Depth		Size	Material
From	11.0	To 30.2 Ft.	ES = .014 UC = 3.5	SAND
From		To Ft.		

14. REMARKS: BENTONITE SEAL 8.5' – 11.0'

Drilling Log: From	To	Formation Description
		SEE ATTACHED SOIL TEST
		BORING FIELD REPORT, ALSO
		WELL INSTALLATION RECORD
		MW-5
		New # MW-9

If additional space is needed use back of form.

LOCATION SKETCH
(Show direction and distance from at least two State Roads, or other map reference points)

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15 NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Jeff Moore 2-19-92
SIGNATURE OF CONTRACTOR OR AGENT DATE

GW-1 Revised 11/84
Submit original to Division of Environmental Management and copy to well owner

Form 25630 (R3-87)

FORM M-26C	REVISION 2
	PAGE 1 OF 1

DUKE POWER COMPANY
CONSTRUCTION DEPARTMENT
PROJECT MCGUIRE

SOIL TEST BORING FIELD REPORT

JOB NO. N/A
JOB NAME MCGUIRE LANDFILL
DATE 2-19-92 WEATHER CLD. RAIN INSPECTOR J.W. Meuders BORING NO. MW-5

STARTING TIME N/A
GROUND SURFACE ELEV. 710.27
HRS. DRILLING N/A HRS. MOVING N/A

New # MW-9

	SAMPLING	1ST 6"	2ND 6"	3RD 6"	SCALE	UD	SOIL CLASSIFICATION AND REMARKS
					0	*	NOTE: NO S.P.T. TAKEN UNTIL 30.2' JAR SAMPLES TAKEN AS SHOWN BELOW.
* 1	5.0	N/A	N/A	N/A	5		RED, MICA, SILTY, FINE/MEDIUM SAND.
* 2	10.0	N/A	N/A	N/A	10		RED/REDDISH BROWN, MICA, SILTY, FINE/MED. SAND.
* 3	~~15.0~~ 15.0	N/A	N/A	N/A	15		REDDISH BROWN, MICA, SILTY, FINE/MED. SAND
* 4	20.0	N/A	N/A	N/A	20		YELISH BROWN, MICA, SILTY, FINE/MEDIUM SAND
* 5	25.0	N/A	N/A	N/A	25		STRONG BROWN/YELLOWISH BROWN, MICA, SILTY, FINE/MED. SAND.
6	30.2 31.7	9	12	18	30		OLIVE BROWN, MICA, SILTY, FINE/MEDIUM SAND
							— BORING TERMINATED @ 30.2 —
					35		
					40		

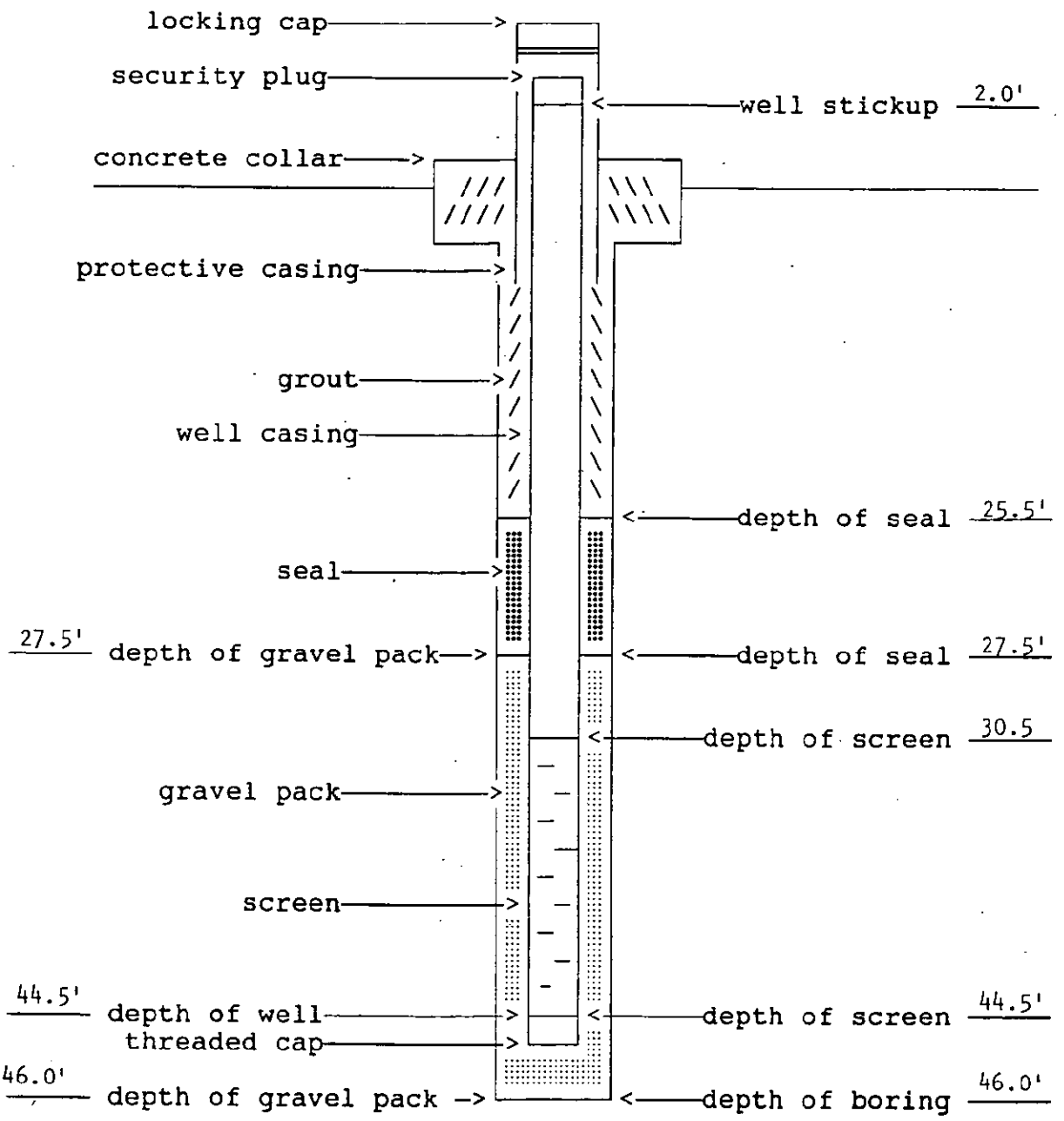
+ STANDARD PENETRATION RESISTANCE IS SUM OF BLOWS FOR 2ND 6" AND 3RD 6" TO DRIVE 1-3/8" I.D., 2" O.D. SPLIT BARREL SAMPLER WITH 140 POUND HAMMER FALLING 30 INCHES

BORING TERMINATED 30.2
BORING REFUSAL N/A
WATER TOB DEPTH 19.3
WATER 24 HR: DEPTH 17.4
WATER LOSSES N/A
CASING SIZE N/A LENGTH N/A

METHOD OF ADVANCING BORING	DEPTH
POWER AUGER	0 TO 30.2
HAND CHOP: W/MUD: W/WATER	TO
ROTARY DRILL: W/MUD: W/WATER	TO
DIAMOND CORE	TO

MONITORING WELL INSTALLATION RECORD

JOB NAME: MNS LANDFILL



DATE INSTALLED: 2-18-92 INSPECTOR: J Meaders	DUKE POWER COMPANY GEOTECHNICAL CENTER	MONITORING WELL NUMBER: MW-5A New # MW-9A

N.C. NATURAL RESOURCES AND COMMUNITY DEVELOPMENT
DIVISION OF ENVIRONMENTAL MANAGEMENT – GROUNDWATER SECTION
P.O. BOX 27687 – RALEIGH, N.C. 27611, PHONE (919) 733-5083

FOR OFFICE USE ONLY
Quad. No. _____ Serial No. _____
Lat. _____ Long. _____ Pc.
Minor Basin _____
Basin Code _____
Header Ent. _____ GW-1 Ent. _____

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR DUKE POWER COMPANY
DRILLER REGISTRATION NUMBER 921

STATE WELL CONSTRUCTION PERMIT NUMBER: 59-1105-wm-0785

1. WELL LOCATION: (Show sketch of the location below)
Nearest Town: CORNELIUS N.C. County: MECKLENBURG
(Road, Community, or Subdivision and Lot No.)

2. OWNER DUKE POWER COMPANY
ADDRESS P.O. BOX 1006 (Street or Route No.)
CHARLOTTE (City or Town) N.C. (State) 28201 (Zip Code)

3. DATE DRILLED 2-18-92 USE OF WELL MONITORING
4. TOTAL DEPTH 46.0' CUTTINGS COLLECTED ☐ Yes ☒ No
5. DOES WELL REPLACE EXISTING WELL? ☐ Yes ☒ No
6. STATIC WATER LEVEL: 19.5' FT. ☐ above ☒ below TOP OF CASING,
TOP OF CASING IS 2.0 FT. ABOVE LAND SURFACE.
7. YIELD (gpm): N/A METHOD OF TEST N/A
8. WATER ZONES (depth): N/A
9. DISINFECTANT: Type N/A Amount N/A
10. CASING:

	Depth From	To	Diameter	Wall Thickness or Weight/Ft.	Material
	+2.0'	30.5 ~~25.5~~	2"	SCH. 40	PVC

11. GROUT:

	Depth From	To	Material	Method
	0.0	25.5	CEMENT/BENTONITE	PUMP

12. SCREEN:

	Depth From	To	Diameter	Slot Size	Material
	30.5	44.5	2 in.	.010 in.	PVC
			in.	in.	
			in.	in.	

13. GRAVEL PACK:

	Depth From	To	Size	Material
	27.5	46.0	ESS .014 UC = 3.5	SAND

14. REMARKS: BENTONITE SEAL 25.5'– 27.5

Depth From	To	DRILLING LOG Formation Description
		SEE ATTACHED SOIL TEST
		BORING FIELD REPORT, ALS
		WELL INSTALLATION RECOR
		MW-5A
		New # MW-9A

If additional space is needed use back of form.

LOCATION SKETCH
(Show direction and distance from at least two State Roads or other map reference points)

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15 NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

SIGNATURE OF CONTRACTOR OR AGENT: [signature] DATE: 2-18-92

GW-1 Revised 11/84

Submit original to Division of Environmental Management and copy to well owner.

Form 25630 (R3-87)

FORM M-26C | REVISION 2

DUKE POWER COMPANY
CONSTRUCTION DEPARTMENT
PROJECT McGUIRE

SOIL TEST BORING FIELD REPORT

JOB NO. N/A
JOB NAME McGUIRE LANDFILL
DATE 2-18-92 WEATHER CLD, RAIN INSPECTOR J.W. Meadors

STARTING TIME N/A
GROUND SURFACE ELEV. 710.30
HRS. DRILLING N/A HRS. MOVING N/A
BORING NO. MW-5A

New # MW-9A

	SAMPLING	1ST 6"	2ND 6"	3RD 6"	SCALE	UD	SOIL CLASSIFICATION AND REMARKS
					0	*	NOTE: NO SPT TAKEN UNTIL 35.0, JAR SAMPLES TAKEN AS SHOWN BELOW.
* 1	5.0	N/A	N/A	N/A	5		REDDISH BROWN/RED, MICA, FINE, SANDY SILT
* 2	10.0	N/A	N/A	N/A	10		REDDISH BROWN, MICA, SILTY, FINE/MEDIUM SAND
* 3	15.0	N/A	N/A	N/A	15		REDDISH BRN, MICA, SILTY, FINE/MED. SAND.
* 4	20.0	N/A	N/A	N/A	20		REDDISH BRN./REDDISH YEL., MICA, SILTY, FINE/MED SAND.
* 5	25.0	N/A	N/A	N/A	25		REDDISH BRN/REDDISH YEL, MICA, SILTY, FINE/MED. SAND
* 6	30.0	N/A	N/A	N/A	30		REDDISH BRN, MICA, SILTY, FINE/MED. SAND
7	35.0 36.5	21	21	29	35		OLIVE BRN, MICA, SILTY, FINE/MEDIUM SAND.
8	40.0 41.5	21	23	30	40		OLIVE GRAY, MICA, SILTY, FINE/MEDIUM SAND

+ STANDARD PENETRATION RESISTANCE IS SUM OF BLOWS FOR 2ND 6" AND 3RD 6" TO DRIVE 1-3/8" I.D., 2" O.D. SPLIT BARREL SAMPLER WITH 140 POUND HAMMER FALLING 30 INCHES

BORING TERMINATED 46.0
BORING REFUSAL 46.0
WATER TOB DEPTH 22.7
WATER 24 HR: DEPTH 17.5
WATER LOSSES N/A
CASING SIZE N/A LENGTH N/A

METHOD OF ADVANCING BORING	DEPTH
POWER AUGER	0 TO 46.0
HAND CHOP: W/MUD: W/WATER	TO
ROTARY DRILL: W/MUD: W/WATER	TO
DIAMOND CORE	TO

Form 25630 (R3-87)

FORM M-26C | REVISION 2

DUKE POWER COMPANY
CONSTRUCTION DEPARTMENT
PROJECT MCGUIRE

SOIL TEST BORING FIELD REPORT

JOB NO. N/A
JOB NAME MCGUIRE LANDFILL
DATE 2-18-92 WEATHER COLD, RAIN INSPECTOR J.W. Meeders BORING NO. MW-9A

STARTING TIME N/A
GROUND SURFACE ELEV.
HRS. DRILLING N/A HRS. MOVING N/A

SAMPLING		1ST 6"	2ND 6"	3RD 6"	SCALE	UD	SOIL CLASSIFICATION AND REMARKS New # MW-9A
					40		
9	45.0 45.9	22	50	4 3/4"	45		OLIVE GRAY/ST. BROWN, MICA, SILTY, FINE /COARSE SAND, W/GRAVELS
							AUGER REFUSAL @ 46.0'
							BORING TERMINATED @ 46.0'
					50		
					55		
					60		
					65		
					70		
					75		
					80		

+ STANDARD PENETRATION RESISTANCE IS SUM OF BLOWS FOR 2ND 6" AND 3RD 6" TO DRIVE 1-3/8" I.D., 2" O.D. SPLIT BARREL SAMPLER WITH 140 POUND HAMMER FALLING 30 INCHES

BORING TERMINATED 46.0
BORING REFUSAL 46.0
WATER TOB DEPTH 22.7
WATER 24 HR: DEPTH 17.5
WATER LOSSES N/A
CASING SIZE N/A LENGTH N/A

METHOD OF ADVANCING BORING	DEPTH
POWER-AUGER	0 TO 46.0
HAND CHOP: W/MUD: W/WATER	TO
ROTARY DRILL: W/MUD: W/WATER	TO
DIAMOND CORE	TO

March 28, 2014 ***Via email: Sean.DeNeale@duke-energy.com***

Mr. Sean DeNeale
Duke Energy Carolinas, LLC
400 South Church Street
Charlotte, NC 28201-1006

Subject: Duke Energy Carolinas, LLC
McGuire Nuclear Station Landfill No. 2, Permit No. 6004-INDUS
Financial Assurance Cost Estimate

Dear Mr. DeNeale:

As requested, HDR Engineering, Inc. (HDR), is providing the financial assurance cost estimate for the closure, post-closure care, and potential assessment and corrective action costs associated with the Duke Energy Carolinas, LLC, McGuire Nuclear Station Landfill #2, Permit No. 6004-INDUS.

The following cost estimates are detailed in the attached tables:

- Closure – the estimated costs are $1,130,248 ($215,318 per acre). Details are provided in the attached Table 1.

- Post-Closure Care – the estimated costs are $799,311 ($5,076 per year per acre) or $26,644 annually. Details are provided in the attached Table 2.

- Potential Assessment and Corrective Action – the estimated costs are $752,019 ($4,775 per year per acre). Details are provided in the attached Table 3. Only the costs associated with groundwater and surface water monitoring and maintenance are included with this cost estimate. North Carolina General Statute 130A-295.2(h) requires the permit holder to establish financial assurance sufficient to cover a minimum of $2,000,000 for potential assessment and corrective action at the facility. As the estimated costs are less than the required minimum, $2,000,000 is used for potential assessment and corrective action costs.

Based on the estimates described above, the total financial assurance cost estimate is $3,929,559.

The estimated costs for closure and post-closure care are based on material quantities contained in the Conceptual Design and Estimated Costs for Landfill Closure, McGuire Nuclear Station, Landfill #2, prepared by Altamont Environmental, Inc. dated October 11, 2011.

Should you have any questions regarding this submittal or need further information, please do not hesitate to contact me at (828) 891-6296 or bill.miller@hdrinc.com.

Respectfully submitted,

HDR Engineering, Inc. of the Carolinas

William M. Miller, P.E.
Senior Engineer

NORTH CAROLINA PROFESSIONAL SEAL 17661 ENGINEER WILLIAM M. MILLER

Enclosures:

Table 1 – Closure Cost Estimate
Table 2 – Post-Closure Care Cost Estimate
Table 3 – Potential Assessment and Corrective Action Cost Estimate

cc: Ms. Kimberlee Hutchinson, Duke Energy Carolinas, LLC
(email: Kim.Hutchinson@duke-energy.com)

Mr. John Williamson, Duke Energy Carolinas, LLC
(email: John.Hutchinson@duke-energy.com)

TABLE 1
CLOSURE COST ESTIMATE
DUKE ENERGY - MCGUIRE NUCLEAR STATION
LANDFILL #2, PERMIT NO. 6004-INDUS
MECKLENBURG COUNTY, NC
APRIL 2014

	Quantity[1]	Unit	Unit Cost [2]	Total Cost
Final Cover System Construction Costs				
Demolition of Interim Cover Measures	5.25	AC	$1,000	$5,249
Fine Grading of Interim Cover	5.25	AC	$3,800	$19,947
Passive Gas Vents and Trenching	5.00	EA	$16,498	$82,488
40 mil LLDPE Geomembrane	228,655	SF	$0.63	$144,053
Geocomposite Drainage Layer	228,655	SF	$0.98	$224,082
6" Vegetative Layer	4,234	CY	$10.00	$42,344
18" Protective Cover	12,703	CY	$4.00	$50,812
Erosion Control Bench	3,200	LF	$20.84	$66,686
Armored Channel	2,600	LF	$73.98	$192,349
RCP Headwall	4	EA	$2,860	$11,441
Surveys	5.25	AC	$1,400	$7,349
Final Landscaping (Seeding, Fertilizing, and Mulching)	5.25	AC	$1,800	$9,449
Subtotal				$856,248
Mobilization/Demobilization (5% of Subtotal)				$42,812
Engineering Services, CQA/CQC (12% of Subtotal)				$102,750
Contingency (15% of Subtotal)				$128,437
Total				**$1,130,248**
Cost Per Acre (for 5.25 acres)				**$215,318**

Notes:
1. Quantities are based on the Conceptual Design and Estimated Costs for Landfill Closure, McGuire Nuclear Station, Landfill #2, prepared by Altamont Environmental, Inc. dated October 11, 2011.
2. Units costs are from the April 2012 Craig Rd Landfill financial assurance cost estimate and the October 2011 MNS Landfill #2 financial assurance cost estimate.
3. Costs provided are Year 2014 dollars.

TABLE 2
POST-CLOSURE CARE COST ESTIMATE
DUKE ENERGY - MCGUIRE NUCLEAR STATION
LANDFILL #2, PERMIT NO. 6004-INDUS
MECKLENBURG COUNTY, NC
APRIL 2014

	Quantity	Unit	Unit Cost [3]	Total Cost
Administration/Inspection/Recordkeeping(1)				
Staff Professional (80 Hrs/Yr @ $85/Hr)	30	Yr	$6,800	$204,000
Technician (40 Hrs/Yr @ $60/Hr)	30	Yr	$2,400	$72,000
Clerical (8 Hrs/Yr @ $50/hr)	30	Yr	$400	$12,000
Maintenance				
Fencing, Gates, Signs, Etc.	30	Yr	$1,000	$30,000
Access Roads	30	Yr	$2,000	$60,000
Mowing ($100 per acre per quarter over 5.25 acres)	30	Yr	$2,100	$63,000
Stormwater Structures	30	Yr	$5,000	$150,000
Leachate Collection and Storage	30	Yr	$1,000	$30,000
Final Cover System ($1,500 per acre)(2)	30	Yr	$1,968	$59,053
Fees				
Annual Permit Fee	30	Yr	$500	$15,000
Subtotal				$695,053
Contingency (15% of Subtotal)				$104,258
30 Year Total				**$799,311**
30 Year Total Per Acre (for 5.25 acres)				**$152,273**
Cost Per Year (Includes 15% Contingency)				**$26,644**
Cost Per Year Per Acre (for 5.25 acres)				**$5,076**

Notes:
1. Assumes quarterly monitoring and reporting, preparation of annual report, and managing site activities.
2. Assumes erosion repair and seeding for 25 percent of the cover annually.
3. Units costs are from the April 2012 Craig Rd Landfill financial assurance cost estimate.
4. Costs provided are Year 2014 dollars.

TABLE 3
POTENTIAL ASSESMENT AND CORRECTIVE ACTION COST ESTIMATE
DUKE ENERGY - MCGUIRE NUCLEAR STATION
LANDFILL #2, PERMIT NO. 6004-INDUS
MECKLENBURG COUNTY, NC
APRIL 2014

	Quantity	Unit	Unit Cost [2]	Total Cost
Compliance Monitoring and Reporting				
Registered Professional (16 Hrs/Yr @ $105/Hr)	30	Yr	$1,680	$50,400
Staff Professional (24 Hrs/Yr @ $85/Hr)	30	Yr	$2,040	$61,200
CAD (8 Hrs/Yr @ $70/Hr)	30	Yr	$560	$16,800
Clerical (4 Hrs/Yr @ $50/hr)	30	Yr	$200	$6,000
Sampling and Analysis				
Semiannual Groundwater and Surface Water Sampling for 30 Years (11 monitoring wells and 1 surface water sample location)	60	Event	$7,961	$477,642.00
Semiannual Landfill Gas Monitoring	60	Event	$698	$41,887.45
Subtotal				$653,929
Contingency (15% of Subtotal)				$98,089
30 Year Total				**$752,019**
30 Year Total Per Acre (for 5.25 acres)				**$143,264**
Cost Per Year (Includes 15% Contingency)				**$25,067.30**
Cost Per Year Per Acre (for 5.25 acres)				**$4,775**
Minimum Financial Assurance Amount [3]				**$2,000,000**

Notes:

1. Assumes semi-annual compliance monitoring and reporting.
2. Units costs are from the April 2012 Craig Rd Landfill financial assurance cost estimate and the October 2011 MNS Landfill #2 financial assurance cost estimate.
3. North Carolina General Statute 130A-295.2(h) requires the owner or operator of a sanitary landfill to establish financial assurance sufficient to cover a minimum of $2,000,000 in costs for potential assessment and corrective action at the facility.
4. Costs provided are Year 2014 dollars.