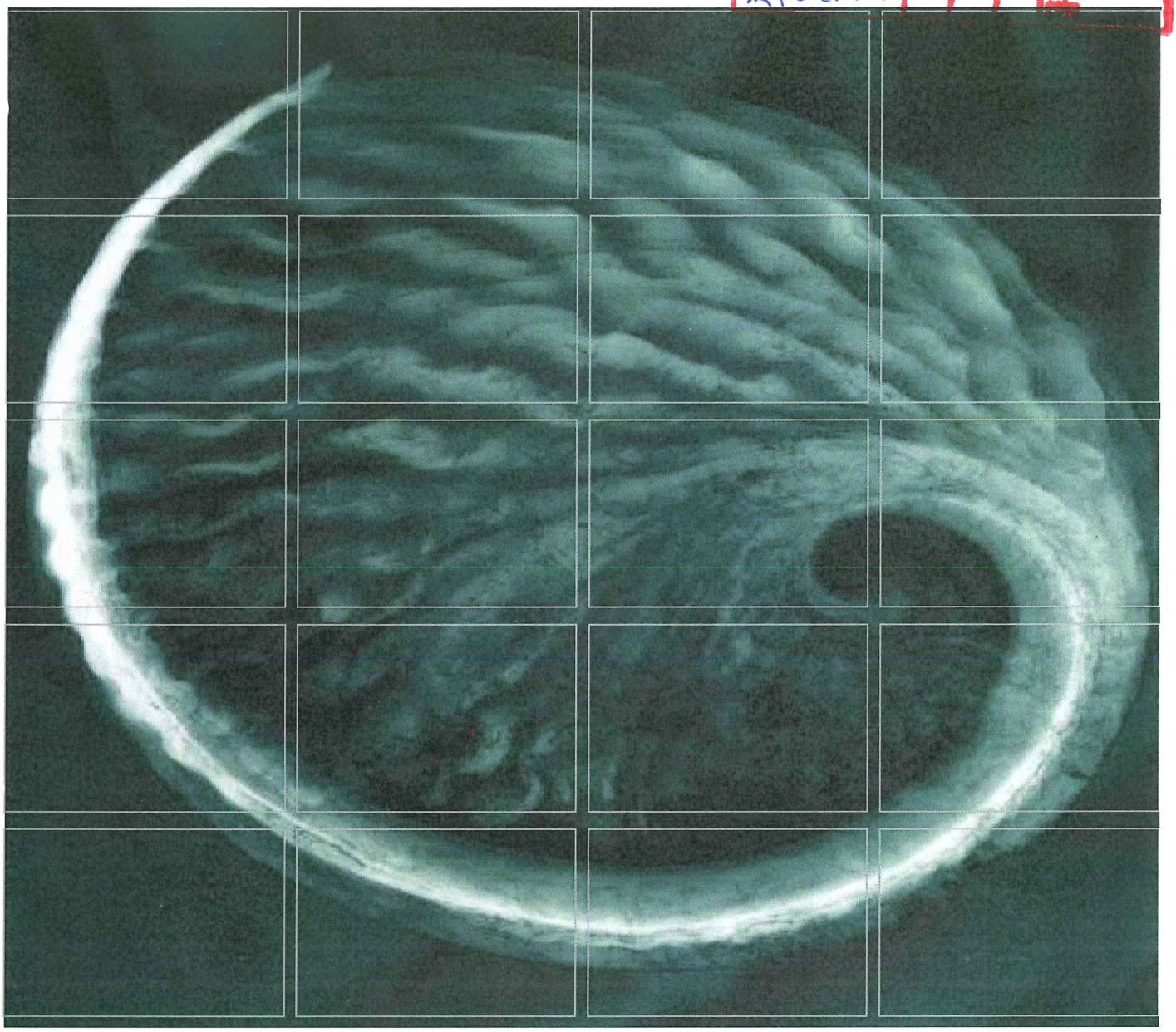
Fac/Perm/Co ID # Maysville C&DL Application
Date 6 21 13
Doc ID 19220



Green Recycling Solutions LLC

Groundwater Monitoring Plan Proposed Construction & Demolition Debris Landfill – Phase 1

Maysville, North Carolina

June 2013

RECEIVED JUN 21 2013 SOLID WASTE SECTION

NORTH CAROLINA LICENSED SEAL 1113 GEOLOGIST THOMAS M. WILSON

06/21/2013 DIN19220 Page 1 of 79

GROUNDWATER MONITORING PLAN
GREEN RECYCLING SOLUTIONS LLC
CONSTRUCTION & DEMOLITION DEBRIS (C&D) LANDFILL
MAYSVILLE, NORTH CAROLINA

PHASE 1, CELLS 1A – 1C

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GROUNDWATER MONITORING PLAN
GREEN RECYCLING SOLUTIONS LLC
CONSTRUCTION & DEMOLITION DEBRIS (C&D) LANDFILL
MAYSVILLE, NORTH CAROLINA

PHASE 1, CELLS 1A – 1C

Introduction

In accordance with 15A NCAC 13B .0544 MONITORING PLANS AND REQUIREMENTS FOR C&DLF FACILITIES, a Monitoring Plan must be submitted that contains information regarding the proposed groundwater monitoring system(s), sampling and analysis requirements, and detection monitoring requirements. The Plan shall include a sufficient number of detection wells and background water quality wells to effectively monitor water quality of the representative aquifer located below the landfill footprint. This Plan has been developed based on the Site Hydrogeologic Study information submitted to NCDENR – Division of Waste Management prepared by ERM NC, Inc. dated December 16, 2011.

Background Information

The proposed Green Recycling Solutions LLC, C&D Landfill is located within the physiographic region of the Inner Coastal Plain. "The Inner Coastal Plain Province consists of stair-step-like planar terraces that dip gently towards the ocean. At higher elevations, the land is dissected to form gently rolling hills and valleys. Elevations range from about 600 feet to 25 feet above mean sea level. The boundary between the Piedmont and Coastal Plain is the Fall Zone. This zone represents the elevational break between the resistant rocks of the Piedmont and the more easily eroded sediments of the Coastal Plain." *(Ref: North Carolina Geological Survey, Physiography of North Carolina, M.A. Medina, J.C. Reid, and R.H. Carpenter, 2004*). The site location is shown on the North Carolina Physiography Map (*Figure - 1*) for reference.

"The unconfined, surficial aquifer of much of the southeastern North Carolina Coastal Plain typically consists of variably thick, Pliocene, Pleistocene, and Holocene deposits. On the south side of the Neuse River, Pleistocene surficial deposits (sand, mud, shell, gravel) are thin (20 ft thick), and the top of the Cretaceous (Peedee) confining unit occurs at a depth of 132 ft. Between these surfaces is a thick sequence (110 ft) of muddy sand, sand and limestone that includes Paleocene (Beaufort Formation), Eocene (Castle Hayne Formation), and Oligocene (Riverbend/Belgrade Formations) deposits. These formations include a variety of siliciclastic and carbonate facies, some of which form porous and permeable aquifers." (Reference: Shallow Aquifers and Confining Units in the

Neuse River Basin, Surry to Suffolk Scarp, Fiscal Year 2003 Grant, NC-DENR Contract Number EW04035).

In Jones County, the Coastal Plain deposits consist primarily of limestone and unconsolidated sands and clays. Geologically, the proposed site is located within the Belgrade Formation (*Ref. North Carolina Geological Survey, Generalized Geologic Map of North Carolina, 1991)* as shown in *Figure – 2*. Generally, the surficial soils within the site area consist of silty sands and clayey sands with discrete areas of surface clays/silts that typically support wetland areas. Based on the predominance of silty and clayey sands observed in shallow borings advanced at the proposed site, the site is considered to be within the Haywood Landing Member of the Belgrade Formation.

The sandy soils within the upper 20-feet of soil strata includes the uppermost ground water aquifer for this region. The ground water level within the surficial aquifer may vary several feet based on significant rainfall events as this aquifer is primarily recharged by rainfall.

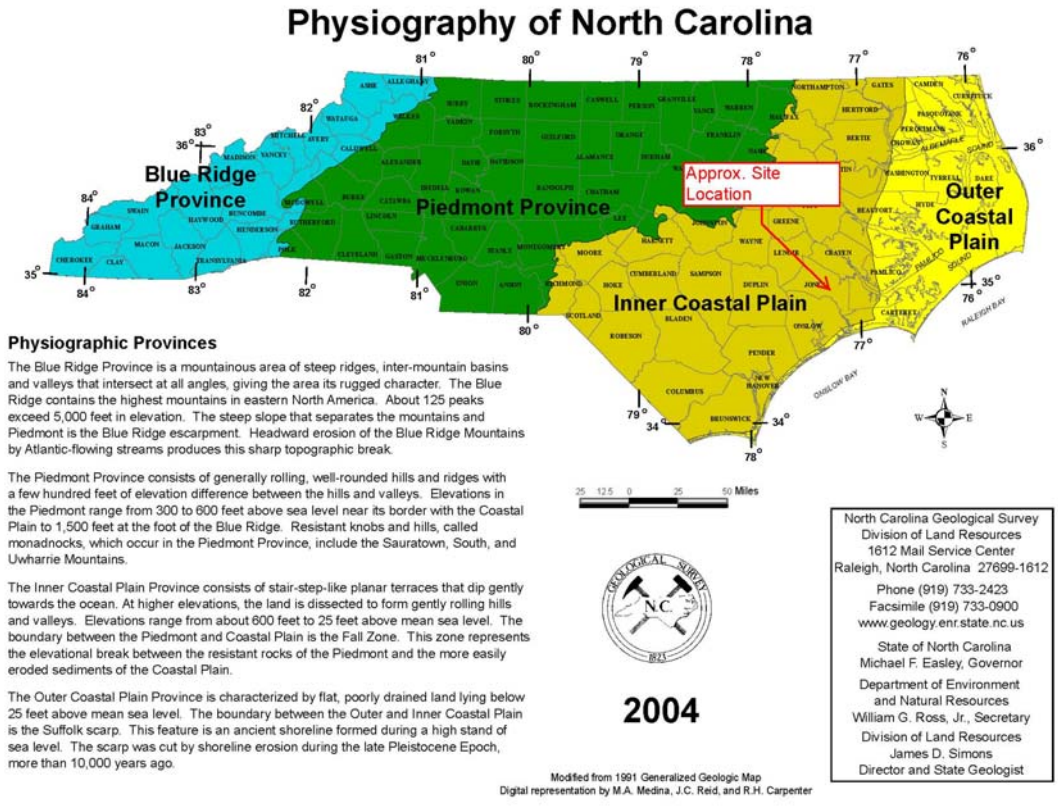


Figure 1

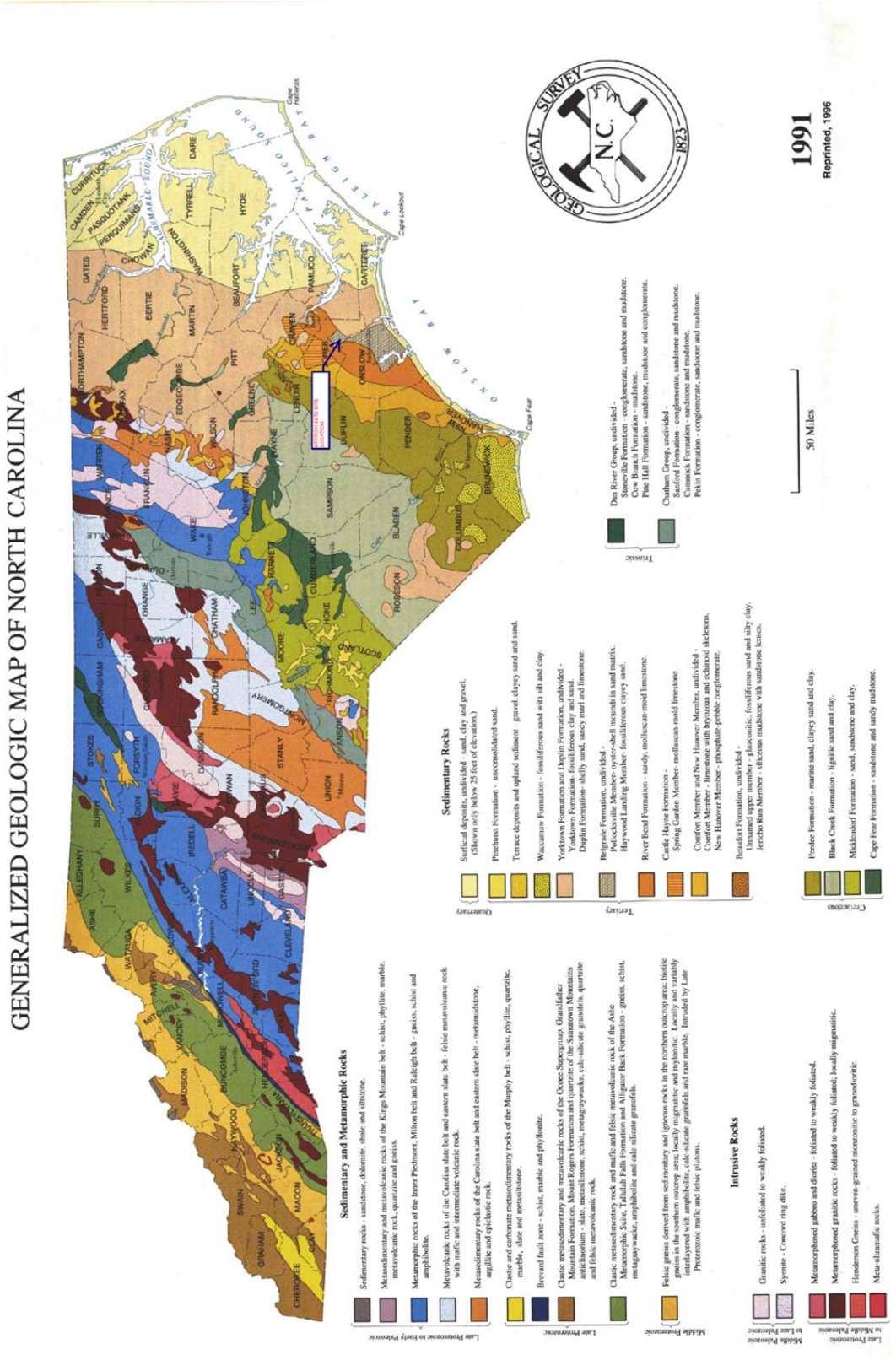

GENERALIZED GEOLOGIC MAP OF NORTH CAROLINA
Sedimentary and Metamorphic Rocks
Sedimentary rocks - sandstone, dolomite, shale and siltstone.
Metasedimentary and metavolcanic rocks of the Kings Mountain belt - schist, phyllite, marble, metavolcanic rock, quartzite and gneiss.
Metamorphic rocks of the Inner Piedmont, Milton belt and Raleigh belt - gneiss, schist and amphibolite.
Metavolcanic rocks of the Carolina slate belt and eastern slate belt - felsic metavolcanic rock with mafic and intermediate volcanic rock.
Metasedimentary rocks of the Carolina slate belt and eastern slate belt - metamudstone, argillite and epiclastic rock.
Late Proterozoic to Early Paleozoic
Clastic and carbonate metasedimentary rocks of the Murphy belt - schist, phyllite, quartzite, marble, slate and metasiltstone.
Brevard fault zone - schist, marble and phyllonite.
Clastic metasedimentary and metavolcanic rocks of the Ocoee Supergroup, Grandfather Mountain Formation, Mount Rogers Formation and quartzite of the Sauratown Mountains anticlinorium - slate, metasiltstone, schist, metagraywacke, calc-silicate granofels, quartzite and felsic metavolcanic rock.
Late Proterozoic
Clastic metasedimentary rock and mafic and felsic metavolcanic rock of the Ashe Metamorphic Suite, Tallulah Falls Formation and Alligator Back Formation - gneiss, schist, metagraywacke, amphibolite and calc-silicate granofels.
Felsic gneiss derived from sedimentary and igneous rocks in the northern outcrop area; biotite gneiss in the southern outcrop area; locally migmatitic and mylonitic. Locally and variably interlayered with amphibolite, calc-silicate granofels and rare marble. Intruded by Late Proterozoic mafic and felsic plutons.
Middle Proterozoic
Intrusive Rocks
Granitic rocks - unfoliated to weakly foliated.
Syenite - Concord ring dike.
Middle Proterozoic to Late Proterozoic
Metamorphosed gabbro and diorite - foliated to weakly foliated.
Metamorphosed granitic rocks - foliated to weakly foliated; locally migmatitic.
Henderson Gneiss - uneven-grained monzonitic to granodioritic.
Meta-ultramafic rocks.
Late Proterozoic to Middle Proterozoic
Sedimentary Rocks
Surficial deposits, undivided - sand, clay and gravel. (Shown only below 25 feet of elevation.)
Pinehurst Formation - unconsolidated sand.
Terrace deposits and upland sediment - gravel, clayey sand and sand.
Quaternary
Waccamaw Formation - fossiliferous sand with silt and clay.
Yorktown Formation and Duplin Formation, undivided -
Yorktown Formation: fossiliferous clay and sand.
Duplin Formation: shelly sand, sandy marl and limestone.
Belgrade Formation, undivided -
Pollocksville Member: oyster-shell mounds in sand matrix.
Haywood Landing Member: fossiliferous clayey sand.
River Bend Formation - sandy, mollusc-and-mold limestone.
Castle Hayne Formation -
Spring Garden Member: mollusca-mold limestone.
Comfort Member and New Hanover Member, undivided -
Comfort Member - limestone with bryozoan and echinoid skeletons.
New Hanover Member - phosphate-pebble conglomerate.
Beaufort Formation, undivided -
Upper member - glauconitic, fossiliferous sand and silty clay.
Jericho Run Member - siliceous mudstone with sandstone lenses.
Tertiary
Peedee Formation - marine sand, clayey sand and clay.
Black Creek Formation - lignitic sand and clay.
Middendorf Formation - sand, sandstone and clay.
Cape Fear Formation - sandstone and sandy mudstone.
Cretaceous
Triassic
Dan River Group, undivided -
Stoneville Formation - conglomerate, sandstone and mudstone.
Cow Branch Formation - mudstone.
Pine Hall Formation - sandstone, mudstone and conglomerate.
Chatham Group, undivided -
Sanford Formation - conglomerate, sandstone and mudstone.
Cumnock Formation - sandstone and mudstone.
Pekin Formation - conglomerate, sandstone and mudstone.
50 Miles
GEOLOGICAL SURVEY
N.C.
1823
1991
Reprinted, 1996

Figure 2

Locally, Martin-Marietta operates a quarry in Belgrade, North Carolina (approximately 2.5 miles south of the site) for extraction of sand and rock. Reportedly, a limestone layer is encountered within the quarry at depths ranging from 40 to 60 feet below natural ground surface. The thickness of the limestone varies and is overlying deposits of sands. Similar reports have been identified for the Morton Trucking, US 17 mine located approximately 8 miles south of the site with a limestone layer encountered approximately 70 to 80 feet below natural ground surface approximately 14 to 18 feet thick. This mine also reports that sand deposits are beneath the limestone layer.

Site Hydrogeologic Conditions

The following is taken from the Site Hydrogelogic Study prepared by ERM NC, Inc. dated December 16, 2011. In summary, fifteen (15) soil test borings and observation wells were installed on site to gather subsurface information to identify and map the surficial aquifer for permitting and monitoring purposes. The Potentiometric Groundwater Plan previously submitted is included in Appendix A of this Plan for reference. The proposed limits and grades for development of Phase 1 of the landfill have been included on the Potentiometric Plan.

The site hydrogeology is characterized by a shallow surficial aquifer within the upper 10 feet of unconsolidated silts, clays and sands of the Inner Coastal Plain deposits. The water table is generally encountered at depths of 2 to 7 feet below land surface at the site. The groundwater flow conditions within the surficial aquifer at the site are characterized by very low hydraulic gradients and groundwater velocities. The groundwater contours indicate a subtle radial pattern of groundwater flow centered in the vicinity of the well OWB-11 located in the eastern portion of the site. The surficial soils in area around well OWB-11 are more sandy than the rest of the site and serve as a local preferential groundwater recharge area. In the western portion of the site, the general groundwater flow direction is southwestward toward the unnamed tributary to the White Oak River located approximately 2,550 feet west. The horizontal hydraulic gradient is essentially flat and the calculated groundwater velocities are on the order of 1 foot per year or less. The wetlands within the site study area do not appear to be connected to the surficial aquifer. Generally, water in the wetland areas is observed to occur at ground elevations that are 3 to 4 feet higher than the water table elevations measured in adjacent observation wells (i.e the wetlands adjacent to well OWB-7). The groundwater elevation data indicate that observation wells located within the immediate vicinity of wetland boundaries (OWB-1, 4, 6, 7, 9 & 14) reflect water table elevations very similar to those in observation wells at locations removed from the vicinity of wetland boundaries. The wetland areas contain hydric soils (clays / silts) in localized

topographically depressed areas that collect and pool rainfall; independent of the ground water table.

The low gradients and groundwater velocities at the site combine to limit both groundwater movement from the site and discharge to the nearest natural drainage features. The low groundwater flow conditions are advantageous for effective monitoring of the site as it allows more time for detection of and response to potential releases before offsite migration can occur from the C&DLF units.

There are no known drinking water supply wells, groundwater receptors or groundwater discharge features within 2,000 feet of proposed facility boundaries. All residences that are located within the study area along US Highway 17 or White Oak River Road are served by public water supply. Based on the lack of groundwater receptors and considering the limited groundwater flow regime at the site, the potential for offsite migration and impacts is considered to be low.

Monitoring Well Network

The proposed groundwater monitoring well network for Phase 1 of landfill construction, operation, closure and post-closure will consist of one (1) upgradient background quality monitoring well (OWB-10) and five (5) downgradient detection wells (OWB-1, OWB-2, OWB-3, OWB-4 and OWB-6). These wells were installed during the Site Hydrogeologic Study with the intent of incorporation into the groundwater monitoring plan. Based on the potentiometric contours developed for the site, OWB-10 is located in the highest potentiometric area available on site. Groundwater flow from this area occurs in a radial pattern as a result of rainfall recharge.

The five detection wells were chosen based on horizontal location in reference to the Phase 1 landfill limits and appropriate screened intervals within the representative surficial aquifer. Based on previous studies, groundwater flow will generally occur in an east to west-southwest pattern in the vicinity of Phase 1. The detection wells are located from 110 feet (OWB-3) to 170 feet (OWB-1) from the proposed waste boundary. Well OWB-5 located south of Phase 1, Cell 1 will be abandoned for construction of the first Cell and not available for inclusion in the monitoring well network.

Monitoring Well Construction

As stated previously, the monitoring wells included within the Phase 1 groundwater monitoring well network were previously installed during the Site Hydrogeologic Study in 2011. These wells were constructed in accordance with

North Carolina Well Constructions Standards so that they could be used as permanent monitoring wells. The construction records for these wells are included in Appendix B for reference.

The depth to seasonal high groundwater at each location and screened intervals for the existing wells are as follows:

Measured Seasonal High Water Table

Well locations survey data supplied by Parker & Associates

Well OWB-#	Date Drilled	Ground Surface Elevation (MSL)	Top of PVC Elevation (MSL)	Well PVC Stick-Up (ft)	Well Depth (ft)	Screened Interval (ft)	Seasonal High Elev.
OWB-1	8/25/11	39.28	42.03	2.75	20.0	20.0 - 7.0	35.21
OWB-2	8/25/11	38.02	40.89	2.87	20.0	20.0 - 7.0	35.03
OWB-3	8/25/11	37.61	40.32	2.71	20.0	20.0 - 8.0	34.94
OWB-4	8/25/11	39.09	41.68	2.59	20.0	20.0 - 8.0	35.15
OWB-6	8/24/11	39.25	42.18	2.93	15.0	20.0 - 8.0	35.24
OWB-10	8/22/11	39.67	42.40	2.73	20.0	20.0 - 8.0	36.69

Following installation of the temporary observation wells on August 26, 2011, Hurricane Irene resulted in over 7 inches of rainfall at the site around August 27, 2011. A significant rise occurred in all wells installed at the site along with the nearby wells in the Division of Water Resources network (Reference Hydrogeologic Report Appendix 2). In general water table elevations rose approximately 6 to 7 feet following the storm event. With the transition into colder months and decreasing evapotranspiration, the water levels remained at or near the levels recorded following Hurricane Irene. Therefore the elevations captured during our groundwater level monitoring following a tropical rainfall event reflect long term seasonal high water levels.

Well Installation Procedures

The monitoring wells proposed for this groundwater monitoring plan have been installed in accordance with North Carolina Well Construction Standards. Refer to individual Well Construction Records in Appendix B for details.

Sampling, Analytical Testing & Reporting

Groundwater monitoring, sampling and reporting shall be executed in accordance with the current Solid Waste Section memorandums, templates and forms regarding groundwater monitoring and submitting reports to the Solid

Waste Section. These reports can be located on the Solid Waste Section's web page located at:
http://portal.ncdenr.org/web/wm/sw/envmonitoring

For reference the memoranda, templates and forms are currently:

- Memorandum - October 16, 2007 - Environmental Monitoring Data for North Carolina Solid Waste Management Facilities

- Memorandum - October 27, 2006 New Guidelines for Electronic Submittal of Environmental Monitoring Data

- February 23, 2007 - Addendum to October 27, 2006, North Carolina Solid Waste Section Memorandum Regarding New Guidelines for Electronic Submittal of Environmental Monitoring Data

- Solid Waste Section - Guidelines for Groundwater, Soil, and Surface Water Sampling

- Electronic Data Deliverable (EDD) Template (Last updated: May 5, 2010)

- Solid Waste Environmental Monitoring Data Form (Last updated: June 10, 2009)

- Constituent Look-up webpage (Solid Waste Section Limits) (Last updated: June 13, 2011)

Groundwater monitoring results shall be sent to Mr. Ervin Lane by electronic format. The following link is the template for the submittal of groundwater monitoring data in EDD format.

http://portal.ncdenr.org/c/document_library/get_file?uuid=3246fa1e-e618-417e-a643-6f5b92bce754&groupId=38361

Contact information for Mr. Ervin Lane is listed below:

Ervin Lane
Compliance Hydrogeologist
NC Department of Environment and Natural Resources
Division of Waste Management - Solid Waste Section
1646 Mail Service Center
Raleigh, NC 27699-1646
919-707-8288 (phone/fax)

Routine monitoring requirements for the Green Recycling Solutions LLC C&D Landfill groundwater wells will include laboratory analysis for the constituents included in Table 1 on the following page.

Table – 1 – Constituents for Analysis

Analytical Method: EPA 6010 Preparation Method: EPA 3010

Arsenic
Barium
Cadmium
Chromium
Copper
Iron
Lead
Manganese
Selenium
Silver
Zinc

Analytical Method: EPA 7470 Preparation Method: EPA 7470

Mercury

Analytical Method: EPA 8260

Acetone
Acrylonitrile
Benzene
Bromochloromethane
Bromodichloromethane
Bromoform
Bromomethane
2-Butanone
Carbon disulfide
Carbon tetrachloride
Chlorobenzene
Chloroethane
Chloroform
Chloromethane
1,2-Dibromo-3-chloropropane
Dibromochloromethane
1,2-Dibromoethane (EDB)
1,2-Dichlorobenzene
1,4-Dichlorobenzene
trans-1,4-Dichloro-2-butene
1,1-Dichloroethane
1,2-Dichloroethane
1,1-Dichloroethene
cis-1,2-Dichloroethene
trans-1,2-Dichloroethene
1,2-Dichloropropane
cis-1,3-Dichloropropene

Table – 1 – Constituents for Analysis (Continued)

trans-1,3-Dichloropropene
Ethylbenzene
2-Hexanone
Iodomethane
Methylene Chloride
4-Methyl-2-pentanone (MIBK)
Styrene
1,1,1,2-Tetrachloroethane
1,1,2,2-Tetrachloroethane
Tetrachloroethene
Toluene
1,1,1-Trichloroethane
1,1,2-Trichloroethane
Trichloroethene
Trichlorofluoromethane
1,2,3-Trichloropropane
Vinyl acetate
Vinyl chloride
Xylene (Total)
m&p-Xylene
o-Xylene

Total Dissolved Solids Analytical Method: SM 2540C

Total Dissolved Solids

Total Suspended Solids Analytical Method: SM 2540D

Total Suspended Solids

5 day Analytical Method: SM 5210B

BOD, 5 day

IC Anions 28 Days Analytical Method: EPA 300.0

Fluoride
Sulfate

Nitrogen, NO2/NO3 unpres Analytical Method: EPA 353.2

Nitrogen, Nitrate

Chloride Analytical Method: SM 4500-Cl-E

Chloride

COD Analytical Method: SM 5220D

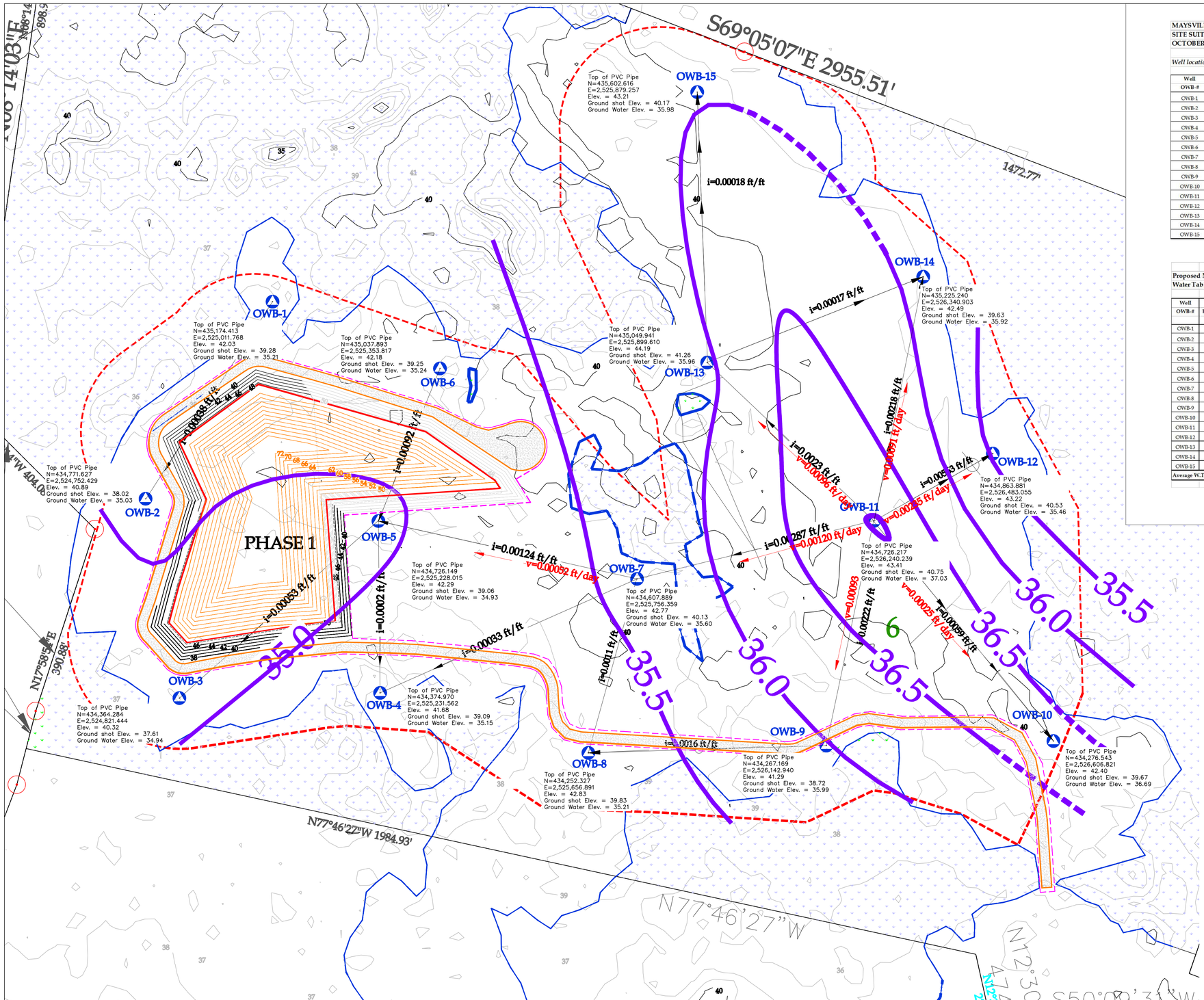
Chemical Oxygen Demand

TOC Analytical Method: SM 5310B

Total Organic Carbon

APPENDIX A

GROUNDWATER POTENTIOMETRIC PLAN



MAYSVILLE C&D LANDFILL
SITE SUITABILITY - OBSERVATION WELL DATA
OCTOBER 6, 2011

Well locations survey data supplied by Parker & Associates

Well OWB-#	Date Drilled	Ground Surface Elevation (MSL)	Top of PVC Elevation (MSL)	Well PVC Stick-Up (ft)	Well Depth (ft)	Screened Interval (ft)	NC State Plane Northing	NC State Plane Easting
OWB-1	8/25/11	39.28	42.03	2.75	20.0	20.0 - 7.0	435174.413	2525011.768
OWB-2	8/25/11	38.02	40.89	2.87	20.0	20.0 - 7.0	434771.627	2524752.429
OWB-3	8/25/11	37.61	40.32	2.71	20.0	20.0 - 8.0	434364.284	2524821.444
OWB-4	8/25/11	39.09	41.68	2.59	20.0	20.0 - 8.0	434374.970	2525231.562
OWB-5	8/24/11	39.06	42.29	3.23	15.0	19.0 -7.0	434726.149	2525228.015
OWB-6	8/24/11	39.25	42.18	2.93	15.0	20.0 - 8.0	435037.893	2525353.817
OWB-7	8/24/11	40.13	42.77	2.64	15.0	34.0 - 21.0	434607.889	2525756.359
OWB-8	8/23/11	39.83	42.83	3.00	20.0	20.0 - 8.0	434252.327	2525656.891
OWB-9	8/23/11	38.72	41.29	2.57	15.0	3.0 - 15.0	434267.169	2526142.940
OWB-10	8/22/11	39.67	42.40	2.73	20.0	20.0 - 8.0	434276.543	2526606.821
OWB-11	8/23/11	40.75	43.41	2.66	15.0	15 -3.5	434726.217	2526240.239
OWB-12	8/23/11	40.53	43.22	2.69	20.0	20.0 - 8.0	434863.881	2526483.055
OWB-13	8/24/11	41.26	44.19	2.93	20.0	20.0 - 8.0	435049.941	2525899.610
OWB-14	8/23/11	39.63	42.49	2.86	20.0	20.0 - 8.0	435225.240	2526340.903
OWB-15	8/24/11	40.17	43.21	3.04	20.0	20.0 - 8.0	435602.616	2525879.257

Proposed Maysville C&D Landfill
Water Table Elevations - Through 11-22-11

Well OWB-#	Top of PVC Elevation (MSL)	Groundwater Level Elevations													
		T.O.B.		24-Hr.		8/26/11		9/6/11		9/9/11		10/10/11		11/22/11	
		Depth (ft)	Elev.	Depth (ft)	Elev.	Depth (ft)	Elev.	Depth (ft)	Elev.	Depth (ft)	Elev.	Depth (ft)	Elev.	Depth (ft)	Elev.
OWB-1	42.03	13.55	28.48	13.92	28.11	13.92	28.11	7.21	34.82	6.82	35.21	7.80	34.23	7.11	34.92
OWB-2	40.89	13.62	27.27	13.62	27.27	13.62	27.27	6.33	34.56	5.86	35.03	7.02	33.87	6.23	34.66
OWB-3	40.32	12.75	27.57	12.79	27.53	12.79	27.53	5.79	34.53	5.38	34.94	6.54	33.78	5.80	34.52
OWB-4	41.68	13.93	27.75	13.86	27.82	13.86	27.82	6.89	34.79	6.53	35.15	7.68	34.00	6.92	34.76
OWB-5	42.29	15.05	27.24	15.00	27.29	14.30	27.99	7.52	34.77	7.36	34.93	8.22	34.07	7.44	34.85
OWB-6	42.18	13.70	28.48	13.78	28.40	13.82	28.36	7.31	34.87	6.94	35.24	7.91	34.27	7.10	35.08
OWB-7	42.77	15.55	27.22	14.85	27.92	14.75	28.02	7.69	35.08	7.17	35.60	8.58	34.19	7.79	34.98
OWB-8	42.83	15.05	27.78	14.97	27.86	14.99	27.84	7.93	34.90	7.62	35.21	8.68	34.15	7.83	35.00
OWB-9	41.29	13.89	27.40	13.10	28.19	13.11	28.18	5.58	35.71	5.30	35.99	5.22	36.07	7.50	33.79
OWB-10	42.40	13.68	28.72	13.70	28.70	13.70	28.70	6.68	35.72	5.71	36.69	7.15	35.25	6.20	36.20
OWB-11	43.41	13.62	29.79	13.65	29.76	13.64	29.77	6.93	36.48	6.38	37.03	7.61	35.80	6.75	36.66
OWB-12	43.22	16.25	26.97	15.13	28.09	15.15	28.07	8.07	35.15	7.76	35.46	8.40	34.82	7.86	35.36
OWB-13	44.19	15.15	29.04	15.34	28.85	15.37	28.82	8.51	35.68	8.23	35.96	9.27	34.92	8.40	35.79
OWB-14	42.49	14.40	28.09	14.09	28.40	14.06	28.43	6.86	35.63	6.57	35.92	7.65	34.84	6.74	35.75
OWB-15	43.21	14.61	28.60	14.56	28.65	14.65	28.56	7.40	35.81	7.23	35.98	8.59	34.62	7.83	35.38
Average W.T. Elevation			28.03		28.19		28.23		35.23		35.62		34.59		35.18

LEGEND

- EXISTING CONTOUR (1-FT INTERVAL)
- ACOE APPROVED WETLAND LIMITS
- FACILITY BOUNDARY
- OWB-8 WELL LOCATION
- GROUNDWATER ELEVATION CONTOUR

i = GROUNDWATER GRADIENT
v = GROUNDWATER VELOCITY

N

SCALE IN FEET
100 50 25 0 100

NO.	DATE	APPR.	REVISION	NO.	DATE	APPR.	REVISION

MAYSVILLE C&D LANDFILL

GREEN RECYCLING SOLUTIONS LLC — MAYSVILLE, NC

DRAWN BY: DWW
PROJECT ENGINEER: DWW
DESIGN ENGINEER: DWW
PROJECT MANAGER: DWW

LICENSE #C-2206
ERM NC, INC.
5000 CORPORATE CENTER DRIVE, SUITE 200
CHARLOTTE, NORTH CAROLINA 28226
(704) 365-0345

NOT FOR CONSTRUCTION

GROUNDWATER POTENTIOMETRIC MAP

SCALE: 1"=100'
DATE: DECEMBER 2011
PROJECT NO.: 0140408
AutoCAD 2007
POTENTIOMETRIC MAP.DWG

DRAWING NO. 1
REV. NO.
SHEET 1 OF 1

APPENDIX B

WELL CONSTRUCTION RECORDS

NON RESIDENTIAL WELL CONSTRUCTION RECORD

North Carolina Department of Environment and Natural Resources- Division of Water Quality

WELL CONTRACTOR CERTIFICATION # 2402

1. WELL CONTRACTOR:

MIKE MCCONAHEY
Well Contractor (Individual) Name

GEOLOGIC EXPLORATION, INC
Well Contractor Company Name

176 COMMERCE BLVD
Street Address

STATESVILLE | NC | 28625
City or Town | State | Zip Code

(704) 872-7686
Area code Phone number

2. WELL INFORMATION:

WELL CONSTRUCTION PERMIT# N/A

OTHER ASSOCIATED PERMIT#(if applicable)

SITE WELL ID #(if applicable) OBW-1

3. WELL USE (Check One Box) Monitoring ☑ Municipal/Public ☐
Industrial/Commercial ☐ Agricultural ☐ Recovery ☐ Injection ☐
Irrigation☐ Other ☐ (list use)

DATE DRILLED 08/25/11

4. WELL LOCATION:

WHITE OAK RIVER ROAD 28555
(Street Name, Numbers, Community, Subdivision, Lot No., Parcel, Zip Code)

CITY: MAYSVILLE COUNTY JONES

TOPOGRAPHIC / LAND SETTING: (check appropriate box)
☐Slope ☐Valley ☐Flat ☐Ridge ☐Other

LATITUDE ___°___'___" DMS **OR** ___ DD

LONGITUDE ___°___'___" DMS **OR** ___ DD

Latitude/longitude source: ☐GPS ☐Topographic map
(location of well must be shown on a USGS topo map andattached to this form if not using GPS)

5. FACILITY (Name of the business where the well is located.)

PROPOSED C&D LANDFILL | N/A
Facility Name | Facility ID# (if applicable)

WHITE OAK RIVER ROAD
Street Address

MAYSVILLE | NC | 28555
City or Town | State | Zip Code

GREEN RECYCLING SOLUTIONS, LLC
Contact Name

166 CENTER STREET
Mailing Address

JACKSONVILLE | NC | 28546
City or Town | State | Zip Code

( )
Area code Phone number

6. WELL DETAILS:

a. **TOTAL DEPTH:** 20.0 FEET

b. **DOES WELL REPLACE EXISTING WELL?** YES ☐ NO ☑

c. **WATER LEVEL** Below Top of Casing: 11.0 FT.
(Use "+" if Above Top of Casing)

d. **TOP OF CASING IS** 2.5 FT. Above Land Surface*
*Top of casing terminated at/or below land surface may require a variance in accordance with 15A NCAC 2C .0118.

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

f. **DISINFECTION: Type** N/A **Amount** N/A

g. **WATER ZONES** (depth):

Top	Bottom	Top	Bottom
Top	Bottom	Top	Bottom
Top	Bottom	Top	Bottom

7. CASING:

Depth		Diameter	Thickness/ Weight	Material
Top 0.0	Bottom 10.0 Ft.	2 INCH	SCH 40	PVC
Top	Bottom Ft.			
Top	Bottom Ft.			

8. GROUT:

Depth		Material	Method
Top 0.0	Bottom 5.0 Ft.	PORTLAND BENTONITE	SLURRY
Top	Bottom Ft.		
Top	Bottom Ft.		

9. SCREEN:

Depth		Diameter	Slot Size	Material
Top 10.0	Bottom 20.0 Ft.	2.0 in.	.010 in.	PVC
Top	Bottom Ft.	in.	in.	
Top	Bottom Ft.	in.	in.	

10. SAND/GRAVEL PACK:

Depth		Size	Material
Top 8.0	Bottom 20.0 Ft.	20-40	FINE SILICA SAND
Top	Bottom Ft.		
Top	Bottom Ft.		

11. DRILLING LOG

Top	Bottom	Formation Description
0.0	1.0	WOOD/WEEDS/TOPSOIL
1.0	10.0	TAN/WHITE SILTY CLAY
10.0	15.0	BLACK SILTY SAND/SHELL
15.0	20.0	GRAY/GREEN CLAY SILT SAND/SHELL

12. REMARKS:

BENTONITE SEAL FROM 5.0 TO 8.0 FEET

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.

SIGNATURE OF CERTIFIED WELL CONTRACTOR | 08/29/11 DATE

MIKE MCCONAHEY
PRINTED NAME OF PERSON CONSTRUCTING THE WELL

Submit within 30 days of completion to: Division of Water Quality - Information Processing, 1617 Mail Service Center, Raleigh, NC 27699-161, Phone : (919) 807-6300

Form GW-1b
Rev. 2/09

NON RESIDENTIAL WELL CONSTRUCTION RECORD

North Carolina Department of Environment and Natural Resources- Division of Water Quality

WELL CONTRACTOR CERTIFICATION # 2402

1. WELL CONTRACTOR:

MIKE MCCONAHEY
Well Contractor (Individual) Name

GEOLOGIC EXPLORATION, INC
Well Contractor Company Name

176 COMMERCE BLVD
Street Address

STATESVILLE NC 28625
City or Town State Zip Code

(704) 872-7686
Area code Phone number

2. WELL INFORMATION:

WELL CONSTRUCTION PERMIT# N/A

OTHER ASSOCIATED PERMIT#(if applicable)

SITE WELL ID #(if applicable) OBW-2

3. WELL USE (Check One Box) Monitoring ☑ Municipal/Public ☐
Industrial/Commercial ☐ Agricultural ☐ Recovery ☐ Injection ☐
Irrigation☐ Other ☐ (list use)

DATE DRILLED 08/25/11

4. WELL LOCATION:

WHITE OAK RIVER ROAD 28555
(Street Name, Numbers, Community, Subdivision, Lot No., Parcel, Zip Code)

CITY: MAYSVILLE COUNTY JONES

TOPOGRAPHIC / LAND SETTING: (check appropriate box)
☐Slope ☐Valley ☐Flat ☐Ridge ☐Other

LATITUDE ___°___'___" DMS **OR** ___ DD

LONGITUDE ___°___'___" DMS **OR** ___ DD

Latitude/longitude source: ☐GPS ☐Topographic map
(location of well must be shown on a USGS topo map andattached to this form if not using GPS)

5. FACILITY (Name of the business where the well is located.)

PROPOSED C&D LANDFILL N/A
Facility Name Facility ID# (if applicable)

WHITE OAK RIVER ROAD
Street Address

MAYSVILLE NC 28555
City or Town State Zip Code

GREEN RECYCLING SOLUTIONS, LLC
Contact Name

166 CENTER STREET
Mailing Address

JACKSONVILLE NC 28546
City or Town State Zip Code

(___) ___
Area code Phone number

6. WELL DETAILS:

a. **TOTAL DEPTH:** 20.0 FEET

b. **DOES WELL REPLACE EXISTING WELL?** YES ☐ NO ☑

c. **WATER LEVEL** Below Top of Casing: 11.0 FT.
(Use "+" if Above Top of Casing)

d. **TOP OF CASING IS** 2.5 FT. Above Land Surface*
*Top of casing terminated at/or below land surface may require a variance in accordance with 15A NCAC 2C .0118.

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

f. **DISINFECTION: Type** N/A **Amount** N/A

g. **WATER ZONES** (depth):

Top	Bottom	Top	Bottom
Top	Bottom	Top	Bottom
Top	Bottom	Top	Bottom

7. CASING:

Depth		Diameter	Thickness/ Weight	Material
Top 0.0	Bottom 10.0	Ft. 2 INCH	SCH 40	PVC
Top	Bottom	Ft.		
Top	Bottom	Ft.		

8. GROUT:

Depth		Material	Method
Top 0.0	Bottom 5.0	Ft. PORTLAND BENTONITE	SLURRY
Top	Bottom	Ft.	
Top	Bottom	Ft.	

9. SCREEN:

Depth		Diameter	Slot Size	Material
Top 10.0	Bottom 20.0	Ft. 2.0 in.	.010 in.	PVC
Top	Bottom	Ft. in.	in.	
Top	Bottom	Ft. in.	in.	

10. SAND/GRAVEL PACK:

Depth		Size	Material
Top 8.0	Bottom 20.0	Ft. 20-40	FINE SILICA SAND
Top	Bottom	Ft.	
Top	Bottom	Ft.	

11. DRILLING LOG

Top	Bottom	Formation Description
0.0	1.0	WOOD/WEEDS/TOPSOIL
1.0	10.0	TAN/WHITE SILTY CLAY
10.0	15.0	BLACK SILTY SAND/SHELL
15.0	20.0	GRAY/GREEN CLAY SILT SAND/SHELL

12. REMARKS:

BENTONITE SEAL FROM 5.0 TO 8.0 FEET

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.

SIGNATURE OF CERTIFIED WELL CONTRACTOR — DATE 08/29/11

MIKE MCCONAHEY
PRINTED NAME OF PERSON CONSTRUCTING THE WELL

Submit within 30 days of completion to: Division of Water Quality - Information Processing, 1617 Mail Service Center, Raleigh, NC 27699-161, Phone : (919) 807-6300

Form GW-1b
Rev. 2/09

NON RESIDENTIAL WELL CONSTRUCTION RECORD

North Carolina Department of Environment and Natural Resources- Division of Water Quality

WELL CONTRACTOR CERTIFICATION # 2402

1. WELL CONTRACTOR:

MIKE MCCONAHEY
Well Contractor (Individual) Name

GEOLOGIC EXPLORATION, INC
Well Contractor Company Name

176 COMMERCE BLVD
Street Address

STATESVILLE NC 28625
City or Town State Zip Code

(704) 872-7686
Area code Phone number

2. WELL INFORMATION:

WELL CONSTRUCTION PERMIT# N/A

OTHER ASSOCIATED PERMIT#(if applicable)

SITE WELL ID #(if applicable) OBW-3

3. WELL USE (Check One Box) Monitoring ☑ Municipal/Public ☐
Industrial/Commercial ☐ Agricultural ☐ Recovery ☐ Injection ☐
Irrigation☐ Other ☐ (list use)

DATE DRILLED 08/25/11

4. WELL LOCATION:

WHITE OAK RIVER ROAD 28555
(Street Name, Numbers, Community, Subdivision, Lot No., Parcel, Zip Code)

CITY: MAYSVILLE COUNTY JONES

TOPOGRAPHIC / LAND SETTING: (check appropriate box)
☐Slope ☐Valley ☐Flat ☐Ridge ☐Other

LATITUDE ___°___'___" DMS **OR** ___ DD

LONGITUDE ___°___'___" DMS **OR** ___ DD

Latitude/longitude source: ☐GPS ☐Topographic map
(location of well must be shown on a USGS topo map andattached to this form if not using GPS)

5. FACILITY (Name of the business where the well is located.)

PROPOSED C&D LANDFILL N/A
Facility Name Facility ID# (if applicable)

WHITE OAK RIVER ROAD
Street Address

MAYSVILLE NC 28555
City or Town State Zip Code

GREEN RECYCLING SOLUTIONS, LLC
Contact Name

166 CENTER STREET
Mailing Address

JACKSONVILLE NC 28546
City or Town State Zip Code

(_____) _____
Area code Phone number

6. WELL DETAILS:

a. **TOTAL DEPTH:** 20.0 FEET

b. **DOES WELL REPLACE EXISTING WELL?** YES ☐ NO ☑

c. **WATER LEVEL** Below Top of Casing: 11.0 FT.
(Use "+" if Above Top of Casing)

d. **TOP OF CASING IS** 2.5 FT. Above Land Surface*
*Top of casing terminated at/or below land surface may require a variance in accordance with 15A NCAC 2C .0118.

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

f. **DISINFECTION: Type** N/A **Amount** N/A

g. **WATER ZONES** (depth):

Top	Bottom	Top	Bottom
Top	Bottom	Top	Bottom
Top	Bottom	Top	Bottom

7. CASING:

Depth		Diameter	Thickness/ Weight	Material
Top 0.0	Bottom 10.0	Ft. 2 INCH	SCH 40	PVC
Top	Bottom	Ft.		
Top	Bottom	Ft.		

8. GROUT:

Depth		Material	Method
Top 0.0	Bottom 5.0	Ft. PORTLAND BENTONITE	SLURRY
Top	Bottom	Ft.	
Top	Bottom	Ft.	

9. SCREEN:

Depth		Diameter	Slot Size	Material
Top 10.0	Bottom 20.0	Ft. 2.0 in.	.010 in.	PVC
Top	Bottom	Ft. in.	in.	
Top	Bottom	Ft. in.	in.	

10. SAND/GRAVEL PACK:

Depth		Size	Material
Top 8.0	Bottom 20.0	Ft. 20-40	FINE SILICA SAND
Top	Bottom	Ft.	
Top	Bottom	Ft.	

11. DRILLING LOG

Top	Bottom	Formation Description
0.0	1.0	WOOD/WEEDS/TOPSOIL
1.0	10.0	TAN/WHITE SILTY CLAY
10.0	15.0	BLACK SILTY SAND/SHELL
15.0	20.0	GRAY/GREEN CLAY SILT SAND/SHELL

12. REMARKS:

BENTONITE SEAL FROM 5.0 TO 8.0 FEET

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.

SIGNATURE OF CERTIFIED WELL CONTRACTOR 08/29/11 DATE

MIKE MCCONAHEY
PRINTED NAME OF PERSON CONSTRUCTING THE WELL

Submit within 30 days of completion to: Division of Water Quality - Information Processing, 1617 Mail Service Center, Raleigh, NC 27699-161, Phone : (919) 807-6300

Form GW-1b
Rev. 2/09

NON RESIDENTIAL WELL CONSTRUCTION RECORD

North Carolina Department of Environment and Natural Resources- Division of Water Quality

WELL CONTRACTOR CERTIFICATION # 2402

1. WELL CONTRACTOR:
MIKE MCCONAHEY
Well Contractor (Individual) Name
GEOLOGIC EXPLORATION, INC
Well Contractor Company Name
176 COMMERCE BLVD
Street Address
STATESVILLE NC 28625
City or Town State Zip Code
(704) 872-7686
Area code Phone number

2. WELL INFORMATION:
WELL CONSTRUCTION PERMIT# N/A
OTHER ASSOCIATED PERMIT#(if applicable)
SITE WELL ID #(if applicable) OBW-4

3. WELL USE (Check One Box) Monitoring ☑ Municipal/Public ☐
Industrial/Commercial ☐ Agricultural ☐ Recovery ☐ Injection ☐
Irrigation☐ Other ☐ (list use)
DATE DRILLED 08/25/11

4. WELL LOCATION:
WHITE OAK RIVER ROAD 28555
(Street Name, Numbers, Community, Subdivision, Lot No., Parcel, Zip Code)
CITY: MAYSVILLE COUNTY JONES
TOPOGRAPHIC / LAND SETTING: (check appropriate box)
☐Slope ☐Valley ☐Flat ☐Ridge ☐Other
LATITUDE ___°___'___" DMS **OR** ___ DD
LONGITUDE ___°___'___" DMS **OR** ___ DD
Latitude/longitude source: ☐GPS ☐Topographic map
(location of well must be shown on a USGS topo map andattached to this form if not using GPS)

5. FACILITY (Name of the business where the well is located.)
PROPOSED C&D LANDFILL N/A
Facility Name Facility ID# (if applicable)
WHITE OAK RIVER ROAD
Street Address
MAYSVILLE NC 28555
City or Town State Zip Code
GREEN RECYCLING SOLUTIONS, LLC
Contact Name
166 CENTER STREET
Mailing Address
JACKSONVILLE NC 28546
City or Town State Zip Code
(___) ___
Area code Phone number

6. WELL DETAILS:
a. **TOTAL DEPTH:** 20.0 FEET
b. **DOES WELL REPLACE EXISTING WELL?** YES ☐ NO ☑
c. **WATER LEVEL** Below Top of Casing: 11.0 FT.
(Use "+" if Above Top of Casing)

d. **TOP OF CASING IS** 2.5 FT. Above Land Surface*
*Top of casing terminated at/or below land surface may require a variance in accordance with 15A NCAC 2C .0118.
e. **YIELD (gpm):** N/A **METHOD OF TEST** N/A
f. **DISINFECTION: Type** N/A **Amount** N/A
g. **WATER ZONES** (depth):
Top___ Bottom___ Top___ Bottom___
Top___ Bottom___ Top___ Bottom___
Top___ Bottom___ Top___ Bottom___

7. CASING:	Depth		Diameter	Thickness/ Weight	Material
Top 0.0	Bottom 10.0	Ft.	2 INCH	SCH 40	PVC
Top	Bottom	Ft.			
Top	Bottom	Ft.			

8. GROUT:	Depth		Material	Method
Top 0.0	Bottom 5.0	Ft.	PORTLAND BENTONITE	SLURRY
Top	Bottom	Ft.		
Top	Bottom	Ft.		

9. SCREEN:	Depth		Diameter	Slot Size	Material
Top 10.0	Bottom 20.0	Ft.	2.0 in.	.010 in.	PVC
Top	Bottom	Ft.	in.	in.	
Top	Bottom	Ft.	in.	in.	

10. SAND/GRAVEL PACK:	Depth		Size	Material
Top 8.0	Bottom 20.0	Ft.	20-40	FINE SILICA SAND
Top	Bottom	Ft.		
Top	Bottom	Ft.		

11. DRILLING LOG

Top	Bottom	Formation Description
0.0	1.0	WOOD/WEEDS/TOPSOIL
1.0	10.0	TAN/WHITE SILTY CLAY
10.0	15.0	BLACK SILTY SAND/SHELL
15.0	20.0	GRAY/GREEN CLAY SILT SAND/SHELL

12. REMARKS:
BENTONITE SEAL FROM 5.0 TO 8.0 FEET

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.

SIGNATURE OF CERTIFIED WELL CONTRACTOR 08/29/11 DATE

MIKE MCCONAHEY
PRINTED NAME OF PERSON CONSTRUCTING THE WELL

Submit within 30 days of completion to: Division of Water Quality - Information Processing, 1617 Mail Service Center, Raleigh, NC 27699-161, Phone : (919) 807-6300

Form GW-1b
Rev. 2/09

NON RESIDENTIAL WELL CONSTRUCTION RECORD

North Carolina Department of Environment and Natural Resources- Division of Water Quality

WELL CONTRACTOR CERTIFICATION # 2402

1. WELL CONTRACTOR:

MIKE MCCONAHEY
Well Contractor (Individual) Name

GEOLOGIC EXPLORATION, INC
Well Contractor Company Name

176 COMMERCE BLVD
Street Address

STATESVILLE | NC | 28625
City or Town | State | Zip Code

(704) 872-7686
Area code Phone number

2. WELL INFORMATION:

WELL CONSTRUCTION PERMIT# N/A

OTHER ASSOCIATED PERMIT#(if applicable)

SITE WELL ID #(if applicable) OBW-6

3. WELL USE (Check One Box) Monitoring ☑ Municipal/Public ☐
Industrial/Commercial ☐ Agricultural ☐ Recovery ☐ Injection ☐
Irrigation ☐ Other ☐ (list use)

DATE DRILLED 08/24/11

4. WELL LOCATION:

WHITE OAK RIVER ROAD 28555
(Street Name, Numbers, Community, Subdivision, Lot No., Parcel, Zip Code)

CITY: MAYSVILLE COUNTY JONES

TOPOGRAPHIC / LAND SETTING: (check appropriate box)
☐Slope ☐Valley ☐Flat ☐Ridge ☐Other

LATITUDE ___°___'___" DMS **OR** ___ DD

LONGITUDE ___°___'___" DMS **OR** ___ DD

Latitude/longitude source: ☐GPS ☐Topographic map
(location of well must be shown on a USGS topo map andattached to this form if not using GPS)

5. FACILITY (Name of the business where the well is located.)

PROPOSED C&D LANDFILL | N/A
Facility Name | Facility ID# (if applicable)

WHITE OAK RIVER ROAD
Street Address

MAYSVILLE | NC | 28555
City or Town | State | Zip Code

GREEN RECYCLING SOLUTIONS, LLC
Contact Name

166 CENTER STREET
Mailing Address

JACKSONVILLE | NC | 28546
City or Town | State | Zip Code

( )
Area code Phone number

6. WELL DETAILS:

a. **TOTAL DEPTH:** 20.0 FEET

b. **DOES WELL REPLACE EXISTING WELL?** YES ☐ NO ☑

c. **WATER LEVEL** Below Top of Casing: 11.0 FT.
(Use "+" if Above Top of Casing)

d. **TOP OF CASING IS** 2.5 FT. Above Land Surface*
*Top of casing terminated at/or below land surface may require a variance in accordance with 15A NCAC 2C .0118.

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

f. **DISINFECTION: Type** N/A **Amount** N/A

g. **WATER ZONES** (depth):

Top	Bottom	Top	Bottom
Top	Bottom	Top	Bottom
Top	Bottom	Top	Bottom

7. CASING:

Depth		Diameter	Thickness/ Weight	Material
Top 0.0	Bottom 10.0 Ft.	2 INCH	SCH 40	PVC
Top	Bottom Ft.			
Top	Bottom Ft.			

8. GROUT:

Depth		Material	Method
Top 0.0	Bottom 5.0 Ft.	PORTLAND BENTONITE	SLURRY
Top	Bottom Ft.		
Top	Bottom Ft.		

9. SCREEN:

Depth		Diameter	Slot Size	Material
Top 10.0	Bottom 20.0 Ft.	2.0 in.	.010 in.	PVC
Top	Bottom Ft.	in.	in.	
Top	Bottom Ft.	in.	in.	

10. SAND/GRAVEL PACK:

Depth		Size	Material
Top 8.0	Bottom 20.0 Ft.	20-40	FINE SILICA SAND
Top	Bottom Ft.		
Top	Bottom Ft.		

11. DRILLING LOG

Top	Bottom	Formation Description
0.0	1.0	WOOD/WEEDS/TOPSOIL
1.0	10.0	TAN/WHITE SILTY CLAY
10.0	15.0	BLACK SILTY SAND/SHELL
15.0	20.0	GRAY/GREEN CLAY SILT SAND/SHELL

12. REMARKS:

BENTONITE SEAL FROM 5.0 TO 8.0 FEET

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.

SIGNATURE OF CERTIFIED WELL CONTRACTOR | 08/29/11 DATE

MIKE MCCONAHEY
PRINTED NAME OF PERSON CONSTRUCTING THE WELL

Submit within 30 days of completion to: Division of Water Quality - Information Processing, 1617 Mail Service Center, Raleigh, NC 27699-161, Phone : (919) 807-6300

Form GW-1b
Rev. 2/09

NON RESIDENTIAL WELL CONSTRUCTION RECORD

North Carolina Department of Environment and Natural Resources- Division of Water Quality

WELL CONTRACTOR CERTIFICATION # 2402

1. WELL CONTRACTOR:

MIKE MCCONAHEY
Well Contractor (Individual) Name

GEOLOGIC EXPLORATION, INC
Well Contractor Company Name

176 COMMERCE BLVD
Street Address

STATESVILLE | NC | 28625
City or Town | State | Zip Code

(704) 872-7686
Area code Phone number

2. WELL INFORMATION:

WELL CONSTRUCTION PERMIT# N/A

OTHER ASSOCIATED PERMIT#(if applicable)

SITE WELL ID #(if applicable) OBW-10

3. WELL USE (Check One Box) Monitoring ☑ Municipal/Public ☐
Industrial/Commercial ☐ Agricultural ☐ Recovery ☐ Injection ☐
Irrigation ☐ Other ☐ (list use)

DATE DRILLED 08/23/11

4. WELL LOCATION:

WHITE OAK RIVER ROAD 28555
(Street Name, Numbers, Community, Subdivision, Lot No., Parcel, Zip Code)

CITY: MAYSVILLE COUNTY JONES

TOPOGRAPHIC / LAND SETTING: (check appropriate box)
☐Slope ☐Valley ☐Flat ☐Ridge ☐Other

LATITUDE ___°___'___" DMS **OR** ___ DD

LONGITUDE ___°___'___" DMS **OR** ___ DD

Latitude/longitude source: ☐GPS ☐Topographic map
(location of well must be shown on a USGS topo map andattached to this form if not using GPS)

5. FACILITY (Name of the business where the well is located.)

PROPOSED C&D LANDFILL | N/A
Facility Name | Facility ID# (if applicable)

WHITE OAK RIVER ROAD
Street Address

MAYSVILLE | NC | 28555
City or Town | State | Zip Code

GREEN RECYCLING SOLUTIONS, LLC
Contact Name

166 CENTER STREET
Mailing Address

JACKSONVILLE | NC | 28546
City or Town | State | Zip Code

( )
Area code Phone number

6. WELL DETAILS:

a. **TOTAL DEPTH:** 20.0 FEET

b. **DOES WELL REPLACE EXISTING WELL?** YES ☐ NO ☑

c. **WATER LEVEL** Below Top of Casing: 11.0 FT.
(Use "+" if Above Top of Casing)

d. **TOP OF CASING IS** 2.5 FT. Above Land Surface*
*Top of casing terminated at/or below land surface may require a variance in accordance with 15A NCAC 2C .0118.

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

f. **DISINFECTION: Type** N/A **Amount** N/A

g. **WATER ZONES** (depth):

Top	Bottom	Top	Bottom
Top	Bottom	Top	Bottom
Top	Bottom	Top	Bottom

7. CASING:

Depth		Diameter	Thickness/ Weight	Material
Top 0.0	Bottom 10.0	Ft. 2 INCH	SCH 40	PVC
Top	Bottom	Ft.		
Top	Bottom	Ft.		

8. GROUT:

Depth		Material	Method
Top 0.0	Bottom 5.0	Ft. PORTLAND BENTONITE	SLURRY
Top	Bottom	Ft.	
Top	Bottom	Ft.	

9. SCREEN:

Depth		Diameter	Slot Size	Material
Top 10.0	Bottom 20.0	Ft. 2.0 in.	.010 in.	PVC
Top	Bottom	Ft. in.	in.	
Top	Bottom	Ft. in.	in.	

10. SAND/GRAVEL PACK:

Depth		Size	Material
Top 8.0	Bottom 20.0	Ft. 20-40	FINE SILICA SAND
Top	Bottom	Ft.	
Top	Bottom	Ft.	

11. DRILLING LOG

Top	Bottom	Formation Description
0.0	1.0	WOOD/WEEDS/TOPSOIL
1.0	10.0	TAN/WHITE SILTY CLAY
10.0	15.0	BLACK SILTY SAND/SHELL
15.0	20.0	GRAY/GREEN CLAY SILT SAND/SHELL

12. REMARKS:

BENTONITE SEAL FROM 5.0 TO 8.0 FEET

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.

SIGNATURE OF CERTIFIED WELL CONTRACTOR | 08/29/11 DATE

MIKE MCCONAHEY
PRINTED NAME OF PERSON CONSTRUCTING THE WELL

Submit within 30 days of completion to: Division of Water Quality - Information Processing, 1617 Mail Service Center, Raleigh, NC 27699-161, Phone : (919) 807-6300

Form GW-1b
Rev. 2/09

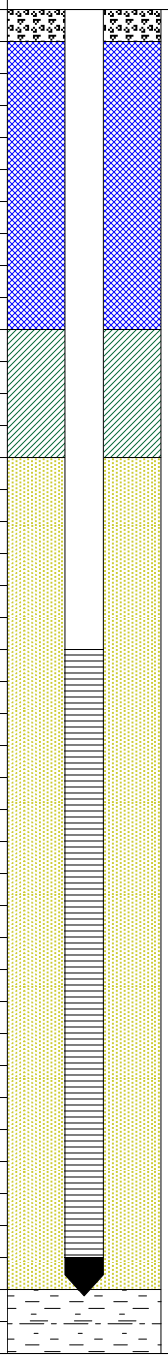
PROJECT: Proposed Maysville C&D Landfill				OWB-1	
BORING LOCATION: Proposed Maysville C&D Landfill				GROUND SURFACE ELEVATION AND DATUM: TBD	
DRILLING CONTRACTOR: Geologic Exploration				DATE STARTED: 8/25/11	DATE FINISHED: 8/25/11
DRILLING METHOD: Hollow-stem auger				TOTAL DEPTH (ft.): 20	SCREEN INTERVAL (ft.): 10-20
DRILLING EQUIPMENT: Diedrich D-120 Truck Rig				DEPTH TO WATER: FIRST: 13.55 COMPL. 13.92	CASING: 2" Sch.40PVC
SAMPLING METHOD: Split Spoon				LOGGED BY: Chris Means	
HAMMER WEIGHT: 142 Lbs.	DROP: 32"			DRILLER: Mike McConahey	REG. NO. 2402

DEPTH (feet)	SAMPLES Blows/ 6 Inches	OVM Reading	DESCRIPTION	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
0				Above Grade Well Monument
1	4-4-5	N/A	Dark grey/Dark Brown, fine sandy SILT, dry	
2				10" diameter borehole Neat cement grout.
3				
4				2" diameter Schedule 40 PVC casing
5	2-6-8		Light/medium brown, clayey medium SAND, dry/slightly moist	
6				Bentonite Chip Seal
7				
8				#2 filter pack sand
9			SM - Light brown, coarse SAND with very little clay with a few rounded quartz pieces, very moist	
10	3-3-3			
11			Light brown, silty CLAY, slightly moist	
12				
13				
14				
15	4-4-3		SM - Black, clayey coarse SAND with small well rounded quartz pieces, wet	2" diameter, 0.010" slot, Schedule 40 PVC screen
16				
17				
18				
19			SP - Dark grey, clayey coarse SAND, wet	
20	woh-woh-woh			2" diameter Schedule 40 PVC end cap
21				Slough

ERM NC Inc. | Project # 0140408 | Page 1 of 1

PROJECT: Proposed Maysville C&D Landfill				OWB-2	
BORING LOCATION: Proposed Maysville C&D Landfill				GROUND SURFACE ELEVATION AND DATUM: TBD	
DRILLING CONTRACTOR: Geologic Exploration				DATE STARTED: 8/25/11	DATE FINISHED: 8/25/11
DRILLING METHOD: Hollow-stem auger				TOTAL DEPTH (ft.): 20	SCREEN INTERVAL (ft.): 10-20
DRILLING EQUIPMENT: Diedrich D-120 Truck Rig				DEPTH TO WATER: FIRST: 13.62 COMPL. 13.62	CASING: 2" Sch.40PVC
SAMPLING METHOD: Split Spoon				LOGGED BY: Chris Means	
HAMMER WEIGHT: 142 Lbs.	DROP: 32"			DRILLER: Mike McConahey	REG. NO. 2402

DEPTH (feet)	SAMPLES Blows/ 6 Inches	OVM Reading	DESCRIPTION	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
0				Above Grade Well Monument
1	4-4-4	N/A	Medium brown, clayey SILT, dry	
2				10" diameter borehole
3				Neat cement grout.
4				2" diameter Schedule 40 PVC casing
5	5-5-4		Light/medium brown, silty CLAY, dry/slightly moist	
6				Bentonite Chip Seal
7				
8				#2 filter pack sand
9				
10	3-3-3		SM - Medium brown, coarse SAND, very moist	
11				
12				
13				
14				
15	2-1-1			2" diameter, 0.010" slot, Schedule 40 PVC screen
16				
17			SP - Dark grey, clayey coarse SAND, very wet, small clay lenses	
18				
19				
20	wor-wor-1			2" diameter Schedule 40 PVC end cap
21				Slough



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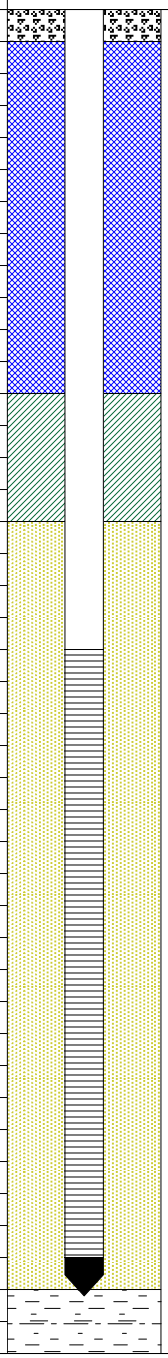
PROJECT: Proposed Maysville C&D Landfill				OWB-3	
BORING LOCATION: Proposed Maysville C&D Landfill				GROUND SURFACE ELEVATION AND DATUM: TBD	
DRILLING CONTRACTOR: Geologic Exploration				DATE STARTED: 8/25/11	DATE FINISHED: 8/25/11
DRILLING METHOD: Hollow-stem auger				TOTAL DEPTH (ft.): 20	SCREEN INTERVAL (ft.): 10-20
DRILLING EQUIPMENT: Diedrich D-120 Truck Rig				DEPTH TO WATER: FIRST: 12.75 COMPL. 12.79	CASING: 2" Sch.40PVC
SAMPLING METHOD: Split Spoon				LOGGED BY: Chris Means	
HAMMER WEIGHT: 142 Lbs.	DROP: 32"			DRILLER: Mike McConahey	REG. NO. 2402

DEPTH (feet)	SAMPLES Blows/ 6 Inches	OVM Reading	DESCRIPTION	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
0				Above Grade Well Monument
1	2-3-4	N/A	Dark/medium brown, silty CLAY, dry, tight	
2				10" diameter borehole Neat cement grout.
3				
4				2" diameter Schedule 40 PVC casing
5	3-3-3		Light/medium brown, fine sandy CLAY, slightly moist, very fine sand	
6				
7				Bentonite Chip Seal
8			Black, silty CLAY, moist	#2 filter pack sand
9				
10	2-2-3			
11			SM - Light/medium brown, coarse SAND, very moist	
12				
13				
14				
15	woh-woh-1			2" diameter, 0.010" slot, Schedule 40 PVC screen
16				
17			SP - Dark grey, clayey SAND, wet, small intermittent clay lenses	
18				
19				
20	woh-woh-woh			2" diameter Schedule 40 PVC end cap
21				Slough



PROJECT: Proposed Maysville C&D Landfill				OWB-4
BORING LOCATION: Proposed Maysville C&D Landfill				GROUND SURFACE ELEVATION AND DATUM: TBD
DRILLING CONTRACTOR: Geologic Exploration			DATE STARTED: 8/25/11	DATE FINISHED: 8/25/11
DRILLING METHOD: Hollow-stem auger			TOTAL DEPTH (ft.): 20	SCREEN INTERVAL (ft.): 10-20
DRILLING EQUIPMENT: Diedrich D-120 Truck Rig			DEPTH TO WATER: FIRST: 13.93 / COMPL. 13.86	CASING: 2" Sch.40PVC
SAMPLING METHOD: Split Spoon			LOGGED BY: Chris Means	
HAMMER WEIGHT: 142 Lbs.	DROP: 32"		DRILLER: Mike McConahey	REG. NO. 2402

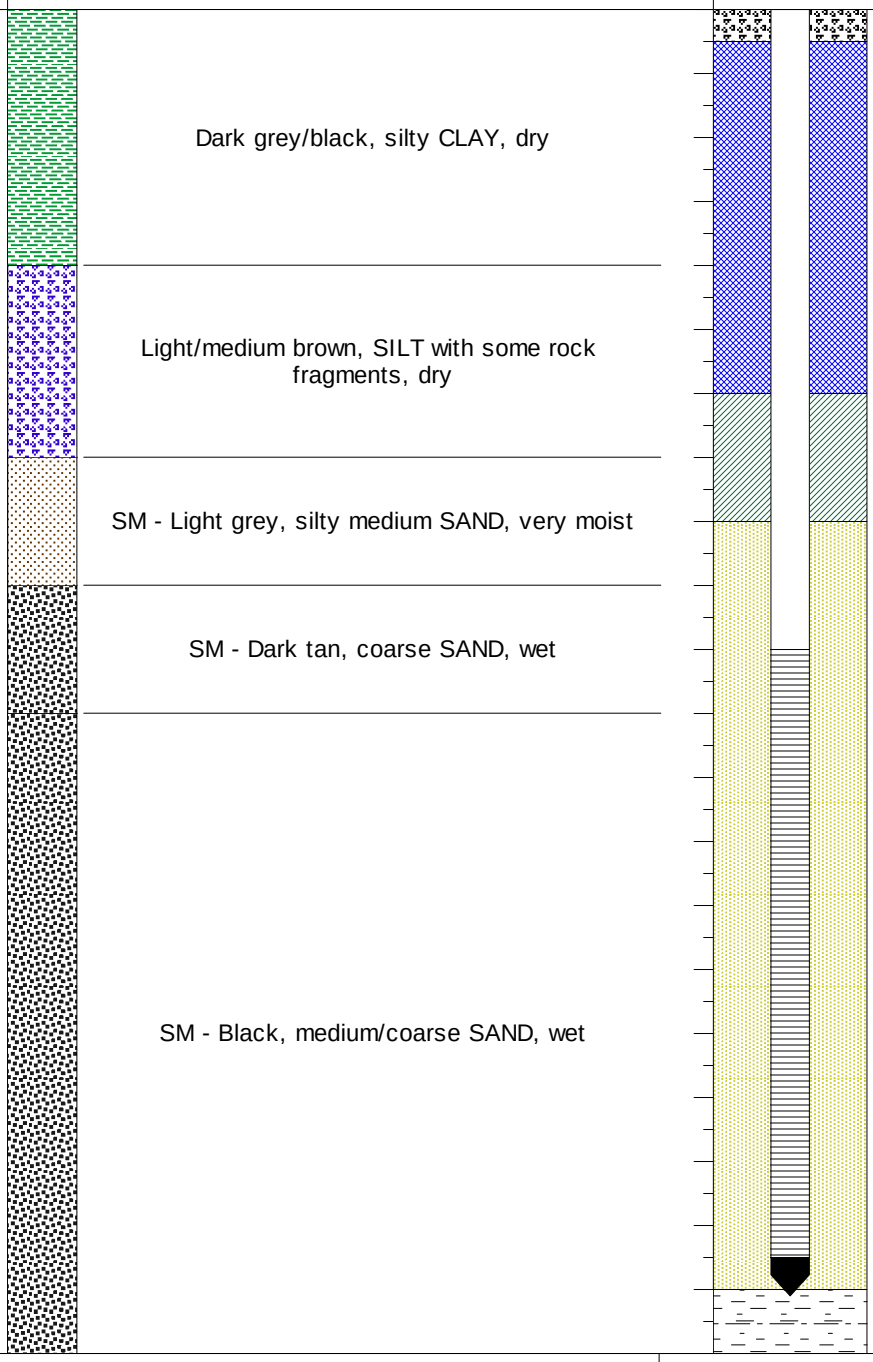
DEPTH (feet)	SAMPLES Blows/ 6 Inches	OVM Reading	DESCRIPTION	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
0			Dark grey, fine sandy SILT, dry	Above Grade Well Monument
1	4-5-5	N/A		
2			Light/medium grey, silty CLAY, slightly moist, tight	10" diameter borehole Neat cement grout.
3				
4				2" diameter Schedule 40 PVC casing
5	5-9-8		Light brown, clayey medium SAND, slightly moist	
6				
7				Bentonite Chip Seal
8				#2 filter pack sand
9				
10	2-3-3		SM - Light/medium brown, silty SAND, moist	
11				
12				
13				
14				
15	wor-wor-wor			2" diameter, 0.010" slot, Schedule 40 PVC screen
16				
17			SP - Dark grey, clayey coarse SAND, wet, small intermittent clay lenses	
18				
19				
20	wor-wor-wor			2" diameter Schedule 40 PVC end cap
21				Slough

PROJECT: Proposed Maysville C&D Landfill				OWB-6	
BORING LOCATION: Proposed Maysville C&D Landfill				GROUND SURFACE ELEVATION AND DATUM: TBD	
DRILLING CONTRACTOR: Geologic Exploration				DATE STARTED: 8/24/11	DATE FINISHED: 8/24/11
DRILLING METHOD: Hollow-stem auger				TOTAL DEPTH (ft.): 20	SCREEN INTERVAL (ft.): 10-20
DRILLING EQUIPMENT: Diedrich D-120 Truck Rig				DEPTH TO WATER: FIRST: 13.70 COMPL. 13.78	CASING: 2" Sch.40PVC
SAMPLING METHOD: Split Spoon				LOGGED BY: Chris Means	
HAMMER WEIGHT: 142 Lbs.	DROP: 32"			DRILLER: Mike McConahey	REG. NO. 2402

DEPTH (feet)	SAMPLES Blows/ 6 Inches	OVM Reading	DESCRIPTION	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
0				Above Grade Well Monument
1	3-3-3	N/A		
2			Medium grey, fine sandy SILT, dry	10" diameter borehole Neat cement grout.
3				
4				2" diameter Schedule 40 PVC casing
5	2-1-3			
6			Light grey, silty CLAY, slightly moist	
7				Bentonite Chip Seal
8				#2 filter pack sand
9				
10	3-2-3		SP - Black, silty coarse SAND, with a few well rounded pieces of quartz	
11				
12				
13				
14				
15	2-8-9		SP-SM - Light/medium grey, silty coarse SAND, with some shell material, wet	2" diameter, 0.010" slot, Schedule 40 PVC screen
16				
17				
18				
19			SP - Dark grey, fine sandy SILT with a small amount of clay, wet	2" diameter Schedule 40 PVC end cap
20	woh-woh-6			
21			Light grey, shell material, SAND with some gravel	Slough

PROJECT: Proposed Maysville C&D Landfill				OWB-10	
BORING LOCATION: Proposed Maysville C&D Landfill				GROUND SURFACE ELEVATION AND DATUM: TBD	
DRILLING CONTRACTOR: Geologic Exploration				DATE STARTED: 8/22/11	DATE FINISHED: 8/23/11
DRILLING METHOD: Hollow-stem auger				TOTAL DEPTH (ft.): 20	SCREEN INTERVAL (ft.): 10-20
DRILLING EQUIPMENT: Diedrich D-120 Truck Rig				DEPTH TO WATER: FIRST: 13.68 COMPL. 13.70	CASING: 2" Sch.40PVC
SAMPLING METHOD: Split Spoon				LOGGED BY: Chris Means	
HAMMER WEIGHT: 142 Lbs.	DROP: 32"			DRILLER: Mike McConahey	REG. NO. 2402

DEPTH (feet)	SAMPLES Blows/ 6 Inches	OVM Reading	DESCRIPTION	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
0				Above Grade Well Monument
1	N/A	N/A		
2			Dark grey/black, silty CLAY, dry	10" diameter borehole Neat cement grout.
3				
4				2" diameter Schedule 40 PVC casing
5	9-5-4		Light/medium brown, SILT with some rock fragments, dry	
6				
7				Bentonite Chip Seal
8			SM - Light grey, silty medium SAND, very moist	#2 filter pack sand
9				
10	10-7-4		SM - Dark tan, coarse SAND, wet	
11				
12				
13				
14				
15	2-1-1			2" diameter, 0.010" slot, Schedule 40 PVC screen
16			SM - Black, medium/coarse SAND, wet	
17				
18				
19				
20	wor-woh-2			2" diameter Schedule 40 PVC end cap
21				Slough



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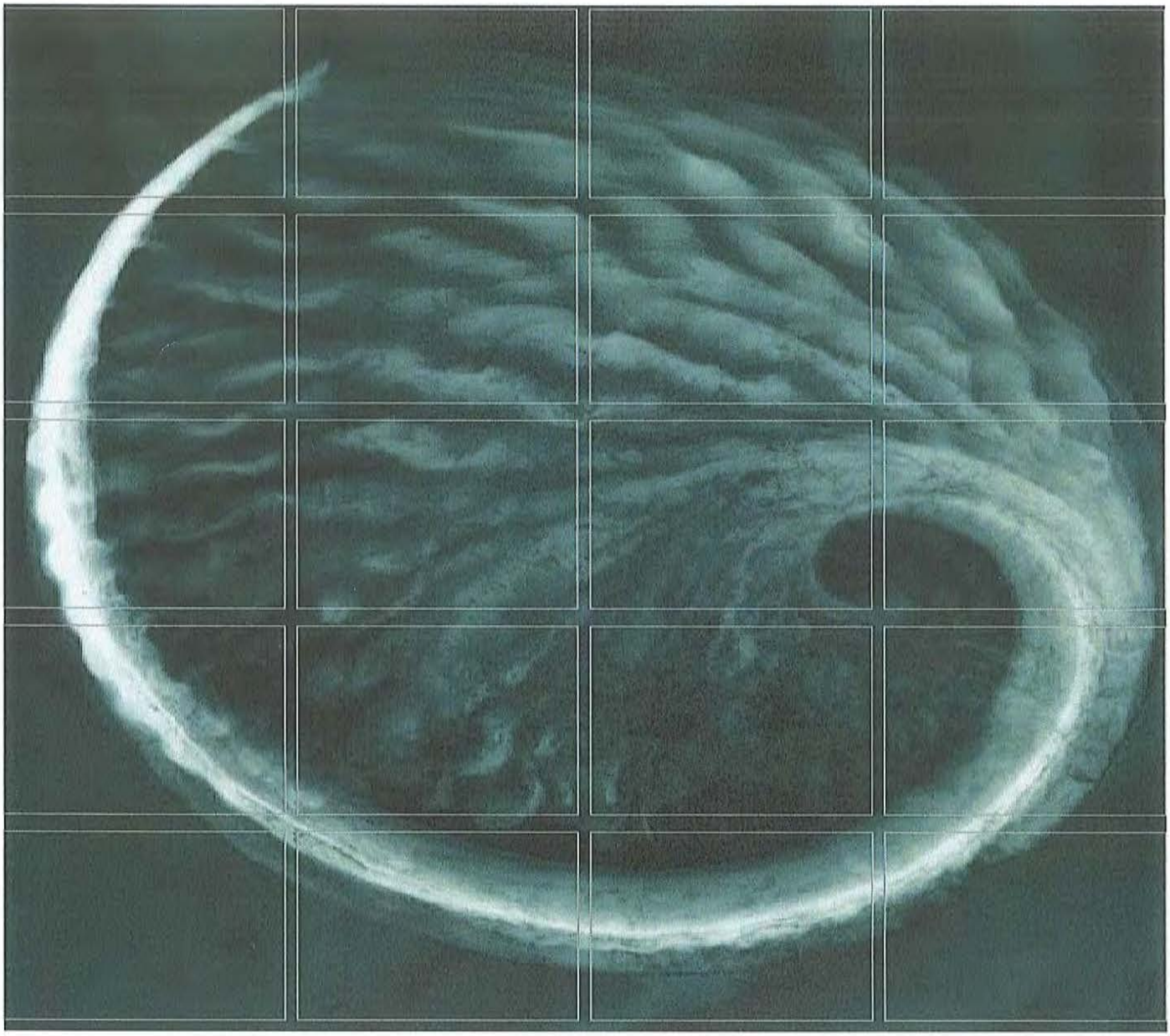

Green Recycling Solutions LLC

Site Hydrogeologic Report
Proposed Construction & Demolition Debris Landfill
Maysville, North Carolina

December 2011

NORTH CAROLINA PROFESSIONAL SEAL 20713 ENGINEER DAVID M. WASIELA
12-16-11

NORTH CAROLINA LICENSED SEAL 1113 GEOLOGIST THOMAS M. WILSON
12-16-11

ERM

Delivering sustainable solutions in a more competitive world

ERM NC, Inc.

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Charlotte, NC 28226
(704) 541-8345
(704) 541-8416 (fax)

December 16, 2011

NCDENR – Division of Waste Management
610 East Center Avenue
Suite 301
Mooresville, NC 28115

Attention: Ms. Elizabeth Werner

Reference: Site Suitability – Site Hydrogeologic Report
Proposed Green Recycling Solutions LLC – C&D Landfill
Maysville, Jones County, North Carolina

Ms. Werner:

On behalf of Green Recycling Solutions LLC, ERM NC, Inc. (ERM) is submitting the attached Site Study – Site Hydrogeologic Report for a Construction & Demolition Debris (C&D) Landfill in accordance with NCDENR Division of Waste Management regulations 15A NCAC 13B .0536(c)(3) and .0538 (a) for the referenced project. The proposed C&D landfill site is located within the jurisdictional limits of Maysville, North Carolina approximately one mile north of the intersection of US Highway 17 and NC Route 58.

ERM submitted a proposed boring location plan for the Maysville site on August 4, 2011 to Division of Waste Management to receive comments or suggestions. The proposed boring location plan included 15 soil test boring locations with installation of temporary observation wells (installed as Type II Monitoring Wells) at each location. The depths of the proposed borings and wells ranged from 15 to 20 feet below ground surface. Ms. Elizabeth Werner responded to ERM on August 15, 2011 with no suggested revisions concerning the locations of the proposed borings or proposed depths. ERM subcontracted Geologic Exploration, Inc. to perform drilling and well installation services and mobilized to the site on August 22, 2011. Representatives from Division of Waste Management; Elizabeth Werner and Ray Williams, visited the site on August 24, 2011 during the installation of soil test borings and observation wells. Field work for the borings and well installation was completed on August 26, 2011. Following installation of the wells, ERM performed field permeability testing for the surficial aquifer and made several site visits to obtain ground water level measurements. The results of our field testing and observations are included in the attached report.

The Site Hydrogelogic Report for the Maysville Green Recycling Solutions site has been compiled to match the order of information requested in regulation 15A NCAC 13B .0538(a). For simplicity purposes, each portion of the regulation is listed prior to the associated discussion of information to illustrate completeness.

If you should have any questions or require additional information concerning this Site Hydrogeologic Report please contact us at your convenience.

Sincerely,

ERM NC, Inc.

David W. Wasiela, P.E.
Senior Engineer
NC Registration #20770

Thomas M. Wilson, P.G.
Senior Geologist
NC Registration #1113

cc: Mr. James Maides – Green Recycling Solutions LLC

Attch: Site Hydrogeologic Report

Site Suitability – Site Hydrogeologic Report
Proposed Green Recycling Solutions LLC – C&D Landfill
Maysville, Jones County, North Carolina

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Appendix F *Stratigraphic Cross-Sections*
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Appendix H *Groundwater Contour Map*

***Regulation* - 15A NCAC 13B .0538(a) GEOLOGIC AND HYDROGEOLOGIC INVESTIGATIONS FOR C&DLF FACILITIES**

(a) Site Hydrogeologic Report. A permit applicant must conduct a hydrogeologic investigation and prepare a report. An investigation is required to assess the geologic and hydrogeologic characteristics of the proposed site to determine the suitability of the site for solid waste management activities, which areas of the site are most suitable for C&DLF units, and the general ground-water flow paths and rates for the uppermost aquifer. The report must provide an understanding of the relationship of the site ground-water flow regime to local and regional hydrogeologic features with special emphasis on the relationship of C&DLF units to ground-water receptors (especially drinking water wells) and to ground-water discharge features. Additionally, the scope of the investigation must include the general geologic information necessary to address compliance with the pertinent location restrictions described in Rule .0536 of this Section. The Site Hydrogeologic Report must provide, at a minimum, the following information:

Discussion

This Site Hydrogeologic Report has been prepared to meet or exceed the requirements stipulated in the regulation above. The report contains:

- Regional geologic characteristics as available from research and ERM observations.
- Local geologic & hydrologic information as available from research and ERM observations.
- A subsurface investigation program and results
- A field testing program and results
- A laboratory testing program and results
- Potentiometric Map
- Ground water table discussion
- Ground water flow discussion
- Topographic Map
- Geologic & Hydrologic considerations for permitting
- Geologic & Hydrogeologic Summary

***Regulation* - 15A NCAC 13B .0538(a)(1)**

(1) A report on local and regional geology and hydrogeology based on research of available literature for the area. This information is to be used in planning the field investigation. For sites located in piedmont or mountain regions, this report must include an evaluation of structurally controlled features identified on a topographic map of the area.

Discussion

The proposed Green Recycling Solutions LLC, C&D Landfill is located within the physiographic region of the Inner Coastal Plain. "The Inner Coastal Plain Province consists of stair-step-like planar terraces that dip gently towards the ocean. At higher elevations, the land is dissected to form gently rolling hills and valleys. Elevations range from about 600 feet to 25 feet above mean sea level. The boundary between the Piedmont and Coastal Plain is the Fall Zone. This zone represents the elevational break between the resistant rocks of the Piedmont and the more easily eroded sediments of the Coastal Plain." *(Ref: North Carolina Geological Survey, Physiography of North Carolina, M.A. Medina, J.C. Reid, and R.H. Carpenter, 2004*). The site location is shown on the North Carolina Physiography Map (*Figure - 1*) for reference.

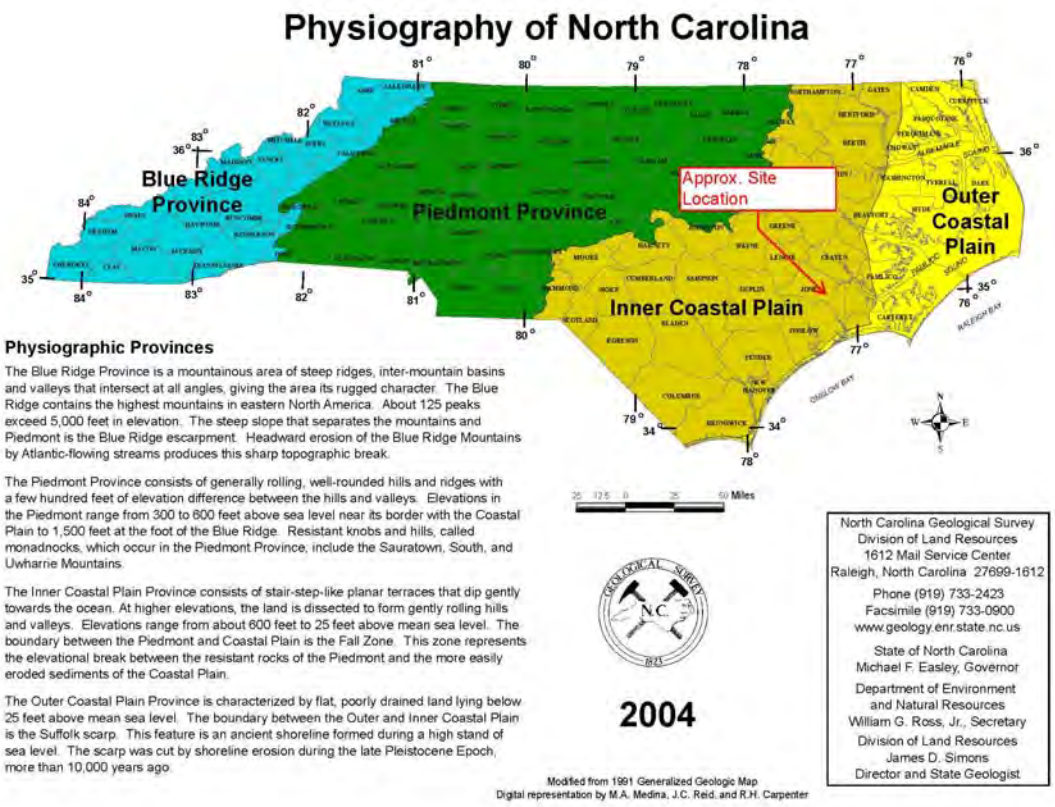


Figure -1

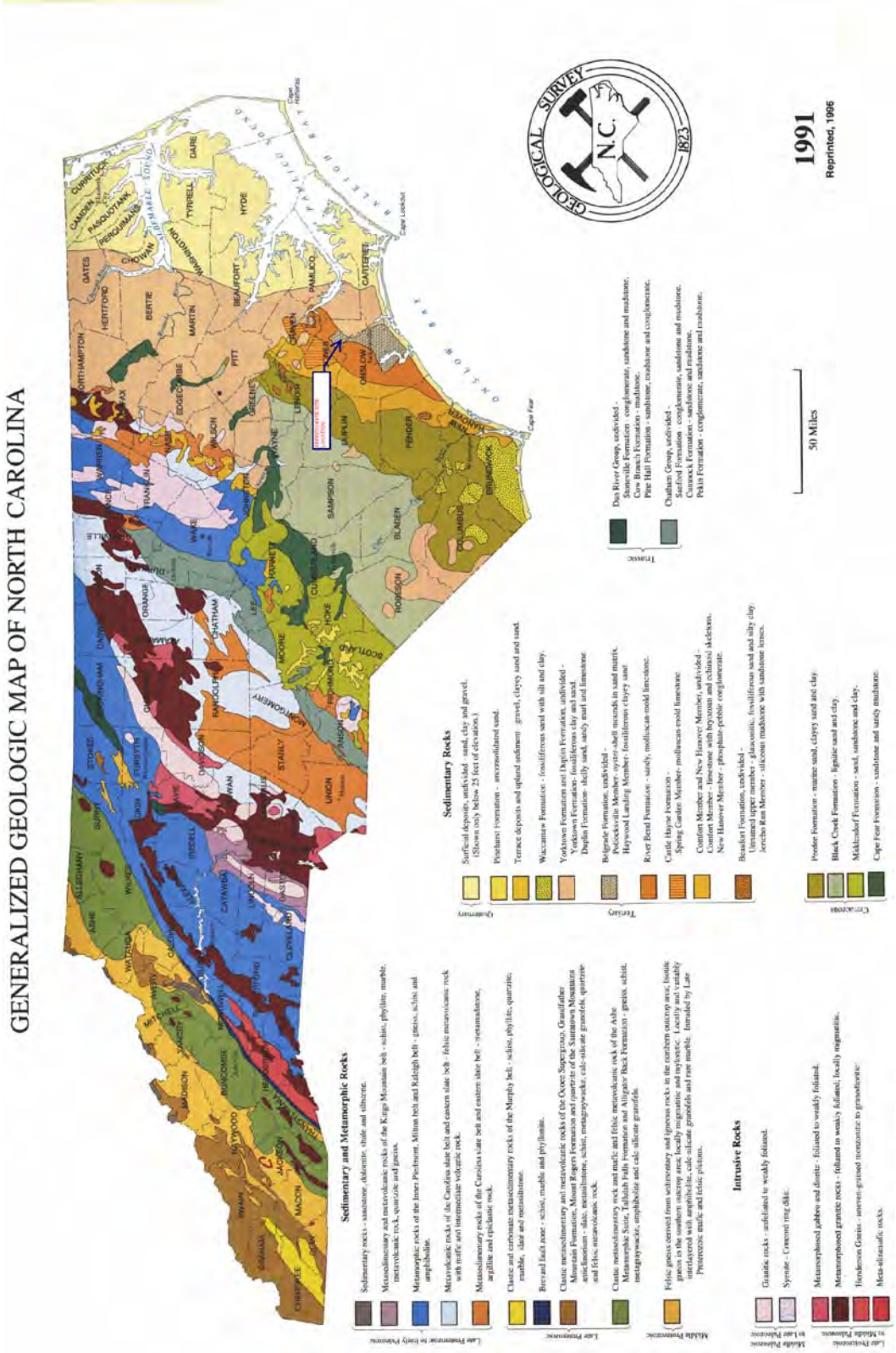

GENERALIZED GEOLOGIC MAP OF NORTH CAROLINA
Sedimentary and Metamorphic Rocks
Sedimentary Rocks
Intrusive Rocks
GEOLOGICAL SURVEY
N.C.
1823
1991
Reprinted, 1996
50 Miles

Figure - 2

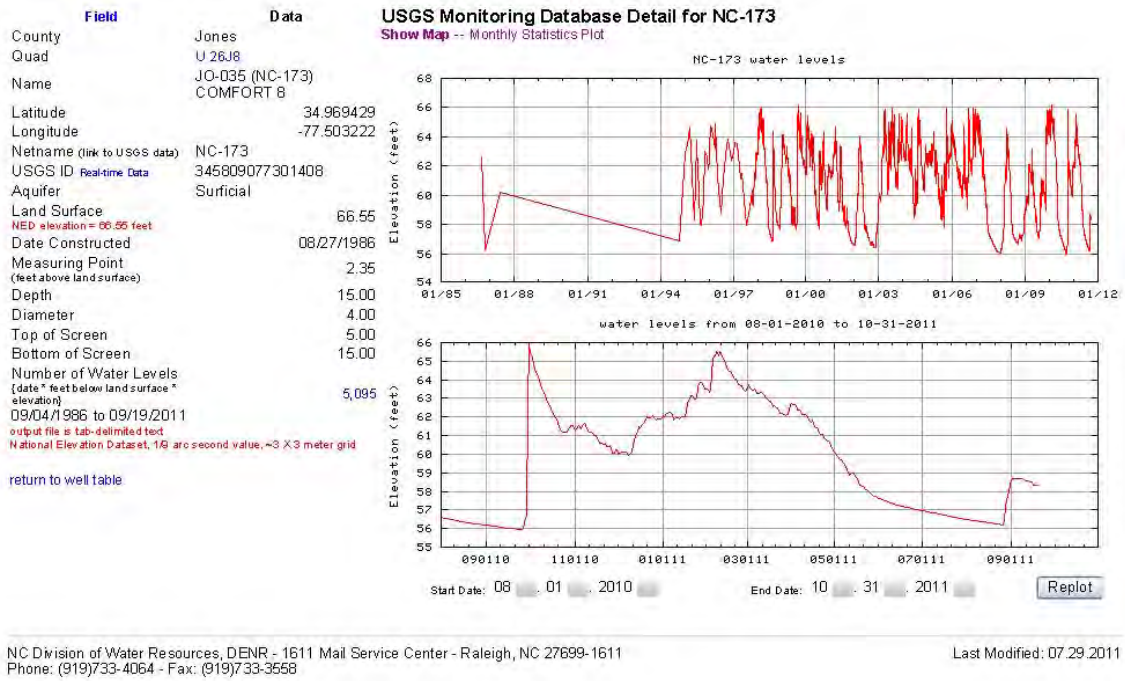
"The unconfined, surficial aquifer of much of the southeastern North Carolina Coastal Plain typically consists of variably thick, Pliocene, Pleistocene, and Holocene deposits. On the south side of the Neuse River, Pleistocene surficial deposits (sand, mud, shell, gravel) are thin (20 ft thick), and the top of the Cretaceous (Peedee) confining unit occurs at a depth of 132 ft. Between these surfaces is a thick sequence (110 ft) of muddy sand, sand and limestone that includes Paleocene (Beaufort Formation), Eocene (Castle Hayne Formation), and Oligocene (Riverbend/Belgrade Formations) deposits. These formations include a variety of siliciclastic and carbonate facies, some of which form porous and permeable aquifers." (Reference: *Shallow Aquifers and Confining Units in the Neuse River Basin, Surry to Suffolk Scarp, Fiscal Year 2003 Grant, NC-DENR Contract Number EW04035).*

In Jones County, the Coastal Plain deposits consist primarily of limestone and unconsolidated sands and clays. Geologically, the proposed site is located within the Belgrade Formation (*Ref. North Carolina Geological Survey, Generalized Geologic Map of North Carolina, 1991)* as shown in *Figure – 2* on the previous page. Generally, the surficial soils within the site area consist of silty sands and clayey sands with discrete areas of surface clays/silts that typically support wetland areas. Based on the predominance of silty and clayey sands observed in shallow borings advanced at the proposed site, the site is considered to be within the Haywood Landing Member of the Belgrade Formation.

The sandy soils within the upper 20-feet of soil strata includes the uppermost ground water aquifer for this region. The ground water level within the surficial aquifer may vary several feet based on significant rainfall events as this aquifer is primarily recharged by rainfall. Detailed descriptions of the composition and properties of the soils for the proposed landfill site and surrounding area are provided in a Custom Soil Resource Report from the National Cooperative Soil Survey that is presented in **Appendix A**.

Locally, Martin-Marietta operates a quarry in Belgrade, North Carolina (approximately 2.5 miles south of the site) for extraction of sand and rock. Reportedly, a limestone layer is encountered within the quarry at depths ranging from 40 to 60 feet below natural ground surface. The thickness of the limestone varies and is overlying deposits of sands. Similar reports have been identified for the Morton Trucking, US 17 mine located approximately 8 miles south of the site with a limestone layer encountered approximately 70 to 80 feet below natural ground surface approximately 14 to 18 feet thick. This mine also reports that sand deposits are beneath the limestone layer.

ERM utilized the NCDENR – Division of Water Resources data base to locate wells within the vicinity of the proposed site that contain historical water level data. Three wells were identified; one well in Jones County, well ID U26J8 (Figure 3) has a total depth of 15 feet and is located approximately 10 miles west of the site, and two wells in Onslow County, well ID V23X4 with a total depth of 35 feet (Figure 4) and V23X1 with a total depth of 120 feet (Figure 5) both located approximately 5 miles southwest of the site along US Highway 17.



Field	Data
County	Jones
Quad	U 26J8
Name	JO-035 (NC-173) COMFORT 8
Latitude	34.969429
Longitude	-77.503222
Netname (link to USGS data)	NC-173
USGS ID Real-time Data	345809077301408
Aquifer	Surficial
Land Surface NED elevation = 66.55 feet	66.55
Date Constructed	08/27/1986
Measuring Point (feet above land surface)	2.35
Depth	15.00
Diameter	4.00
Top of Screen	5.00
Bottom of Screen	15.00
Number of Water Levels {date * feet below land surface * elevation} 09/04/1986 to 09/19/2011	5,095

output file is tab-delimited text
National Elevation Dataset, 1/9 arc second value, ~3 X 3 meter grid

return to well table

Figure - 3

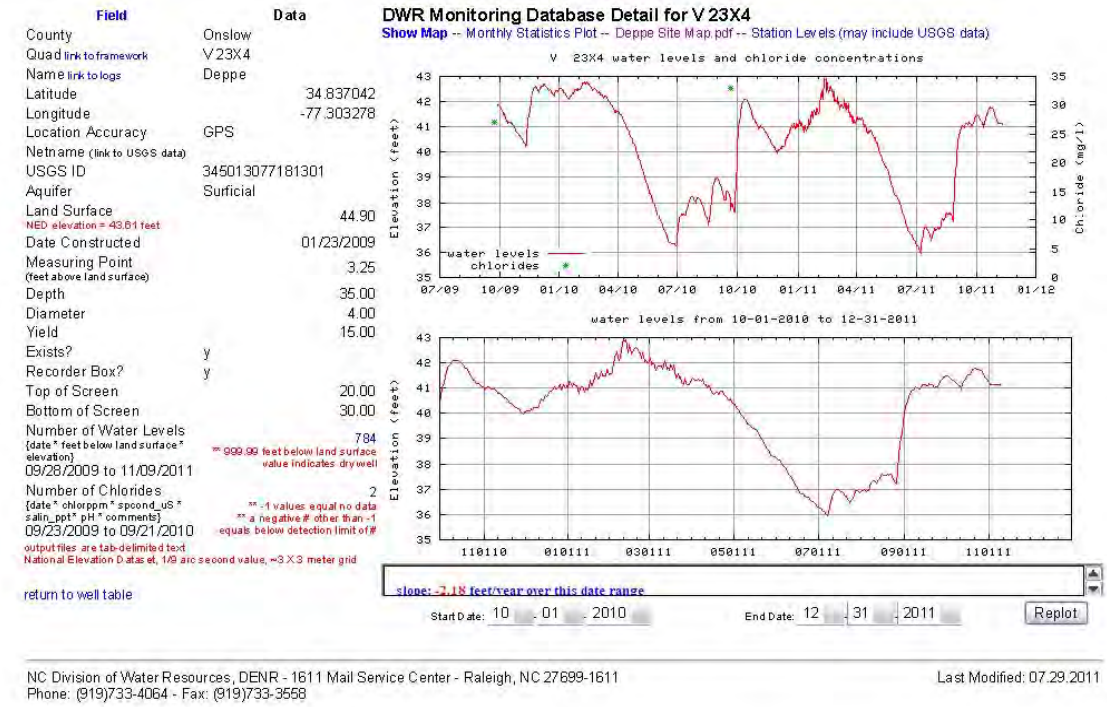


Figure - 4

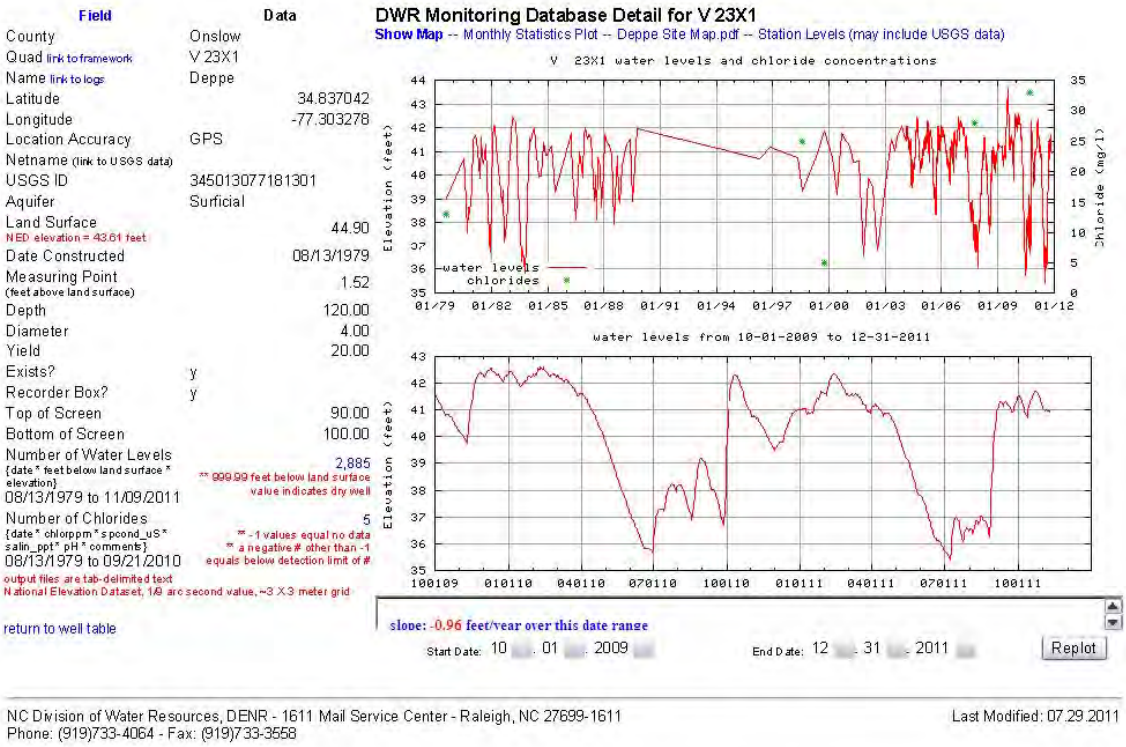


Figure - 5

Based on the historical water level data for the three identified wells in the vicinity of the site, the water table generally occurs within 10 feet of the land

surface and long term seasonal ground water level fluctuations have generally ranged from 7 to 10 feet over a time period in excess of 30 years.

In summary, the general characterization for the local and regional geologic and hydrogeologic conditions in this area of North Carolina includes:

- Near surface ground water table; 4 to 14 feet below ground surface
- Water table fluctuations of 7 to 10 feet
- Silty sands, clayey sands and sands in surficial aquifer
- Potential to encounter limestone at depths of 40 to 80 feet
- Rainfall recharged surficial aquifer

***Regulation* - 15A NCAC 13B .0538(a)(2)**

(2) A report on field observations of the site that includes information on the following:
(A) topographic setting, springs, streams, drainage features, existing or abandoned wells, rock outcrops, (including trends in strike and dip), and other features that may affect site suitability or the ability to effectively monitor the site; and
(B) ground-water discharge features. For a proposed site where the owner or operator does not control the property from any landfill unit boundary to the controlling, downgradient, ground-water discharge feature(s), additional borings, geophysics or other hydrogeological investigations may be required to characterize the nature and extent of groundwater flow; and
(C) the hydrogeological properties of the bedrock, if the uppermost ground-water flow is predominantly in the bedrock. Bedrock for the purpose of this rule is defined as material below auger refusal.

Discussion

A site plan is included in **Appendix B** for reference. In general, the proposed site is relatively flat with approximately 3 feet of topographic relief within the approximately 43.5 acres of the area included in the proposed landfill facility. Topographic elevations at the site range from 40.0 to 37.0 feet MSL. There is no predominant direction of topographic relief. Discrete topographically low areas are present within the site and typically contain wetland areas. The site is generally wooded with cleared access roads and roadside ditches. Standing water is typical within the roadside ditches.

There are no natural creeks, streams or rivers within the proposed landfill facility boundary. The nearest natural drainage feature that may receive groundwater discharge is the head waters of an unnamed tributary to the White Oak River located approximately 2,550 feet west of the proposed landfill footprint on the west side of White Oak River Road. Manmade drainage ditches are located to

the north of the proposed site on property owned by Weyerhauser and managed as a pine forest.

There are no known existing or abandoned wells or rock outcrops within the proposed landfill facility boundary.

***Regulation* - 15A NCAC 13B .0538(a)(3)**
(3) Borings for which the numbers, locations, and depths are sufficient to provide an adequate understanding of the subsurface conditions and ground-water flow regime of the uppermost aquifer at the site. The number and depths of borings required will depend on the hydrogeologic characteristics of the site. At a minimum, there must be an average of one boring for each 10 acres of the proposed landfill facility unless otherwise authorized by the Division. All borings intersecting the water table must be converted to piezometers or monitoring wells in accordance with 15A NCAC 02C .0108.

Discussion

ERM submitted a proposed boring location plan for the Maysville site on August 4, 2011 to Division of Waste Management to receive comments or suggestions. The proposed boring location plan included 15 soil test boring locations with installation of temporary observation wells (installed as Type II Monitoring Wells) at each location. The depths of the proposed borings and wells ranged from 15 to 35 feet below ground surface. Ms. Elizabeth Werner responded to ERM on August 15, 2011 with no suggested revisions concerning the locations of the proposed borings or proposed depths. ERM subcontracted Geologic Exploration, Inc. to perform drilling and well installation services and mobilized to the site on August 22, 2011. Representatives from Division of Waste Management; Elizabeth Werner and Ray Williams, visited the site on August 24, 2011 during the installation of soil test borings and observation wells. Field work for the borings and well installation was completed on August 26, 2011.

A total of 15 wells were installed within soil test borings for the characterization of the 43.5-acre study area (3.5 wells per 10 acres), which includes the proposed limits of waste placement, and a 200-foot perimeter (Maysville annexation limits). Wells were advanced to penetrate the surficial aquifer ranging in depths from 15 to 35 feet below ground surface.

Surveyed well locations, depths, and lithologic (well construction) logs and NC DENR Division of Water Quality Non-Residential Well Construction Records are presented in **Appendix C**.

***Regulation* - 15A NCAC 13B .0538(a)(4)**

(4) A testing program for the borings which describes the frequency, distribution, and type of samples taken and the methods of analysis (ASTM Standards or test methods approved by the Division) used to obtain, at a minimum, the following information:
(A) standard penetration - resistance (ASTM D 1586);
(B) particle size analysis (ASTM D 422);
(C) soil classification: Unified Soil Classification System (USCS) (ASTM D 2487);
(D) formation descriptions; and
(E) saturated hydraulic conductivity, porosity, effective porosity, and dispersive characteristics for each lithologic unit of the uppermost aquifer including the vadose zone.

Discussion

Wells were constructed using hollow-stem auger, with split spoon sampling, including standard penetration testing (ASTM D 1586) approximately every 5 feet. Standard penetration test results are presented in **Appendix C** as shown on the soil test boring records.

In order to characterize the soil properties of the samples collected in the surficial aquifer, eight (8) bulk samples of soil were collected during drilling operations for laboratory testing. The samples were transported to the geotechnical laboratory at ESP Associates, P.A. in Fort Mill, South Carolina for particle size analysis (ASTM D 422). In general, the testing results indicate that all of the samples classify as a sand with a low sand percentage of 50.3% at OWB-14 to a high percentage of sand of 97.6% at OWB-2. The results of particle size analysis (grain size distribution) are presented in **Appendix D**. USCS classifications were field-determined based on physical inspection of split spoon samples in the field and again in our office. The USCS classifications for each split spoon sample retrieved are presented in **Appendix C** as part of the soil test boring records.

Additionally, ERM retrieved two undisturbed 3-inch diameter Shelby tube samples of near surface clayey soils encountered at OWB-5 and OWB-7. These soils are typical for the majority of the boring locations. ERM transported these samples to ESP Associates, P.A. geotechnical laboratory in Fort Mill, South Carolina for permeability testing (ASTM D 5084). These samples were initially identified in the field as candidate soil liner materials. The permeability testing results are included in **Appendix D** for reference. The sample obtained from OWB-7 (4 to 6 feet below ground surface) has a coefficient of permeability of $2.8X10^{-6}$ cm/sec whereas the sample from OWB-5 (2 to 4 feet below ground surface) has a coefficient of permeability of $2.8X10^{-4}$ cm/sec. The laboratory noted that upon extracting the OWB-5 sample that small roots were observed that may impact the test results.

In addition to laboratory testing program, ERM attempted to perform field permeability, rising head field slug test, testing at each of the temporary observation wells (OWB-1 through OWB-15). Due to quickly recharging conditions, our attempts were successful at only 5 of the 15 locations. Testing was achieved at OWB-7, OWB-9, OWB-12, OWB-14 and OWB-15 with results ranging from a low of $8.9X10^{-5}$ cm/sec (OWB-14) to a high of $6.7X10^{-4}$ cm/sec (OWB-7). These results are reflective of the laboratory grain size distribution testing results and physical classifications of the soils. With the attempts at 10 wells failing due to inability to drawdown the water table, these results should be considered as "Low" when evaluating the rest of the site. The observations of field slug testing and results are presented in **Appendix D**.

In summary, the site subsurface conditions may be generalized to include a thin topsoil layer of approximately 6 to 10 inches in depth at the surface. Beneath the topsoil, a clay, silt or combination of the two is typically encountered ranging in depths from 3 to 10 feet below ground surface. In some instances, clays and silts are absent from the near surface and sand is encountered beneath the topsoil layer (OWB-5, OWB-11, OWB-12 and OWB-14). All well locations reveal sands located in the water bearing zones in the surficial aquifer. Intermittent layers or lenses of silts and/or clays may be present within these sands but the predominant composition of the surficial aquifer soils are sands.

***Regulation* - 15A NCAC 13B .0538(a)(5)**

(5) In addition to borings, other techniques may be used to investigate the subsurface conditions at the site, including but not limited to: geophysical well logs, surface geophysical surveys, and tracer studies.

Discussion

During preliminary site studies and wetland delineations, preliminary subsurface test pits were installed on March 25, 2011 by Mr. Haywood Pittman, a NC Licensed Soil Scientist, of Pittman Soil Consulting. The purpose of the test pits was to determine the approximate depth to water and classification of near surface soils. Test pits remained open for 24 hours before Mr. Pittman recorded the depth to ground water. Water table elevations stabilized within the open test pits generally ranged from 5 to 7 feet below ground surface. These results were used by ERM to develop our preliminary well installation program submitted to the Division of Waste Management in August 2011. The results of the test pit investigation, a summary table of the results, and a map showing the locations of the test pits overlaying the proposed landfill are presented in **Appendix E**.

***Regulation* - 15A NCAC 13B .0538(a)(6)**

(6) Stratigraphic cross-sections identifying hydrogeologic and lithologic units, and stabilized water table elevations.

Discussion

Stratigraphic cross-sections, including a cross-section location plan are presented in **Appendix F**. Cross sections were developed using field and laboratory test data to group similar soil components together, survey information, soil test boring records and water table elevation records for each well. The subsurface cross sections generally indicate a continuous sand aquifer underlying the proposed site with stabilized water table elevations generally ranging from 4 to 5.5 feet below ground surface. Based on our visits to the site to retrieve water table readings, the results obtained on September 9, 2011 appeared to be the most representative for the highest water table.

The cross sections also illustrate the presence of a near surface clay, silt or combination of the two, layer extending across the majority of the site. It appears that ground water in these areas will reach potentiometric elevations dictated by the regional ground water elevation within the sand aquifer; extending into to silts and clays.

***Regulation* - 15A NCAC 13B .0538(a)(7)**

(7) Water table information, including:
(A) tabulations of water table elevations measured at the time of boring, 24 hours, and stabilized readings for all borings (measured within a period of time short enough to avoid temporal variations in ground-water flow which could preclude accurate determination of ground-water flow direction and rate);
(B) tabulations of stabilized water table elevations over time in order to develop an understanding of seasonal fluctuations in the water table;
(C) an estimation of the long-term seasonal high water table based on stabilized water table readings, hydrographs of wells in the area, precipitation and other meteorological data, and streamflow measurements from the site frequent enough to demonstrate infiltration and runoff characteristics, and any other information available; and
(D) a discussion of any natural or man-made activities that have the potential for causing water table fluctuations, including but not limited to, tidal variations, river stage changes, flood pool changes of reservoirs, high volume production wells, and injection wells.

Discussion

Water levels in the temporary observation wells were recorded at termination of boring, approximately 24 hours after termination of boring and several dates

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thereafter. Water levels were obtained for all of the wells within the same calendar day. A summary table of water level readings is included on the following page as Table -1 and also included in **Appendix G.**

Following installation of the temporary observation wells on August 26, 2011, Hurricane Irene resulted in over 7 inches of rainfall at the site around August 27, 2011. A significant rise occurred in all wells installed at the site along with the nearby wells in the Division of Water Resources network (Figures 3, 4 & 5). In general water table elevations rose approximately 6 to 7 feet following the storm event. With the transition into colder months and decreasing evapotranspiration, the water levels have remained at or near the levels recorded following Hurricane Irene.

Individual graphs charting the progression of water table elevations along with recorded rainfall over the evaluation period are included in **Appendix G** for reference. Of particular note is that all of the site wells exhibit the same graph shape and very similar groundwater elevations over the study period indicating a laterally continuous, relatively permeable and homogeneous groundwater flow regime within the surficial aquifer zone across the site. These same characteristics are seen in the nearby wells monitored by Division of Water Resources (Figures 3, 4 & 5). As a result, generally the ground water table is located approximately 4 to 6 feet below ground surface across the site.

Based on the nearby wells in the Division of Water Resources monitoring network discussed previously, the water table elevations recorded during our evaluation are near long term seasonal high levels. Historically, the long term seasonal high levels may be an additional 1 foot higher than those recorded.

Proposed Maysville C&D Landfill
Water Table Elevations - Through 11-22-11

Well OWB-#	Top of PVC Elevation (MSL)	Groundwater Level Elevations													
		T.O.B.		24-Hr.		8/26/11		9/6/11		9/9/11		10/10/11		11/22/11	
		Depth (ft)	Elev.	Depth (ft)	Elev.	Depth (ft)	Elev.	Depth (ft)	Elev.	Depth (ft)	Elev.	Depth (ft)	Elev.	Depth (ft)	Elev.
OWB-1	42.03	13.55	28.48	13.92	28.11	13.92	28.11	7.21	34.82	6.82	35.21	7.80	34.23	7.11	34.92
OWB-2	40.89	13.62	27.27	13.62	27.27	13.62	27.27	6.33	34.56	5.86	35.03	7.02	33.87	6.23	34.66
OWB-3	40.32	12.75	27.57	12.79	27.53	12.79	27.53	5.79	34.53	5.38	34.94	6.54	33.78	5.80	34.52
OWB-4	41.68	13.93	27.75	13.86	27.82	13.86	27.82	6.89	34.79	6.53	35.15	7.68	34.00	6.92	34.76
OWB-5	42.29	15.05	27.24	15.00	27.29	14.30	27.99	7.52	34.77	7.36	34.93	8.22	34.07	7.44	34.85
OWB-6	42.18	13.70	28.48	13.78	28.40	13.82	28.36	7.31	34.87	6.94	35.24	7.91	34.27	7.10	35.08
OWB-7	42.77	15.55	27.22	14.85	27.92	14.75	28.02	7.69	35.08	7.17	35.60	8.58	34.19	7.79	34.98
OWB-8	42.83	15.05	27.78	14.97	27.86	14.99	27.84	7.93	34.90	7.62	35.21	8.68	34.15	7.83	35.00
OWB-9	41.29	13.89	27.40	13.10	28.19	13.11	28.18	5.58	35.71	5.30	35.99	5.22	36.07	7.50	33.79
OWB-10	42.40	13.68	28.72	13.70	28.70	13.70	28.70	6.68	35.72	5.71	36.69	7.15	35.25	6.20	36.20
OWB-11	43.41	13.62	29.79	13.65	29.76	13.64	29.77	6.93	36.48	6.38	37.03	7.61	35.80	6.75	36.66
OWB-12	43.22	16.25	26.97	15.13	28.09	15.15	28.07	8.07	35.15	7.76	35.46	8.40	34.82	7.86	35.36
OWB-13	44.19	15.15	29.04	15.34	28.85	15.37	28.82	8.51	35.68	8.23	35.96	9.27	34.92	8.40	35.79
OWB-14	42.49	14.40	28.09	14.09	28.40	14.06	28.43	6.86	35.63	6.57	35.92	7.65	34.84	6.74	35.75
OWB-15	43.21	14.61	28.60	14.56	28.65	14.65	28.56	7.40	35.81	7.23	35.98	8.59	34.62	7.83	35.38
Average W.T. Elevation			**28.03**		**28.19**		**28.23**		**35.23**		**35.62**		**34.59**		**35.18**
W.T. Standard Deviation			**-0.28**		**-0.93**		**-1.01**		**-1.01**		**-0.94**		**-1.01**		**-0.73**

Table - 1

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ERM will continue to monitor water table elevations throughout the winter months to further evaluate ground water table fluctuations during the design permitting phase of this project. For the purpose of this study, the highest water table elevations are based on readings recorded on September 9, 2011 and are also presented in **Appendix F** as part of the Stratigraphic cross-sections.

Based on our initial investigation, the surficial aquifer appears to be recharged from rainfall infiltration. The surficial aquifer conditions also appear to be consistent beyond the limits of our investigation. Therefore, manmade impacts such as landfilling that may locally reduce the direct rainfall infiltration are not anticipated to significantly affect the behavior of the historic water table fluctuations.

***Regulation* - 15A NCAC 13B .0538(a)(8)**

(8) The horizontal and vertical dimensions of ground-water flow including flow directions, rates, and gradients.

Discussion

The groundwater flow conditions within the surficial aquifer at the site are characterized by very low hydraulic gradients and velocities. The horizontal hydraulic gradient is essentially flat, with a subtle radial groundwater flow pattern occurring in the area around OWB-11 which serves as a local preferential groundwater recharge area. The horizontal gradient can be seen in the stratigraphic cross-section presented in **Appendix F** along with individual hydraulic gradients and ground water velocities from well to well shown on the Potentiometric Map in **Appendix H**. The gradient is most evident in the east-west cross-sections: A-A′, B-B′ & C-C′. The gradients shown are based on ground water table measurements from September 9, 2011.

Hydraulic gradients and ground water velocities are most pronounced in the vicinity of OWB-11, a local recharge area. Within this area hydraulic gradients range from 0.00563 ft/ft (from west to east) to 0.00218 ft/ft (from south to north). Consequently, the calculated ground water flow velocities at the site are low, ranging from 0.00235 ft/day (west to east) to 0.00091 ft /day (south to north). Velocities were calculated using the hydraulic gradients from well to well and average results of with an average coefficient of permeability of 1×10^{-4} cm/sec determined from the field permeability testing (rising head slug tests). The gradients and velocities decrease in the western portion of the site with increasing distance from the recharge area. Gradients in this area of the site average approximately 0.0005 ft/ft with corresponding ground water flow velocities of .00052 ft/day.

Based on the results of the calculated hydraulic gradients and ground water flow velocities, ground water movement below the site appears to be minimal (approximately 1 foot per year or less) in horizontal directions. Additionally, there does not appear to be a significant vertical gradient present within the surficial aquifer. Water levels within the deepest well OWB-7 at 35 feet are similar to those in the most shallow 15-foot wells.

***Regulation* - 15A NCAC 13B .0538(a)(9)**

(9) Ground-water contour map(s) to show the occurrence and direction of ground-water flow in the uppermost aquifer and any other aquifers identified in the hydrogeologic investigation. The ground-water contours must be superimposed on a topographic map. The location of all borings and rock cores and the water table elevations or potentiometric data at each location used to generate the ground-water contours must be shown on the ground-water contour map(s).

Discussion

A groundwater contour map / potentiometric map of the uppermost aquifer is presented in **Appendix H**. Groundwater contours are based on water level measurements recorded on September 9, 2011, and are intended to be representative of the seasonal high water table. The contour interval chosen is 0.5-ft due to the low hydraulic gradients across the site. The groundwater contours indicate a subtle radial pattern of groundwater flow centered in the vicinity of the well OWB-11 located in the eastern portion of the site. In the western portion of the site, the general groundwater flow direction is southwestward toward the unnamed tributary to the White Oak River located approximately 2,550 feet west.

***Regulation* - 15A NCAC 13B .0538(a)(10)**

(10) A topographic map of the site locating soil borings with accurate horizontal and vertical control, which are tied to a permanent onsite benchmark.

Discussion

The surveyed locations of all borings are presented in the Surveyed Well Location Plan in **Appendix C**. Surveying was performed by Parker & Associates, Inc. of Jacksonville, North Carolina. The well data along with surveyed information is presented on the following page as Table – 2. The topographic information shown on the plan was taken from the North Carolina Floodplain Mapping Program as updated through 2010 based on Lidar data.

MAYSVILLE C&D LANDFILL
SITE SUITABILITY - OBSERVATION WELL DATA
OCTOBER 6, 2011

Well locations survey data supplied by Parker & Associates

Well OWB-#	Date Drilled	Ground Surface Elevation (MSL)	Top of PVC Elevation (MSL)	Well PVC Stick-Up (ft)	Well Depth (ft)	Screened Interval (ft)	NC State Plane Northing	NC State Plane Easting
OWB-1	8/25/11	39.28	42.03	2.75	20.0	20.0 - 7.0	435174.413	2525011.768
OWB-2	8/25/11	38.02	40.89	2.87	20.0	20.0 - 7.0	434771.627	2524752.429
OWB-3	8/25/11	37.61	40.32	2.71	20.0	20.0 - 8.0	434364.284	2524821.444
OWB-4	8/25/11	39.09	41.68	2.59	20.0	20.0 - 8.0	434374.970	2525231.562
OWB-5	8/24/11	39.06	42.29	3.23	15.0	19.0 -7.0	434726.149	2525228.015
OWB-6	8/24/11	39.25	42.18	2.93	15.0	20.0 - 8.0	435037.893	2525353.817
OWB-7	8/24/11	40.13	42.77	2.64	15.0	34.0 - 21.0	434607.889	2525756.359
OWB-8	8/23/11	39.83	42.83	3.00	20.0	20.0 - 8.0	434252.327	2525656.891
OWB-9	8/23/11	38.72	41.29	2.57	15.0	3.0 - 15.0	434267.169	2526142.940
OWB-10	8/22/11	39.67	42.40	2.73	20.0	20.0 - 8.0	434276.543	2526606.821
OWB-11	8/23/11	40.75	43.41	2.66	15.0	15 -3.5	434726.217	2526240.239
OWB-12	8/23/11	40.53	43.22	2.69	20.0	20.0 - 8.0	434863.881	2526483.055
OWB-13	8/24/11	41.26	44.19	2.93	20.0	20.0 - 8.0	435049.941	2525899.610
OWB-14	8/23/11	39.63	42.49	2.86	20.0	20.0 - 8.0	435225.240	2526340.903
OWB-15	8/24/11	40.17	43.21	3.04	20.0	20.0 - 8.0	435602.616	2525879.257

Table - 2

<u>Regulation</u> - 15A NCAC 13B .0538(a)(11)

(11) Information for wells and water intakes within the site characterization study area, in accordance with Rule .0536(c) of this Section including:
(A) boring logs, construction records, field logs and notes, for all onsite borings, piezometers and wells;
(B) construction records, number and location served by wells, and production rates, for public water wells; and
(C) available information for all surface water intakes, including use and production rate.

<u>Discussion</u>

Based on ERM's site reconnaissance, data research and correspondence with local government authorities, there are no known drinking water supply wells within the study area (within 2,000 feet of proposed facility boundaries). ERM confirmed the absence of wells with the Jones County Public Works Department. All residences that are located within the study area along US Highway 17 or White Oak River Road receive public water supply from the Town of Maysville or Jones County. The well that provides the public water supply through utility service is located in the Town of Maysville approximately 1.5 miles south of the proposed landfill site. The location of the well is shown on the next page in Figure – 6 provided by Division of Water Resources.

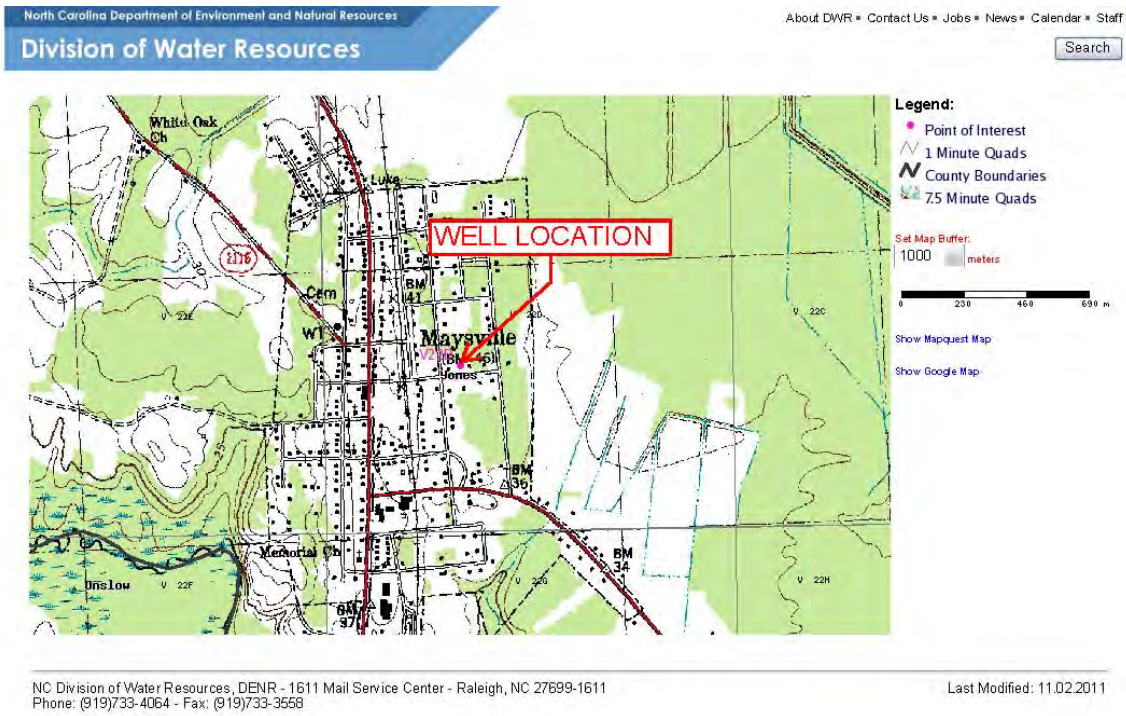

Figure – 6

<u>Regulation</u> - 15A NCAC 13B .0538(a)(12)

(12) Identification of other geologic and hydrologic considerations including but not limited to: slopes, streams, springs, gullies, trenches, solution features, karst terrains, sinkholes, dikes, sills, faults, mines, ground-water discharge features, and ground-water recharge/discharge areas.

<u>Discussion</u>

Based on the results of our subsurface investigation and field observations, the seasonal high water table will be near surface requiring the base grades of the landfill to be elevated above natural ground surface. Additionally, the flow of ground water beneath and surrounding the site appears to be minimal and limited in horizontal direction and velocity. Based on site reconnaissance, the immediate area surrounding the proposed site does not include natural or manmade ground water discharge features. Manmade roadside ditches within the site and surrounding properties may serve as episodic recharge features and intersect the surficial aquifer on a seasonal basis during very wet winter months or following major tropical rain events. The potential affect on the overall groundwater flow pattern is not expected to be significant but will be assessed.

With the availability of public water supply utility in the surrounding area, the potential for a new substantial ground water consumer or intake is minimal.

***Regulation* - 15A NCAC 13B .0538(a)(13)**

(13) A report summarizing the geological and hydrogeological evaluation of the site that includes the following:
(A) a description of the relationship between the uppermost aquifer of the site to local and regional geologic and hydrogeologic features,
(B) a discussion of the ground-water flow regime of the site focusing on the relationship of C&DLF unit(s) to ground-water receptors and to ground-water discharge features,
(C) a discussion of the overall suitability of the proposed site for solid waste management activities and which areas of the site are most suitable for C&DLF units, and
(D) a discussion of the ground-water flow regime of the uppermost aquifer at the site and the ability to effectively monitor the C&DLF units in order to ensure early detection of any release of constituents to the uppermost aquifer.

Discussion

The site hydrogeology is characterized by a shallow surficial aquifer within the upper 10 feet of unconsolidated silts, clays and sands of the Inner Coastal Plain deposits. The water table is generally encountered at depths of 2 to 7 feet below land surface at the site. The groundwater flow conditions within the surficial aquifer at the site are characterized by very low hydraulic gradients and groundwater velocities. The groundwater contours indicate a subtle radial pattern of groundwater flow centered in the vicinity of the well OWB-11 located in the eastern portion of the site. The surficial soils in area around well OWB-11 are more sandy than the rest of the site and serve as a local preferential groundwater recharge area. In the western portion of the site, the general groundwater flow direction is southwestward toward the unnamed tributary to the White Oak River located approximately 2,550 feet west. The horizontal hydraulic gradient is essentially flat and the calculated groundwater velocities are on the order of 1 foot per year or less. The wetlands within the site study area do not appear to be connected to the surficial aquifer. Several wells are placed within the immediate vicinity of wetland boundaries; OWB-1, 4, 6, 7, 9 & 14, and reflect water table elevations very similar to those removed from the vicinity of wetland boundaries. The wetland areas contain hydric soils (clays / silts) in localized topographically depressed areas that collect and pool rainfall; not supported by ground water table.

The low gradients and groundwater velocities at the site combine to limit both groundwater movement from the site and discharge to the nearest natural drainage features. The low groundwater flow conditions and relatively consistent surficial aquifer characteristics will allow for effective monitoring and detection of potential releases from the C&DLF units.

There are no known drinking water supply wells, groundwater receptors or groundwater discharge features within 2,000 feet of proposed facility

boundaries. All residences that are located within the study area along US Highway 17 or White Oak River Road are served by public water supply. Based on the lack of groundwater receptors and considering the limited groundwater flow regime at the site, the potential for offsite migration and impacts is considered to be low.

The area within the limits of this hydrogeologic study was pre-determined as the best suited for landfill development based on regulatory requirements beyond hydrogeologic consideration. The abundance of wetland areas within the property boundaries limited the consideration for development footprint. Green Recycling Solutions LLC directed ERM to develop a proposed landfill area with no wetland impacts. Therefore, the study area included in this hydrogeologic study is the best suited for landfill development within this parcel of land.

Based on the results of the subsurface investigation and field observations at the site, the overall suitability of the proposed site for solid waste management activities is good. The seasonal high water table will be near land surface requiring the base grades of the landfill to be elevated above natural ground surface. Other engineering features may require incorporation into the final design based on subsequent investigations throughout the permitting process.

Appendix A

Local and Regional Geology and Hydrogeology

United States Department of Agriculture

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Jones County, North Carolina, and Onslow County, North Carolina

Maysville

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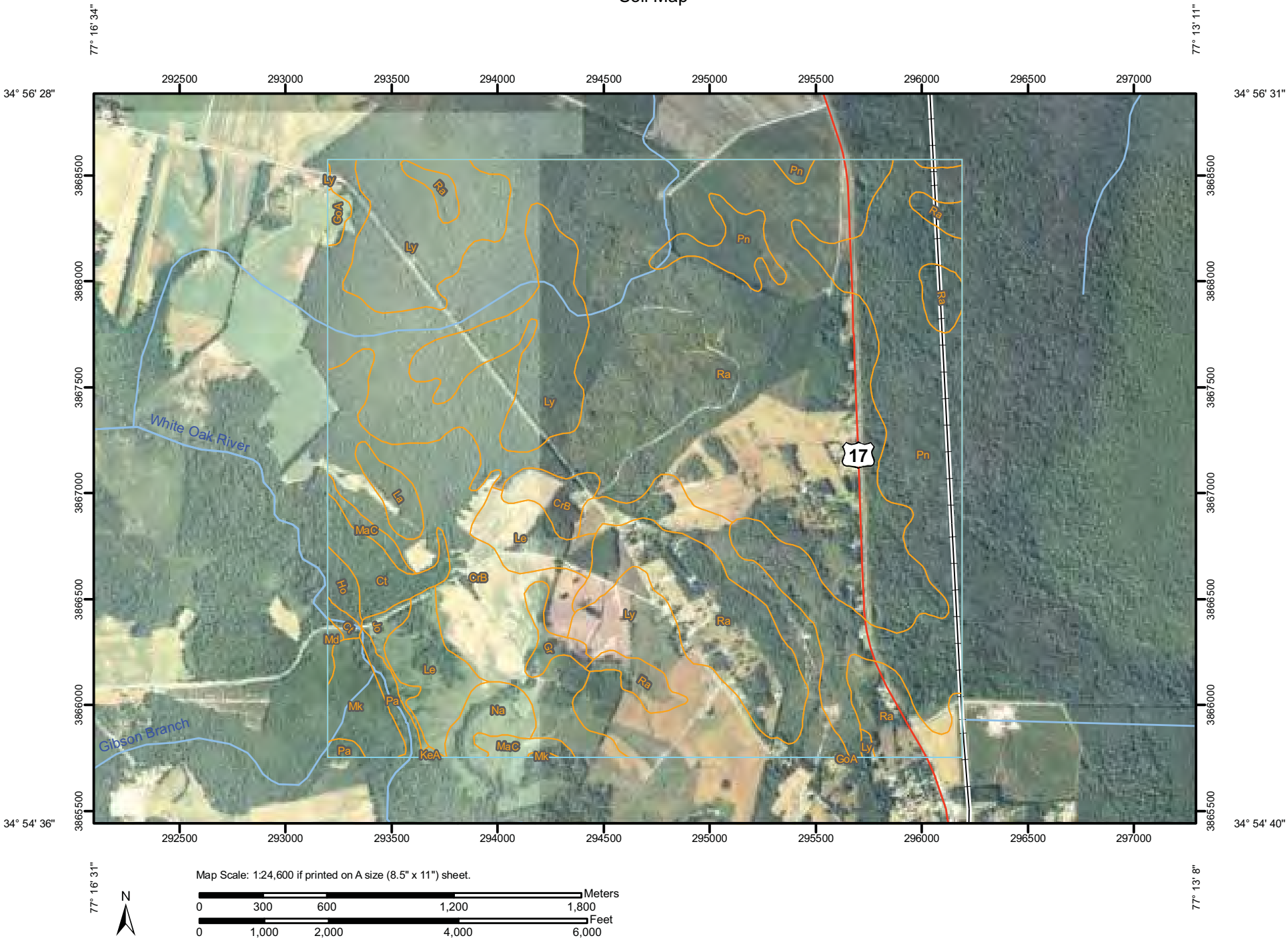
July 29, 2011

Custom Soil Resource Report
Soil Map



Map Scale: 1:24,600 if printed on A size (8.5" x 11") sheet.

N

Meters
0 300 600 1,200 1,800

Feet
0 1,000 2,000 4,000 6,000

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Units

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other

Special Line Features

- Gully
- Short Steep Slope
- Other

Political Features

- Cities

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:24,600 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 18N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Jones County, North Carolina
Survey Area Data: Version 15, Oct 17, 2008

Soil Survey Area: Onslow County, North Carolina
Survey Area Data: Version 11, Jun 5, 2009

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Date(s) aerial images were photographed: 7/10/2006; 10/14/2006

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Jones County, North Carolina (NC103)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
CrB	Craven very fine sandy loam, 1 to 4 percent slopes	198.8	9.5%
Ct	Croatan muck	30.5	1.5%
GoA	Goldsboro loamy sand, 0 to 2 percent slopes	5.1	0.2%
Gr	Grantham loam	12.9	0.6%
Ho	Hobonny muck	8.5	0.4%
Jo	Johns fine sandy loam	10.3	0.5%
KeA	Kenansville loamy fine sand, 0 to 3 percent slopes	0.8	0.0%
La	Leaf silt loam	16.5	0.8%
Le	Lenoir loam	75.4	3.6%
Ly	Lynchburg fine sandy loam	362.8	17.4%
MaC	Marvyn loamy sand, 6 to 15 percent slopes	17.0	0.8%
Mk	Muckalee loam	0.6	0.0%
Na	Nahunta loam	23.8	1.1%
Pn	Pantego loam	303.9	14.6%
Ra	Rains fine sandy loam	964.0	46.3%
Subtotals for Soil Survey Area		**2,031.0**	**97.5%**
Totals for Area of Interest		**2,083.7**	**100.0%**

Onslow County, North Carolina (NC133)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
Ct	Croatan muck	3.8	0.2%
Md	Masontown mucky fine sandy loam	2.5	0.1%
Mk	Muckalee loam	32.5	1.6%
Pa	Pactolus fine sand	13.8	0.7%
Subtotals for Soil Survey Area		**52.6**	**2.5%**
Totals for Area of Interest		**2,083.7**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named

according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or

anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Jones County, North Carolina

CrB—Craven very fine sandy loam, 1 to 4 percent slopes

Map Unit Setting

Elevation: 20 to 160 feet
Mean annual precipitation: 40 to 55 inches
Mean annual air temperature: 59 to 70 degrees F
Frost-free period: 200 to 280 days

Map Unit Composition

Craven and similar soils: 85 percent
Minor components: 6 percent

Description of Craven

Setting

Landform: Flats on marine terraces, ridges on marine terraces
Landform position (two-dimensional): Shoulder, summit
Landform position (three-dimensional): Crest
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Clayey marine deposits

Properties and qualities

Slope: 1 to 4 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 24 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 8.2 inches)

Interpretive groups

Land capability (nonirrigated): 3e

Typical profile

0 to 7 inches: Fine sandy loam
7 to 9 inches: Fine sandy loam
9 to 54 inches: Clay
54 to 80 inches: Sandy loam

Minor Components

Bibb, undrained

Percent of map unit: 3 percent
Landform: Flood plains
Landform position (two-dimensional): Toeslope
Down-slope shape: Concave
Across-slope shape: Linear

Johnston, undrained

Percent of map unit: 2 percent
Landform: Flood plains

Down-slope shape: Concave
Across-slope shape: Linear

Muckalee, undrained
Percent of map unit: 1 percent
Landform: Flood plains
Down-slope shape: Concave
Across-slope shape: Linear

Ct—Croatan muck

Map Unit Setting
Elevation: 20 to 160 feet
Mean annual precipitation: 40 to 55 inches
Mean annual air temperature: 59 to 70 degrees F
Frost-free period: 200 to 280 days

Map Unit Composition
Croatan, undrained, and similar soils: 80 percent
Croatan, drained, and similar soils: 10 percent

Description of Croatan, Undrained

Setting
Landform: Pocosins
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Woody organic material

Properties and qualities
Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to high (0.00 to 1.98 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very high (about 16.1 inches)

Interpretive groups
Land capability (nonirrigated): 7w

Typical profile
0 to 28 inches: Muck
28 to 33 inches: Mucky sandy loam
33 to 60 inches: Sandy clay loam
60 to 80 inches: Loamy sand

Description of Croatan, Drained

Setting

Landform: Pocosins
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Woody organic material

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to high (0.00 to 1.98 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very high (about 16.1 inches)

Interpretive groups

Land capability (nonirrigated): 4w

Typical profile

0 to 28 inches: Muck
28 to 33 inches: Mucky sandy loam
33 to 60 inches: Sandy clay loam
60 to 80 inches: Loamy sand

GoA—Goldsboro loamy sand, 0 to 2 percent slopes

Map Unit Setting

Elevation: 20 to 330 feet
Mean annual precipitation: 38 to 55 inches
Mean annual air temperature: 59 to 70 degrees F
Frost-free period: 200 to 280 days

Map Unit Composition

Goldsboro and similar soils: 90 percent
Minor components: 6 percent

Description of Goldsboro

Setting

Landform: Flats on marine terraces, broad interstream divides on marine terraces
Landform position (two-dimensional): Summit
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy marine deposits

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 24 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 7.7 inches)

Interpretive groups

Land capability (nonirrigated): 2w

Typical profile

0 to 10 inches: Loamy fine sand
10 to 13 inches: Fine sandy loam
13 to 72 inches: Sandy clay loam
72 to 80 inches: Clay loam

Minor Components

Rains, undrained

Percent of map unit: 5 percent
Landform: Flats on marine terraces, carolina bays on marine terraces, broad interstream divides on marine terraces
Landform position (two-dimensional): Summit
Down-slope shape: Linear
Across-slope shape: Linear

Muckalee, undrained

Percent of map unit: 1 percent
Landform: Flood plains
Down-slope shape: Concave
Across-slope shape: Linear

Gr—Grantham loam

Map Unit Setting

Elevation: 20 to 160 feet
Mean annual precipitation: 40 to 55 inches
Mean annual air temperature: 59 to 70 degrees F
Frost-free period: 200 to 280 days

Map Unit Composition

Grantham, drained, and similar soils: 80 percent
Grantham, undrained, and similar soils: 10 percent

Description of Grantham, Drained

Setting

Landform: Broad interstream divides on depressions, broad interstream divides on flats

Down-slope shape: Concave
Across-slope shape: Concave, linear
Parent material: Loamy and silty marine deposits

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: High (about 10.6 inches)

Interpretive groups

Land capability (nonirrigated): 3w

Typical profile

0 to 14 inches: Loam
14 to 17 inches: Loam
17 to 72 inches: Loam
72 to 80 inches: Loam

Description of Grantham, Undrained

Setting

Landform: Broad interstream divides on depressions, broad interstream divides on flats
Down-slope shape: Concave
Across-slope shape: Concave, linear
Parent material: Loamy and silty marine deposits

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: High (about 10.6 inches)

Interpretive groups

Land capability (nonirrigated): 6w

Typical profile

0 to 14 inches: Loam
14 to 17 inches: Loam
17 to 72 inches: Loam
72 to 80 inches: Loam

Ho—Hobonny muck

Map Unit Setting

Elevation: 20 to 160 feet
Mean annual precipitation: 40 to 55 inches
Mean annual air temperature: 59 to 70 degrees F
Frost-free period: 200 to 280 days

Map Unit Composition

Hobonny, tidal, and similar soils: 80 percent

Description of Hobonny, Tidal

Setting

Landform: Tidal marshes
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Herbaceous organic material

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: Very frequent
Frequency of ponding: Frequent
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water capacity: Very high (about 13.8 inches)

Interpretive groups

Land capability (nonirrigated): 8w

Typical profile

0 to 16 inches: Muck
16 to 30 inches: Muck
30 to 80 inches: Muck

Jo—Johns fine sandy loam

Map Unit Setting

Elevation: 20 to 160 feet
Mean annual precipitation: 40 to 55 inches
Mean annual air temperature: 59 to 70 degrees F
Frost-free period: 200 to 280 days

Map Unit Composition

Johns and similar soils: 85 percent
Minor components: 6 percent

Description of Johns

Setting

Landform: Stream terraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy alluvium over sandy alluvium

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: 20 to 40 inches to strongly contrasting textural stratification
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 18 to 36 inches
Frequency of flooding: Rare
Frequency of ponding: None
Available water capacity: Low (about 5.1 inches)

Interpretive groups

Land capability (nonirrigated): 2w

Typical profile

0 to 7 inches: Fine sandy loam
7 to 11 inches: Fine sandy loam
11 to 37 inches: Sandy clay loam
37 to 80 inches: Sand

Minor Components

Lumbee, undrained

Percent of map unit: 5 percent
Landform: Backswamps on stream terraces
Down-slope shape: Concave
Across-slope shape: Linear

Muckalee, undrained

Percent of map unit: 1 percent
Landform: Flood plains
Down-slope shape: Concave
Across-slope shape: Linear

KeA—Kenansville loamy fine sand, 0 to 3 percent slopes

Map Unit Setting

Elevation: 20 to 160 feet
Mean annual precipitation: 40 to 55 inches
Mean annual air temperature: 59 to 70 degrees F
Frost-free period: 200 to 280 days

Map Unit Composition

Kenansville and similar soils: 90 percent

Description of Kenansville

Setting

Landform: Stream terraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy alluvium over sandy alluvium

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 4.2 inches)

Interpretive groups

Land capability (nonirrigated): 2s

Typical profile

0 to 8 inches: Loamy sand
8 to 24 inches: Loamy sand
24 to 36 inches: Sandy loam
36 to 42 inches: Loamy sand
42 to 84 inches: Sand

La—Leaf silt loam

Map Unit Setting

Elevation: 20 to 160 feet
Mean annual precipitation: 40 to 55 inches

Mean annual air temperature: 59 to 70 degrees F
Frost-free period: 200 to 280 days

Map Unit Composition
Leaf, drained, and similar soils: 80 percent
Leaf, undrained, and similar soils: 10 percent

Description of Leaf, Drained

Setting
Landform: Flats on broad interstream divides, terraces
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Clayey marine deposits

Properties and qualities
Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very high (about 12.0 inches)

Interpretive groups
Land capability (nonirrigated): 4w

Typical profile
0 to 6 inches: Silt loam
6 to 67 inches: Clay
67 to 80 inches: Clay loam

Description of Leaf, Undrained

Setting
Landform: Flats on broad interstream divides, terraces
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Clayey marine deposits

Properties and qualities
Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very high (about 12.0 inches)

Interpretive groups
Land capability (nonirrigated): 6w

Typical profile
0 to 6 inches: Silt loam

6 to 67 inches: Clay
67 to 80 inches: Clay loam

Le—Lenoir loam

Map Unit Setting

Elevation: 20 to 160 feet
Mean annual precipitation: 40 to 55 inches
Mean annual air temperature: 59 to 70 degrees F
Frost-free period: 200 to 280 days

Map Unit Composition

Lenoir, drained, and similar soils: 80 percent
Lenoir, undrained, and similar soils: 10 percent
Minor components: 8 percent

Description of Lenoir, Drained

Setting

Landform: Flats on broad interstream divides, terraces
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Clayey marine deposits

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 12 to 30 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 7.6 inches)

Interpretive groups

Land capability (nonirrigated): 2w

Typical profile

0 to 3 inches: Loam
3 to 8 inches: Loam
8 to 63 inches: Clay
63 to 80 inches: Sandy clay

Description of Lenoir, Undrained

Setting

Landform: Flats on broad interstream divides, terraces
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Clayey marine deposits

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 12 to 30 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 7.6 inches)

Interpretive groups

Land capability (nonirrigated): 3w

Typical profile

0 to 3 inches: Loam
3 to 8 inches: Loam
8 to 63 inches: Clay
63 to 80 inches: Sandy clay

Minor Components

Leaf, undrained

Percent of map unit: 5 percent
Landform: Flats on broad interstream divides, terraces
Down-slope shape: Linear
Across-slope shape: Linear

Bethera, undrained

Percent of map unit: 2 percent
Landform: Flats, depressions
Down-slope shape: Concave
Across-slope shape: Concave

Tomotley, undrained

Percent of map unit: 1 percent
Landform: Depressions on marine terraces, flats on marine terraces
Down-slope shape: Linear
Across-slope shape: Linear

Ly—Lynchburg fine sandy loam

Map Unit Setting

Elevation: 20 to 330 feet
Mean annual precipitation: 38 to 55 inches
Mean annual air temperature: 59 to 70 degrees F
Frost-free period: 200 to 280 days

Map Unit Composition

Lynchburg and similar soils: 85 percent

Minor components: 7 percent

Description of Lynchburg

Setting

Landform: Flats on marine terraces, broad interstream divides on marine terraces
Landform position (two-dimensional): Summit
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Loamy marine deposits

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 1.98 in/hr)
Depth to water table: About 6 to 18 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 7.4 inches)

Interpretive groups

Land capability (nonirrigated): 2w

Typical profile

0 to 9 inches: Fine sandy loam
9 to 14 inches: Sandy loam
14 to 65 inches: Sandy clay loam
65 to 80 inches: Clay

Minor Components

Rains, undrained

Percent of map unit: 5 percent
Landform: Flats on marine terraces, carolina bays on marine terraces, broad interstream divides on marine terraces
Landform position (two-dimensional): Summit
Down-slope shape: Linear
Across-slope shape: Linear

Woodington, undrained

Percent of map unit: 2 percent
Landform: Flats on marine terraces, depressions on marine terraces, broad interstream divides on marine terraces
Down-slope shape: Linear
Across-slope shape: Concave

MaC—Marvyn loamy sand, 6 to 15 percent slopes

Map Unit Setting

Elevation: 20 to 160 feet

Mean annual precipitation: 40 to 55 inches
Mean annual air temperature: 59 to 70 degrees F
Frost-free period: 200 to 280 days

Map Unit Composition
Marvyn and similar soils: 80 percent
Minor components: 5 percent

Description of Marvyn

Setting
Landform: Ridges on marine terraces
Landform position (two-dimensional): Shoulder, backslope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy and clayey marine deposits

Properties and qualities
Slope: 6 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 7.7 inches)

Interpretive groups
Land capability (nonirrigated): 4e

Typical profile
0 to 4 inches: Loamy fine sand
4 to 12 inches: Loamy fine sand
12 to 45 inches: Sandy clay loam
45 to 80 inches: Sandy clay loam

Minor Components

Muckalee, undrained
Percent of map unit: 5 percent
Landform: Flood plains
Down-slope shape: Concave
Across-slope shape: Linear

Mk—Muckalee loam

Map Unit Setting
Elevation: 20 to 160 feet
Mean annual precipitation: 40 to 55 inches
Mean annual air temperature: 59 to 70 degrees F

Frost-free period: 200 to 280 days

Map Unit Composition

Muckalee, undrained, and similar soils: 80 percent

Description of Muckalee, Undrained

Setting

Landform: Flood plains
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Sandy and loamy alluvium

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Available water capacity: Moderate (about 6.5 inches)

Interpretive groups

Land capability (nonirrigated): 5w

Typical profile

0 to 24 inches: Loam
24 to 80 inches: Sandy loam

Na—Nahunta loam

Map Unit Setting

Elevation: 20 to 160 feet
Mean annual precipitation: 40 to 55 inches
Mean annual air temperature: 59 to 70 degrees F
Frost-free period: 200 to 280 days

Map Unit Composition

Nahunta, drained, and similar soils: 80 percent
Nahunta, undrained, and similar soils: 10 percent
Minor components: 5 percent

Description of Nahunta, Drained

Setting

Landform: Flats on marine terraces, broad interstream divides on marine terraces
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Loamy and silty marine deposits

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: About 12 to 18 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: High (about 10.8 inches)

Interpretive groups

Land capability (nonirrigated): 2w

Typical profile

0 to 6 inches: Loam
6 to 80 inches: Clay loam

Description of Nahunta, Undrained

Setting

Landform: Flats on marine terraces, broad interstream divides on marine terraces
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Loamy and silty marine deposits

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: About 12 to 18 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: High (about 10.8 inches)

Interpretive groups

Land capability (nonirrigated): 2w

Typical profile

0 to 6 inches: Loam
6 to 80 inches: Clay loam

Minor Components

Grantham, undrained

Percent of map unit: 5 percent
Landform: Broad interstream divides on depressions, broad interstream divides on flats
Down-slope shape: Concave
Across-slope shape: Concave, linear

Pn—Pantego loam

Map Unit Setting

Elevation: 20 to 160 feet
Mean annual precipitation: 40 to 55 inches
Mean annual air temperature: 59 to 70 degrees F
Frost-free period: 200 to 280 days

Map Unit Composition

Pantego, drained, and similar soils: 80 percent
Pantego, undrained, and similar soils: 10 percent

Description of Pantego, Drained

Setting

Landform: Flats on marine terraces, broad interstream divides on marine terraces
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Loamy marine deposits

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: Rare
Frequency of ponding: None
Available water capacity: High (about 10.2 inches)

Interpretive groups

Land capability (nonirrigated): 3w

Typical profile

0 to 18 inches: Loam
18 to 27 inches: Sandy clay loam
27 to 80 inches: Sandy clay loam

Description of Pantego, Undrained

Setting

Landform: Flats on marine terraces, broad interstream divides on marine terraces
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Loamy marine deposits

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches

Drainage class: Very poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: Rare
Frequency of ponding: None
Available water capacity: High (about 10.2 inches)

Interpretive groups
Land capability (nonirrigated): 6w

Typical profile
0 to 18 inches: Loam
18 to 27 inches: Sandy clay loam
27 to 80 inches: Sandy clay loam

Ra—Rains fine sandy loam

Map Unit Setting
Elevation: 20 to 160 feet
Mean annual precipitation: 40 to 55 inches
Mean annual air temperature: 59 to 70 degrees F
Frost-free period: 200 to 280 days

Map Unit Composition
Rains, drained, and similar soils: 80 percent
Rains, undrained, and similar soils: 10 percent

Description of Rains, Drained

Setting
Landform: Flats on marine terraces, carolina bays on marine terraces, broad interstream divides on marine terraces
Landform position (two-dimensional): Summit
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy marine deposits

Properties and qualities
Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 1.98 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: High (about 9.4 inches)

Interpretive groups
Land capability (nonirrigated): 3w

Typical profile

0 to 7 inches: Fine sandy loam
7 to 12 inches: Fine sandy loam
12 to 20 inches: Sandy loam
20 to 62 inches: Sandy clay loam
62 to 85 inches: Sandy clay loam

Description of Rains, Undrained

Setting

Landform: Flats on marine terraces, carolina bays on marine terraces, broad interstream divides on marine terraces
Landform position (two-dimensional): Summit
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy marine deposits

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 1.98 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: High (about 9.4 inches)

Interpretive groups

Land capability (nonirrigated): 4w

Typical profile

0 to 7 inches: Fine sandy loam
7 to 12 inches: Fine sandy loam
12 to 20 inches: Sandy loam
20 to 62 inches: Sandy clay loam
62 to 85 inches: Sandy clay loam

Onslow County, North Carolina

Ct—Croatan muck

Map Unit Setting

Elevation: 20 to 160 feet
Mean annual precipitation: 40 to 55 inches
Mean annual air temperature: 59 to 70 degrees F
Frost-free period: 200 to 280 days

Map Unit Composition

Croatan, undrained, and similar soils: 80 percent
Croatan, drained, and similar soils: 10 percent

Description of Croatan, Undrained

Setting

Landform: Pocosins
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Woody organic material

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to high (0.00 to 1.98 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very high (about 16.1 inches)

Interpretive groups

Land capability (nonirrigated): 7w

Typical profile

0 to 28 inches: Muck
28 to 33 inches: Mucky sandy loam
33 to 60 inches: Sandy clay loam
60 to 80 inches: Loamy sand

Description of Croatan, Drained

Setting

Landform: Pocosins
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Woody organic material

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to high (0.00 to 1.98 in/hr)

Depth to water table: About 0 to 12 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very high (about 16.1 inches)

Interpretive groups
Land capability (nonirrigated): 4w

Typical profile
0 to 28 inches: Muck
28 to 33 inches: Mucky sandy loam
33 to 60 inches: Sandy clay loam
60 to 80 inches: Loamy sand

Md—Masontown mucky fine sandy loam

Map Unit Setting
Elevation: 0 to 20 feet
Mean annual precipitation: 42 to 58 inches
Mean annual air temperature: 61 to 64 degrees F
Frost-free period: 190 to 270 days

Map Unit Composition
Masontown, undrained, and similar soils: 85 percent

Description of Masontown, Undrained

Setting
Landform: Flood plains
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Sandy and loamy alluvium

Properties and qualities
Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: Frequent
Frequency of ponding: Frequent
Available water capacity: Moderate (about 9.0 inches)

Interpretive groups
Land capability (nonirrigated): 7w

Typical profile
0 to 27 inches: Mucky loam
27 to 32 inches: Fine sandy loam
32 to 80 inches: Sand

Mk—Muckalee loam

Map Unit Setting

Elevation: 20 to 160 feet
Mean annual precipitation: 40 to 55 inches
Mean annual air temperature: 59 to 70 degrees F
Frost-free period: 200 to 280 days

Map Unit Composition

Muckalee, undrained, and similar soils: 80 percent

Description of Muckalee, Undrained

Setting

Landform: Flood plains
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Sandy and loamy alluvium

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Available water capacity: Moderate (about 6.5 inches)

Interpretive groups

Land capability (nonirrigated): 5w

Typical profile

0 to 24 inches: Loam
24 to 80 inches: Sandy loam

Pa—Pactolus fine sand

Map Unit Setting

Elevation: 0 to 20 feet
Mean annual precipitation: 42 to 58 inches
Mean annual air temperature: 61 to 64 degrees F
Frost-free period: 190 to 270 days

Map Unit Composition

Pactolus and similar soils: 85 percent

Minor components: 5 percent

Description of Pactolus

Setting

Landform: Ridges on marine terraces
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Eolian sands and/or sandy fluviomarine deposits

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: About 18 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 3.9 inches)

Interpretive groups

Land capability (nonirrigated): 3s

Typical profile

0 to 6 inches: Fine sand
6 to 30 inches: Loamy sand
30 to 80 inches: Loamy sand

Minor Components

Leon

Percent of map unit: 5 percent
Landform: Flats on marine terraces
Down-slope shape: Linear
Across-slope shape: Concave