HYDROGEOLOGIC ASSESSMENT REPORT

PROPOSED BIOENERGY DEVELOPMENT GROUP, LLC DIGESTER
28338 ENVIRO WAY
SEAFORD, DELAWARE
TAX PARCELS 132-11.00-41.00 AND 41.02
SUSSEX COUNTY, DELAWARE

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Prepared for:

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1.0 INTRODUCTION

Duffield Associates, Inc. (Duffield) has prepared this Hydrogeologic Assessment Report to characterize "baseline" subsurface conditions prior to development of a new Bioenergy DevCo facility in Sussex County, Delaware. Part of the permitting process involves obtaining a permit to construct and operate a Resource Recovery Facility in the form of a poultry waste digester unit on tax parcel 132-11.00-41.00. Adjoining tax parcel 132-11.00-41.02 is an operational poultry manure composting facility to be included in the permitting process. The two parcels are referred to herein as the Property or Site.

The Property location is presented on Figure 1, and the boundaries of the two parcels are shown on the aerial images derived from the Sussex County website (Appendix 1).

The Delaware Department of Natural Resources and Environmental Control, Solid and Hazardous Waste Management Section (DNREC-SHWMS) requires a hydrogeologic assessment be completed as part of the permit application process for the planned Resource Recovery Facility. The Hydrogeologic Assessment included the following tasks:

1. Characterization of the Property in terms of location, topography, and surface water drainage.

2. Description of the geology and groundwater characteristics of the Property and surrounding area based on published and publicly available documents.

3. Evaluation of soil borings and monitor well data to characterize site-specific subsurface soil and groundwater characteristics.

4. Groundwater quality sampling to provide background groundwater quality conditions at the Property.

5. Determination of groundwater elevation and flow direction at the Property.

6. Approximate groundwater flow rates and travel times from the facility to points of discharge (including wells and/or surface water).

7. Potential pathways of contaminants to points of groundwater discharge.

8. A limited review of DNREC files for Recognized Environmental Conditions (RECs) related to the Site or nearby properties.

9. Assessment of planned groundwater use, handling of storm water, and wastewater facilities proposed for the Property.

10. A delineation of the anticipated maximum elevation of the seasonal high-water table.

11. Inferred changes to geohydrology due to potential groundwater withdrawal or infiltration of storm water or wastewater.

2.0 PROJECT SITE AND ADJACENT LANDS

The Property is located approximately 1 to 1.5 miles south of Blades, and approximately 0.75 miles west of Seaford Road (Business Route 13). Mapping on the Sussex County, Delaware website, shows the two parcels comprising the 124± acres, zoned AR-1 for agricultural-residential use. The Property is currently owned by BDG DE, LLC.

The Property is bordered by the following Lands:

- Three single-family homes and poultry farms to the south;
- Undeveloped agricultural fields to the east;
- Undeveloped agricultural fields to the north; and
- Wooded lands owned by BDG to the west, beyond which are farmsteads and residential properties along Gum Branch Road.

The adjacent properties and property owners are shown on the Preliminary Site Plan in Appendix 2.

3.0 TOPOGRAPHY AND SURFACE WATER DRAINAGE

Topographic mapping by ARC GIS shows the Property as gently sloping from an elevation of approximately 35 feet above mean sea level (MSL) on the east side of the Property to about 23 feet above MSL at Gums Branch bordering the south end of the Property. Topographic features on the Property include:

1. A tax ditch (Gums Branch Prong) draining from east to west through the center of the Property.

2. Stormwater handling facilities located west-southwest of the operational buildings and the composting operation.

3. A raised rail bed for a spur that enters the northeast corner of the Property and extends along the west side of the stormwater structures.

4. An elongated depression east of and parallel to the main building structure.

Topography of the Property is presented on Figure 2.

4.0 GEOLOGY AND GROUNDWATER CHARACTERISTICS

The Property is located within the Coastal Plain Physiographic Province, which is characterized by flat to gently sloping land surfaces underlain by sedimentary deposits. Mapping by the Delaware Geological Survey (2014) indicates that the Property is underlain in succession by sediments of the Beaverdam and Cat Hill Formations.

The Beaverdam Formation is described by the DGS as a heterogeneous unit ranging from very coarse sand with pebbles to silty clay. The predominant lithology encountered near surface is white and gray reddish-brown silty to clayey, fine to coarse sand. The sands of the Beaverdam commonly have white silt matrix that creates a milky appearance in drill cuttings. Rare beds of red silty sand are sometimes encountered at the contact of the Beaverdam and Cat Hill Formations. The Beaverdam Formation ranges in thickness from approximately 50 feet to 100 feet.

The Cat Hill Formation is described by the DGS as yellowish-brown to light gray medium to fine sand with thin beds of laminae of medium to coarse sand and with some pebbles. The Cat Hill Formation ranges from 100 to 120 feet in the vicinity of Georgetown.

The United States Geological Survey, Hydrologic Investigations Atlas (1964) maps a groundwater elevation contour of 30 feet above MSL east of the Property and a groundwater elevation contour of 20 feet above MSL west of the Property, suggesting a westerly groundwater flow direction. While groundwater elevations vary seasonably, the groundwater elevation contours suggest depth to groundwater is less than 10 feet below ground surface. Site-specific depth to water measurements and groundwater flow characteristics are discussed in later sections of this report.

5.0 ENVIRONMENTAL ISSUES

Duffield reviewed the DNREC Environmental Navigator (DEN) website in order to determine if the Property or nearby properties are listed on DNREC's database because of environmental issues. The review was completed on June 10, 2020. The Property was included in the DEN database system for an Air Permit associated with the Property. However, no Superfund sites, HSCA sites, leaking tank sites, registered underground storage tank sites, or registered above ground storage tank sites were mapped within 2,500 feet of the Property.

6.0 SOIL BORINGS

Eight soil borings and groundwater monitoring wells were installed at the Property during June 2020 using a hollow-stem rotary drill rig equipped with a split spoon sampler. Soil samples were collected on a continuous basis to depths of 30 feet below ground surface to characterize soil textures and groundwater conditions. The boring locations are presented on Figure 3. Copies of the soil boring logs are included in Appendix 3. Per the DGS description of the Beaverdam Formation as heterogeneous, variability in the soils was observed in the boreholes at the Property.

The soils consisted primarily of fine sands with varying amounts of silt and clay, with silt/clay lenses and intervals containing coarse sand and gravel. The soils generally coarsened with depth.

Soils from the test borings were screened in the field for volatile organic compounds (VOCs) using a photoionization detector (PID). The soils collected from SB-4/MW-4 generated PID readings above background levels, with the highest reading recorded at 72 deflection units in soils collected at the water table interface. However, no petroleum staining or petroleum odors or other chemical-type odors were noted in the soils or groundwater. The soil from the split spoon sampler and groundwater from this well location were placed in steel drums with secured lids.

The augers and split spoon samplers were decontaminated between boring locations using a pressure washer, non-phosphate solution, and distilled water.

7.0 MONITORING WELLS

Eight groundwater monitoring wells (MW-1 through MW-8) were installed from June 17, 2020 to June 24, 2020 at the Property by CGC Geoservices, LLC. The wells were constructed with two-inch diameter PVC casing and 20-slot well screen. The borehole space around each well screen was backfilled using No. 2 filter sand to a level approximately 2 feet above the top of the screen. The borehole space above the filter sand was sealed using granular bentonite. The monitoring wells were finished within metal flush-mount curb boxes.

The well permits and well completion reports are included in Appendix 4. The well casing and ground surface elevations were surveyed at each location by Transition Engineering Surveying, LLC. The survey plan prepared by Transition Engineering Surveying, LLC is included as Appendix 6. The well details are summarized as follows.

Local Well ID	Permit Number	Screen Interval	Northing	Easting	Top of Casing Elevation	Ground Surface Elevation
MW-1	269871	6 to 21 ft.	220113.32	602637.66	30.69	30.09
MW-2	269872	6 to 21 ft.	219805.71	602240.78	29.80	30.0
MW-3	269873	5 to 20 ft.	219450.12	602446.32	28.97	29.3
MW-4	269874	5 to 20 ft.	219582.48	601791.57	28.14	28.4
MW-5	269875	5 to 20 ft.	218898.12	601845.97	28.56	28.7
MW-6	269876	7 to 22 ft.	218695.43	602453.39	34.89	35.1
MW-7	269877	7 to 22 ft.	218973.64	603053.43	31.74	31.9
MW-8	269878	5 to 20 ft.	218506.42	601572.28	26.42	26.5

Top of casing and ground surface elevation are presented in feet above mean sea level (MSL).

The monitoring wells were developed by CGC Geoservices on June 24 and June 25, 2020 using dedicated tubing and surge cones. The tubing was attached to a gas-powered surface pump, and the purge water was discharged at least 30 feet from the well locations. The purge water from monitoring well MW-4 was contained in a 55-gallon metal drum because of PID readings recorded above background levels during drilling. Field logs documenting the development monitoring are included as Appendix 5.

8.0 GROUNDWATER CHARACTERISTICS, DISCHARGE, AND RECEPTORS

Duffield utilized depth to water measurements and the well casing elevations to determine groundwater elevation data and groundwater flow direction at the Property. The well information and water table elevation data from the sampling event on July 1, 2020 and from the resampling event on November 9, 2020 are presented in feet above mean sea level (MSL) as follows:

Local Well ID	Well Permit Number	Top of Casing Elevation (ft.)	July 2020 Depth to Water (ft.)	November 2020 Depth to Water (ft.)	July 2020 Groundwater Elevation (ft.)	November 2020 Groundwater Elevation (ft.)
MW-1	269871	30.69	5.91	3.04	24.78	27.65
MW-2	269872	29.80	6.95	3.56	22.85	26.24
MW-3	269873	28.97	5.70	2.36	23.27	26.61
MW-4	269874	28.14	6.48	2.93	21.66	25.21
MW-5	269875	28.56	6.42	3.45	22.14	25.11
MW-6	269876	34.89	11.91	9.11	22.98	25.78
MW-7	269877	31.74	7.30	3.77	24.44	27.97
MW-8	269878	26.42	4.90	2.35	21.52	24.07

Figure 4 shows the groundwater elevations, contours of equal groundwater elevation, and direction of groundwater flow at the Property as measured on November 9, 2020. As indicated by the water table elevation contours, the direction of groundwater flow is westerly, and follows the general direction of surface water drainage. Goundwater elevations rose by approximately 2 to 3 feet across the site between the July and November monitoring events.

The gradient of the water table was determined by calculating the drop in the November 2020 water table elevation over distance. Based on the westerly direction of groundwater flow, gradient was calculated between MW-1 and MW-4, and between MW-7 and MW-8 as follows.

- The change in groundwater elevation from MW-1 to MW-4 is 2.44 feet and the distance between the two wells is approximately 1,000 feet, resulting in a gradient of 0.002.
- The change in groundwater elevation from MW-7 to MW-8 is 3.90 feet and the distance between the two wells is approximately 1,500 feet, resulting in a gradient of 0.003.

Flow Velocity and Travel Time

Groundwater velocity was estimated using Eq. 1 below:

$$\text{Velocity} = -K/n \times (\Delta h/\Delta L)$$

Where: K = hydraulic conductivity in feet per day
n = porosity (unit less)
$\Delta h/\Delta L$ = hydraulic gradient in feet per feet (ft./ft.)
Δh = change in groundwater elevation (feet)
ΔL = distance between points of groundwater elevation (feet)

For this site, a porosity of 0.35 was used which is the typical porosity for silty sand as per *Representative Values of Hydraulic Properties* (HydroSOLV, Inc., 2018-2020). The typical hydraulic conductivity for fine silty sand ranges from one to 50 fpd. Using the higher value of 50 fpd, the following calculations were performed using the data for monitoring wells MW-7 and MW-8:

MW-7, h_1 = 27.97 feet
MW-8, h_2 = 24.07 feet
Distance MW-7 to MW-8: 1,500 feet

Velocity for K = 50 ft./day

V = 50/0.35 × [(27.97-24.07) /(1,500)]
V = 0.37 feet/day
V = 135 feet per year

Receptors

Lands owned by Bioenergy extend approximately 1,600 feet from the planned digester area to the nearest adjacent properties to the west. Lands owned by Bioenergy extend approximately 1,400 feet from the existing composting area to the nearest adjacent properties to the west. Six developed properties (residential and farms) are located west of the Site along Gum Branch Road. Assuming that supply wells serving these properties are located near the building structures, we estimate that the digester and composting areas are located approximately 2,500 feet from any down gradient off-site supply wells. Based on the estimated groundwater flow velocity of 135 feet per year, the time for groundwater to travel from the digester area to down gradient adjacent properties is approximately 11.85 years, and the time travel from the composting area is approximately 10.4 years. The time to travel to off-site supply wells (2,500 feet) is 18.5 years.

The DNREC Environmental Navigator mapping system shows State wetlands on-site directly west of the digester and composting areas. The wetlands and the tax ditch (Gums Branch Prong) draining from east to west through the center of the Property may be areas of shallow groundwater discharge.

Seasonal High Water Table

Estimates of seasonal high water table were determined by the change in soil color from brown to gray and the presence of mottling. The depths at which these conditions were first encountered in the boreholes, and the current groundwater levels are summarized below.

Soil Boring Monitor Well	Estimated depth to Seasonal High Water Table (feet)	July 2020 Depth to Water Measured in Monitor Wells (feet)
SB-1/MW-1	4	5.91
SB-2/MW-2	4	6.95
SB-3/MW-3	4.5	5.70
SB-4/MW-4	4	6.48
SB-5/MW-5	5	6.42
SB-6/MW-6	6	11.91
SB-7/MW-7	6	7.30
SB-8/MW-8	3	4.90

Based on the soil characteristics, the seasonal high water table ranges from approximately 6 feet on the east side of the site to 3 feet on the west portion of the Site approaching the wetland areas. However, the seasonal high water table is apparently higher as indicated by the depth to water measurements recorded in the monitoring wells on November 9, 2020.

Water levels across most of the site ranged from approximately 2.35 feet to 3.77 feet, with the exception of MW-6 where the depth to water was measured at 9.11 feet.

9.0 GROUNDWATER QUALITY MONITORING

Baseline groundwater quality monitoring was completed on June 30 and July 1, 2020 using the eight installed monitoring wells at the Property. Because of a laboratory code error, wells MW-5 through MW-8 were resampled on July 7, 2020 exclusively for Campylobacter. The monitoring and sampling procedures were completed as follows.

- The depth to groundwater was measured in each well using an electronic water interface probe.
- The wells were purged of a minimum of three volumes of water prior to sampling using a variable flow submersible pump.
- Field measurements of pH, temperature, dissolved oxygen, conductivity, turbidity, and oxidation-reduction potential were measured using an electronic water quality meter. Copies of the field monitoring sheets are included as Appendix 7.
- Once the field parameters stabilized, groundwater samples were collected from each well and placed in laboratory-prepared bottleware.

The final field measurements recorded prior to collecting groundwater samples from the eight monitoring wells are summarized in the following table.

Well Locations	Field Testing Parameter					
	pH	Conductivity (mS/cm)	Temperature Degrees C	Dissolved Oxygen (mg/L)	Redox Potential (mv)	Turbidity (NTU)
MW-1	4.79	120	16.65	4.81	318	103
MW-2	4.70	275	16.70	2.35	239	273
MW-3	5.07	397	17.23	0.31	289	82.8
MW-4	4.45	186	15.82	3.21	267	173
MW-5	5.36	122	23.6	1.09	263	520
MW-6	4.65	150	19.64	4.88	317	529
MW-7	5.13	184	16.20	1.75	280	102
MW-8	4.93	120	16.42	2.97	334	397

The pH levels in groundwater at all of the well locations were below the EPA's Secondary Drinking Water Standard range of 6.5 to 8.5. However, the pH of water in the unconfined aquifers of the Delaware Coastal Plain are typically acidic. National Secondary Drinking Water Regulations (NSDWRs or secondary standards) are non-enforceable guidelines for constituents in water that may cause cosmetic effects (such as skin or tooth discoloration) or aesthetic effects (such as taste, odor, or color).

Wells MW-2 and MW-3, located near the building facilities, exhibited higher concentrations of conductivity, while groundwater from monitor wells MW-5 and MW-6, located near the composting area, exhibited higher temperatures and turbidity levels.

The groundwater samples collected for laboratory analysis were placed on ice in a transport cooler and submitted to Envirocorp Laboratories, Inc. (Envirocorp Labs), Test America, Inc. (Test America), and ESML Analytical, Inc. for analysis of the following:

- Total Dissolved Solids (TDS)
- Total Suspended Solids (TSS)
- Chemical Oxygen Demand
- Biological Oxygen Demand
- Total Nitrogen
- Ammonia Nitrogen
- Kjeldahl Nitrogen
- Nitrates
- Nitrites
- Cyanide
- Chlorides
- Sodium
- Sulfide
- Total Phosphorus
- Total Phosphorus, Soluble
- Ortho Phosphorus as P, Soluble
- Salmonella
- Fecal Coliform
- Campylobacter
- EPA Target Compound List (TCL) Volatile Organic Compounds
- EPA TCL Semi-Volatile Organic Compounds
- EPA TCL Pesticides and Herbicides
- EPA Target Analyte List Metals (arsenic, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, selenium, sodium, zinc)

The analysis of the following polychlorinated biphenyls (PCBs) Aroclors were not included as part of the initial sampling event: Aroclor-1016, Aroclor-1221, Aroclor-1232, Aroclor-1242, Aroclor-1248, Aroclor-1254, and Aroclor-1260. The wells were resampled on November 9, 2020 for analysis of the referenced PCBs.

Copies of the laboratory reports are included in Appendix 8, and the laboratory analyses are summarized on the tables in Appendix 9. The data included in the summary tables is limited to those testing parameters that were detected above the laboratory reporting limits. “Non-detect” results are included in the full laboratory reports.

The results are compared to the DNREC, Remediation Section (DNREC-RS) Screening Level Table, the DNREC-RS Reporting or Notification Levels, and the EPA Drinking Water Standards.

The Hazardous Substance Cleanup Act (HSCA) Screening Level Table (updated February 2020), is used as a screening tool, and the screening levels are not considered site-specific cleanup levels. However, exceedances of the DNREC Reporting Levels are subject to the notification requirement included in the DNREC "Guidance for Notification Requirements" (updated November 2019). If DNREC Reporting Levels are exceeded, and the owner or operator of a property is planning to undertake land disturbing activities, then DNREC must be notified. Notification does not mean that remediation will be necessarily be required, but the DNREC-RS will review the available information and decide if further action is warranted.

No DNREC Reporting Levels were exceeded for the samples collected at the Property with the exception of nitrates in the sample collected from MW-7. Nitrates were reported at 10.7 milligrams per liter (mg/L) which exceeds the EPA Primary Drinking Water Standard, Maximum Contaminant Level (MCL) permitted for water supplies and the HSCA Notification Level of 10 mg/L. Nitrates often exceed the MCL of 10 mg/L in the unconfined aquifer beneath agricultural areas in the Delaware Coastal Plain.

<u>TCL and TAL Analytes</u>

None of the TCL VOCs, TCL semi-volatile organic compounds, PCB Aroclors, or TCL Pesticides and Herbicides were detected above the laboratory reporting limits in the groundwater samples, with the following exceptions:

- Chloroform was reported at 0.64 micrograms per liter (ug/L) in the sample collected from well MW-4. This concentration exceeds the DNREC Screening Level of 0.22 mg/L, but was well below the DNREC-RS Reporting Level of 80 ug/L. Monitor well MW-4 was resampled for chloroform on November 9, 2020. The laboratory report is included in Appendix 8. As indicated in the laboratory report, chloroform was not detected above the laboratory reporting limit in the second sample collected from MW-4. Chloroform is an organic compound that was historically used as an anesthetic and sedative, but also used in the production of pesticides and refrigerants. It is also used in laboratories and the initial detection may have been the result of laboratory contamination.
- Toluene was reported in the groundwater samples collected from MW-1 (0.58 ug/l), and reported at 11.0 ug/L in the samples collected from wells MW-5 and MW-6. The reported concentrations are well below the DNREC-RS Screening Level of 110 ug/L. Toluene is a constituent in a wide range of petroleum products.

The inorganics aluminum, arsenic, barium, calcium, cadmium, cobalt, copper, iron, lead, manganese, magnesium, nickel, potassium, sodium, thallium, and zinc were detected in one or more of the groundwater samples. The following metals exceeded HSCA Screening Levels or EPA Drinking Water Standards:

- The concentrations of cobalt ranged from 1.7 ug/L to 4.9 ug/L and exceeded the DNREC-RS Screening Level of 0.6 in all eight groundwater samples. The DNREC-RS Guidance for Notification Requirements does not include a reporting level for cobalt in

groundwater for which a property owner is required to notify DNREC prior to earth disturbing activities. Naturally occurring cobalt is often reported above the DNREC Screening Level in soil and groundwater in Delaware.

- The concentration of manganese in the groundwater samples ranged from 43.6 ug/L to 420 ug/L, exceeding the DNREC-RS Screening Level of 43 ug/L and the EPA Secondary MCL of 50 ug/L. The DNREC-RS Guidance for Notification Requirements does not include a reporting level for manganese in groundwater for which a property owner is required to notify DNREC prior to earth disturbing activities. Secondary MCLs are non-enforceable concentrations used to assess aesthetics in water such as color, taste, and odor.
- The concentrations of arsenic and thallium reported in the groundwater sample collected from MW-3 exceeded the DNREC-RS Screening Levels but were well below the DNREC Reporting Levels.

  These metals are naturally occurring and it is not uncommon for the concentrations to exceed the DNREC-SR Screening Levels or EPA Secondary MCLs in groundwater of unconfined aquifers in the Coastal Plain.

Nitrogen Compounds

The concentration of nitrates ranged from 1.29 mg/L in monitoring well MW-5 to 10.7 mg/L in monitor well MW-7. The nitrate concentration exceeded the EPA MCL of 10 mg/L in the samples collected from wells MW-7, and equaled the EPA MCL of 10 mg/L in MW-2. Nitrates in MW-7 exceed the HSCA Notification Level of 10 mg/L.

Monitor well MW-7 is located at an up gradient location on the Property, and down gradient of an adjacent property used for agriculture and poultry farming. Monitor well MW-2 is located directly down gradient of the current operations building on-site.

Kjeldahl nitrogen was detected in the eight groundwater samples, ranging from 0.18 mg/L in MW-4 to 0.54 mg/L in MW-3.

Nitrites and ammonia nitrogen were not detected above the reporting limits in the groundwater samples.

Biological Analysis

Fecal coliform bacteria were reported at eight colonies per 100 milliliters in the sample collected from MW-5, but were not detected above the laboratory reporting limits in the remaining samples. Monitor well MW-5 is located directly west and down gradient of the composting operation. MW-5 was resampled on November 9, 2020 and fecal coliform was not detected in the sample. Fecal coliform historically is used as an indicator of possible sewage intrusion due to human or animal feces. It is possible that a lack of thorough cleanliness during sampling or laboratory analysis may have been the result of the previous detection of fecal coliform bacteria during the July 2020 sampling event.

Salmonella, campylobacter bacteria, and biochemical oxygen demand were not detected above the laboratory reporting limits in the groundwater samples.

Phosphorus

Total phosphorus was reported at 0.05 mg/L in the sample collected from MW-5 and reported at 0.08 mg/L in the sample collected from MW-6. Total phosphorus was not detected above the laboratory reporting limits in the remaining samples. In addition, ortho phosphorus and total phosphorus (soluble) were not detected above the laboratory reporting limits in the eight groundwater samples. We could not locate a laboratory that performs analysis of Polydrolyzable phosphorus.

Chlorides, Sulfides, and Cyanide

Chlorides were reported in the eight groundwater samples, ranging in concentration from 13.6 mg/L in MW-6 to 50.5 mg/L in well MW-3, located on the south end of the facility building complex. Chlorides include salts that may be derived from agricultural run-off, winter road treatment, or wastewater. The EPA maintains a secondary drinking water standard of 250 mg/L for Chlorides.

Sulfides were reported in the groundwater samples collected from all of the monitor wells, with the exception of MW-3 and MW-4. The concentrations ranged from 0.0832 mg/L in MW-2 to 6.37 mg/L in MW-8. Organic sulfides are compounds formed by sulfur bonding to organic compounds, while inorganic sulfides are compounds containing negatively charged sulfide ions. The EPA does not list a Primary or Secondary Drinking Water Standard for sulfides.

Cyanide was not detected above the laboratory reporting limits in the groundwater samples.

Quality Control

Trip blanks were collected on the two days of initial sampling. The trip blanks were handled and stored with the bottleware during sampling and shipping to Test America. The trip blanks were analyzed for the full TCL and TAL analyses. Acetone was reported in the trip blank collected on June 30, 2020 at a concentration of 10 ug/L. Acetone and 2-Butanone were reported in the trip blank collected on July 2, 2020 at concentrations of 8.2 ug/L and 8.1 ug/L, respectively. Acetone and 2-Butanone are laboratory cleaning agents and often detected in laboratory-prepared samples.

One equipment blank sample was collected on July 2, 2020. Acetone was reported in the equipment blank delivered to Test America at a concentration of 8.9 ug/L. Chlorides, sulfides, kjeldahl nitrogen, total phosphorus, and TDS were detected in the equipment blank collected on July 2, 2020 for Envirocorp Labs

A blind duplicate samples was collected from monitor well MW-2. A comparison of analytes detected for the referenced well location is presented below in micrograms per liter.

Analyte	Monitor Well MW-2	Duplicate Sample	% Replicable
Aluminum	275	242	88
Barium	181	172	95
Calcium	22,300	21,000	94
Cobalt	4.6	4.4	96
Iron	76.7	70.5	92
Magnesium	9,410	8,760	93
Manganese	141	144	98
Nickel	3.7	3.6	97
Potassium	2,570	2,520	98
Sodium	7,090	7,030	99
Zinc	19.8	19.8	100
Nitrates	10.0	10.2	98
Kjeldahl N	0.22	0.23	96
Sulfide	0.0832	0.0832	100
Chloride	46.8	47.2	99
TDS	210	210	100
TSS	182	125	67

Matrix spike and matrix spike duplicate samples were prepared and analyzed for monitor wells MW-2 (Envirocorp Labs) and MW-4 (Test America). Discussions of the results are included under the case narratives of the laboratory reports.

10.0 STORMWATER

A Stormwater Management Predevelopment Plan prepared by Duffield and dated April 2020 is included as Appendix 10. The referenced plan shows the existing topography and drainage patterns. An Exploratory Stormwater Management Report for the Property was also prepared by Duffield in April 2020 and is included as Appendix 11. The exploratory report indicated the following.

- The existing property consists of approximately 91.25 acres with four existing ponds on the site. There is some impervious surface on the site including an existing facility and associated gravel and asphalt areas.
- The site generally drains to five analysis points. Three areas drain toward the existing on-site ponds and two points of analysis have been identified for offsite drainage.

    1. Drainage Area #1 consists of about half of the site and drains west towards existing ponds on the property.
    2. Drainage Area #2 is located east of the existing bioenergy facility on site and discharges towards an existing pond on site.
    3. Drainage Area #3 is located in the center portion of the site and discharges north towards a sump along Cedar Beach Road.
    4. Drainage Area #4 is located in the western portion of the site and discharges west towards the edge of property.

5. Drainage Area #5 is located in the in the northern portion of the site and discharges west towards the edge of property.

The final Stormwater Management Report and the final Erosion & Sediment Control Plans, will be submitted with the Record Plan Stage submission, and will demonstrate how the proposed land use action is in accordance with DNREC Sediment and Stormwater Regulations (DSSR), as adopted January 1, 2014, and revised February 11, 2019. The proposed drainage and stormwater management system will be configured to maintain existing site drainage patterns as much as possible. There are currently no foreseen erosion issues that would arise with the proposed development. Erosion and sediment control measures are designed to capture any sediment-laden runoff (prior to it leaving the site), and are in accordance with the DSSR and DNREC Erosion and Sediment Control Handbook. Perimeter controls, stabilized construction entrances, temporary seeding and mulching, and permanent vegetative cover are the key elements of the erosion and sedimentation control practices for this project.

11.0 PLANNED WATER USE AND WASTEWATER

Bioenergy will require approximately 4 million gallons of startup water to initiate the digester process, and anticipates utilizing up to 35,000 gallons of water per day for operations using on-site water sources. Approximately 5,000 to 7,000 gallons of the daily operational water will be water that is recycled from the digester process. According to DNREC Regulations Governing the Allocation of Water (effective March 1987), any water users that withdraw more than 50,000 gallons of water from one or more sources in any 24-hour period require an Allocation Permit. Accordingly, we do not anticipate that an allocation permit will be required.

Existing wells permitted to serve the Bioenergy parcels are summarized below. Documents related to these wells were derived from the Delaware Open Data website and the DNREC Groundwater Protection Branch, and are included as Appendix 12. As indicated by the completion reports and other documents, the existing wells on the Property far exceed the capacity needed for the planned operations.

<u>Well Permit Number 252846</u>

Classification: Public Miscellaneous
Well Screen Interval: 88 to 118 feet
Diameter: 4 inches
Construction: PVC
Estimated Capacity: 45 gallons per minute
Estimated Daily Use: 10,800 gallons per day
Construction Date: June 19, 2016

This well is finished above grade and fitted with a permit tag. It is assumed to be the potable supply for the existing facility.

Well Permit Number 103281

Classification: Irrigation
Well Screen Interval: 20 to 80 feet
Diameter: 8 inches
Construction: PVC
Estimated Capacity: 350 gallons per minute.
Pump test at completion: 400 gpm for 3 hours. Water level dropped 3 feet.
Estimated Daily Use: 508,000 gallons per day
Construction Date: April 25, 1995

Appendix 11 includes a letter from DNREC to Perdue dated January 12, 2000. DNREC searched for well permits connected to the Site, and confirmed that well 103281 is on Parcel 1-32-6-95. DNREC went on to indicate that Perdue would need to obtain and maintain a Water Allocation Permit for the well. This appears to be the well serving the pivot irrigation system on the referenced parcel, and could potentially be re-classified as a production well.

Well at Fire Tank Building

One 8-inch diameter supply well is located near the facility fire suppression holding tank. Bioenergy is not certain of the well installation details, but labels in the adjacent well house indicate that the well is fitted with a 15-horsepower submersible pump, suggesting a potentially high capacity well. A well completion report was obtained for the Property from the DNREC Groundwater Protection Section that appears to correspond to this well. The well completion report indicates the following.

Classification: Industrial
Well Screen Interval: 70 to 130 feet
Diameter: 8 inches
Construction: Steel
Estimated Capacity: Well pumped @ 113 gpm for 8 hours: 54,250 gallons
Water level dropped ~18 feet during pumping.
Construction Date: November 30, 2000

Well with Permit Number 171453

The DNREC provided Duffield with a well completion report under DNREC Permit Number 171453, on Tax Parcel 1-32-6.00-95. The well completion report indicates the following.

Classification: Industrial
Well Screen Interval: 70 to 130 feet
Diameter: 4 inches
Construction: PVC
Estimated Capacity: Well pumped @ 112.5 gpm for 8 hours: 54,000 gallons
Water level dropped ~18 feet during pumping.
Construction Date: May 1, 2001

Well with Permit Number 252847

The DNREC provided Duffield with a well completion report under DNREC Permit Number 252847, on Tax Parcel 1-32-11.00-41. The well completion report indicates the following.

Classification: Public-Miscellaneous
Well Screen Interval: 58 to 118 feet
Diameter: 6 inches
Construction: PVC
Estimated Capacity: Well pumped @ 100 gpm for 4 hours: 24,000 gallons
Water level dropped ~5 feet during pumping.
Construction Date: May 1, 2001

Well Permit Number 35219

Well 35219 was originally permitted under the previous owner Joe Holt, and is likely the well serving the on-site house south of the composting area. The permit and completion report are included in Appendix 11 and indicate that the well was installed the same year the house was built. The referenced well is 2-inches in diameter and screened from 27 to 32 feet. According to the well completion report, the driller pumped the well for 2 hours at 60 gallons per minute and the water level dropped about 10 feet during the pumping.

The wells listed in the referenced DNREC letter with permit numbers 82957 and 83122 were abandoned, and also owned by Joe Holt.

Wastewater

Sanitary wastewater disposal will be required for 12 to 15 full-time employees. The wastewater or liquid fraction from the digestate if not recycled back into the anaerobic digestion process is pre-treated before discharge using a membrane bioreactor and ultrafiltration.

The wastewater treatment program consists of two equally sized systems and when fully built out are each designed to treat approximately 135,000 gallons per day. The wastewater passes through a mix tank and into an anoxic reactor via screening and micro-screening to remove particulate or suspended solids. After the anoxic reactor, the wastewater passes through two aerobic reactor tanks in parallel where antifoam sprayers are used as needed and then is stored in the ultrafiltration feed tank for a short duration. From the UF feed tank, the liquid is pumped into and treated by an ultrafiltration unit followed by treatment with a reverse osmosis unit. The wastewater is then cooled and stored for discharge to Sussex County via a forced main connection from the plant to the Sussex County wastewater system.

The total discharge to Sussex County is estimated to be 72,000 gallons per day when plant is fully built out. The wastewater makeup is being finalized and Bioenergy is currently in discussions with Sussex County for an extension of their sewer line to the facility.

12.0 CONCLUSIONS

Based on a review of published literature, site-specific assessments, and information provided by Bioenergy, Duffield offers the following comments.

1. The Property and surrounding areas have a history of agricultural use, and the groundwater has been impacted with nitrogen compounds. Nitrates and total nitrogen concentrations exceeded the EPA MCL of 10 mg/L at only one of the monitoring well locations, near the eastern, up gradient boundary. The concentration of 10.7 mg/L reported in well MW-7 exceeded the EPA MCL and DNREC Notification Level. It is common for nitrogen levels in groundwater to exceed the EPA MCL within the unconfined aquifers beneath agricultural areas in Delaware.

2. The concentration of chloroform reported for the initial sample collected from MW-4 exceeded the DNREC-RS Screening Level, but was well below the DNREC-RS Reporting Level. The well was resampled and chloroform was not detected above the laboratory reporting limits. The chloroform detected in MW-4 may be residual remnants of pesticide use on or near the Property, but was more likely a laboratory contaminant.

3. The concentrations of cobalt and manganese exceeded the applicable DNREC-RS Screening Levels reported in all eight groundwater samples, and the concentrations of arsenic and thallium in MW-3 exceeded the DNREC Screening Levels. These metals are naturally occurring and there are no DNREC-RS Notification Levels for cobalt and manganese in groundwater, and there are no Primary Drinking Water Standards for cobalt or manganese. There is a Secondary Drinking Water Standard of 50 ug/L for manganese, which was exceeded in all of the wells with the exception of MW-1. The concentrations of thallium and arsenic reported in MW-3 were well below the DNREC Notification Levels.

4. If used as a potable water supply, groundwater from the unconfined aquifer may require treatment for nitrates and other constituents. Groundwater from deeper, confined aquifers sometimes require treatment for naturally occurring conditions such as high iron or sulfides, but would be less susceptible to impacts from human activities.

5. Best available technology is planned to manage stormwater discharges in accordance with Requirements of 7 DEL C. Chapter 60. Regulations Governing the Control of Water Pollution, Section 9.1.02: Special Conditions for Stormwater Discharges Associated with Construction Activities, and Department Policies, Procedures, and Guidance.

6. Bioenergy plans to use up to 35,000 gallons of process water per day to be withdrawn from on-site supply wells, and through recycling. An Allocation Permit will not be required. Bioenergy is currently considering the use of a combination of existing wells on-site, or installing a new production well to serve the facility. A withdraw of 35,000 gallons per day is not anticipated to adversely deplete the unconfined aquifer. The nearest off-site supply wells serve residential properties approximately 1,500 feet south of the existing production/supply wells.

7. Wastewater will be discharged to Sussex County via a forced main connection from the plant to the Sussex County wastewater system. The total discharge to Sussex County is

estimated to be 72,000 gallons per day when plant is fully constructed. The wastewater makeup is being finalized and Bioenergy is currently in discussions with Sussex County for an extension of their sewer line to the facility.

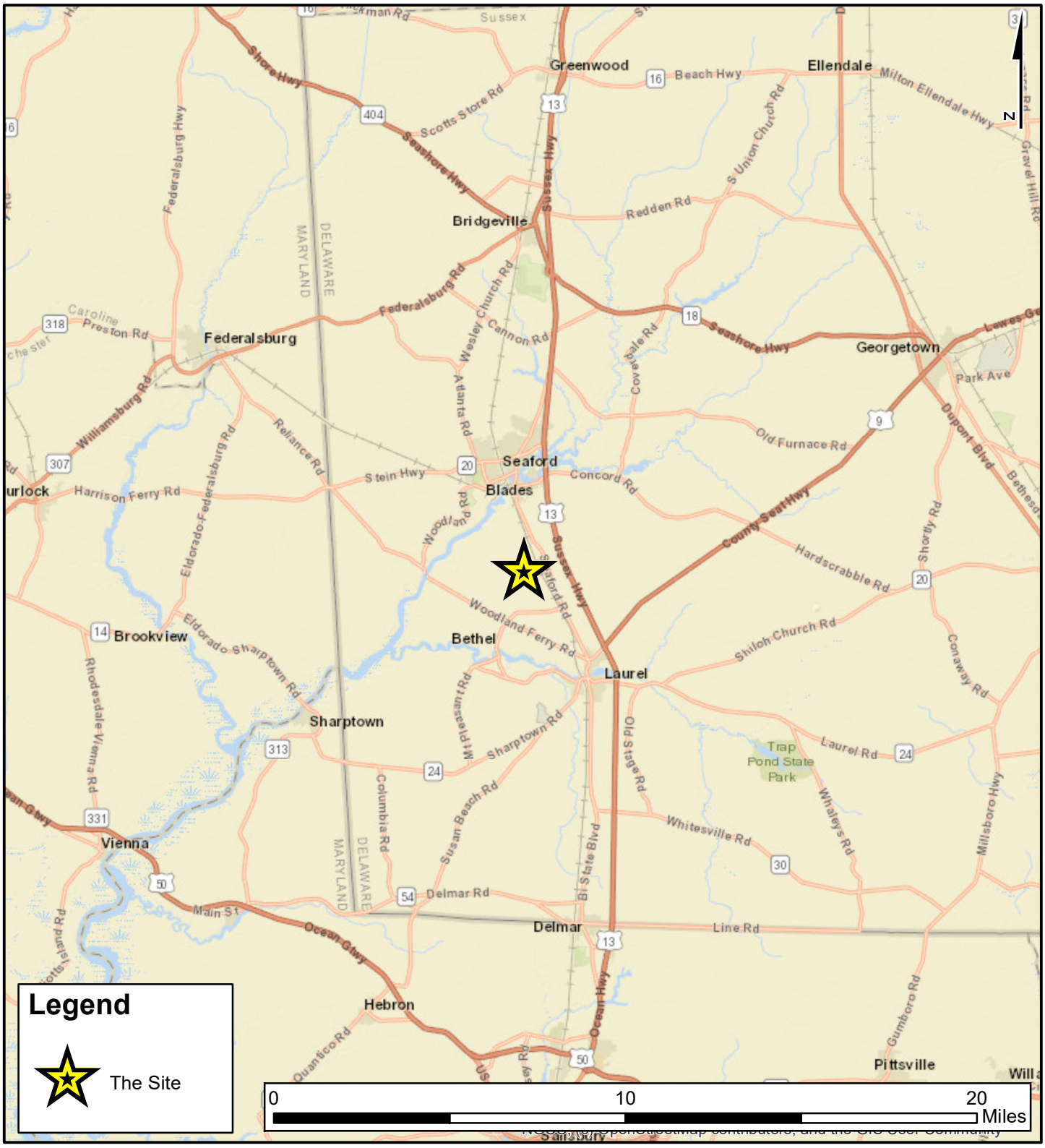
This report is based on our professional judgement of site conditions represented by soil borings, well gauging data, available maps, plans and well search data. While this evaluation was performed to generally characterize the hydrogeology of the project site, subsurface conditions between test boring and well locations are in fact unknown. In addition, this evaluation was based on conditions present during the field reconnaissance. It is important to note that latent conditions and other contingencies bearing upon the results of this study may become evident in the future.

13.0 REFERENCES

1. http://www.arcgis.com/home/webmap/viewer (Topography)
2. Ramsey, Tomlinson, Delaware Geological Survey, Geologic Map of the Sharptown, Laurel, Hebron, and Delmar Quadrangles, Delaware, 2014.
3. Delaware Geologic Information Resource website http://maps.dgs.udel.edu/dgir/draft/
4. Adams and Boggess, U.S. Geological Survey, "Water-Table, Surface Drainage, and Engineering Soils Map of the Laurel Quadrangle, Delaware", Hydrologic Investigations Atlas HA-123, 1964.

SFC:cpt
12393ED.1120-Bioenergy HydroREV1.RPT

FIGURES



DATE: 03/2020	**FIGURE 1** **SITE LOCATION MAP**		DUFFIELD ASSOCIATES Soil, Water & the Environment
SCALE: AS SHOWN	BIOENERGY INNOVATION CENTER 28338 ENVIRO WAY	DRAWN BY: MAN	5400 LIMESTONE ROAD WILMINGTON, DE 19808-1232 TEL. (302)239-6634 FAX (302)239-8485
PROJECT NO. 12393.ED		CHECKED BY: SFC	OFFICES IN PENNSYLVANIA, SOUTHERN DELAWARE, MARYLAND AND NEW JERSEY
	SEAFORD~SUSSEX COUNTY~DELAWARE	FILE: 12393ED.SiteLocation	EMAIL: DUFFIELD@DUFFNET.COM

ArcGIS Delaware Elevation Contours 2014

Details | Basemap | Share Print | Measure Find address or pla

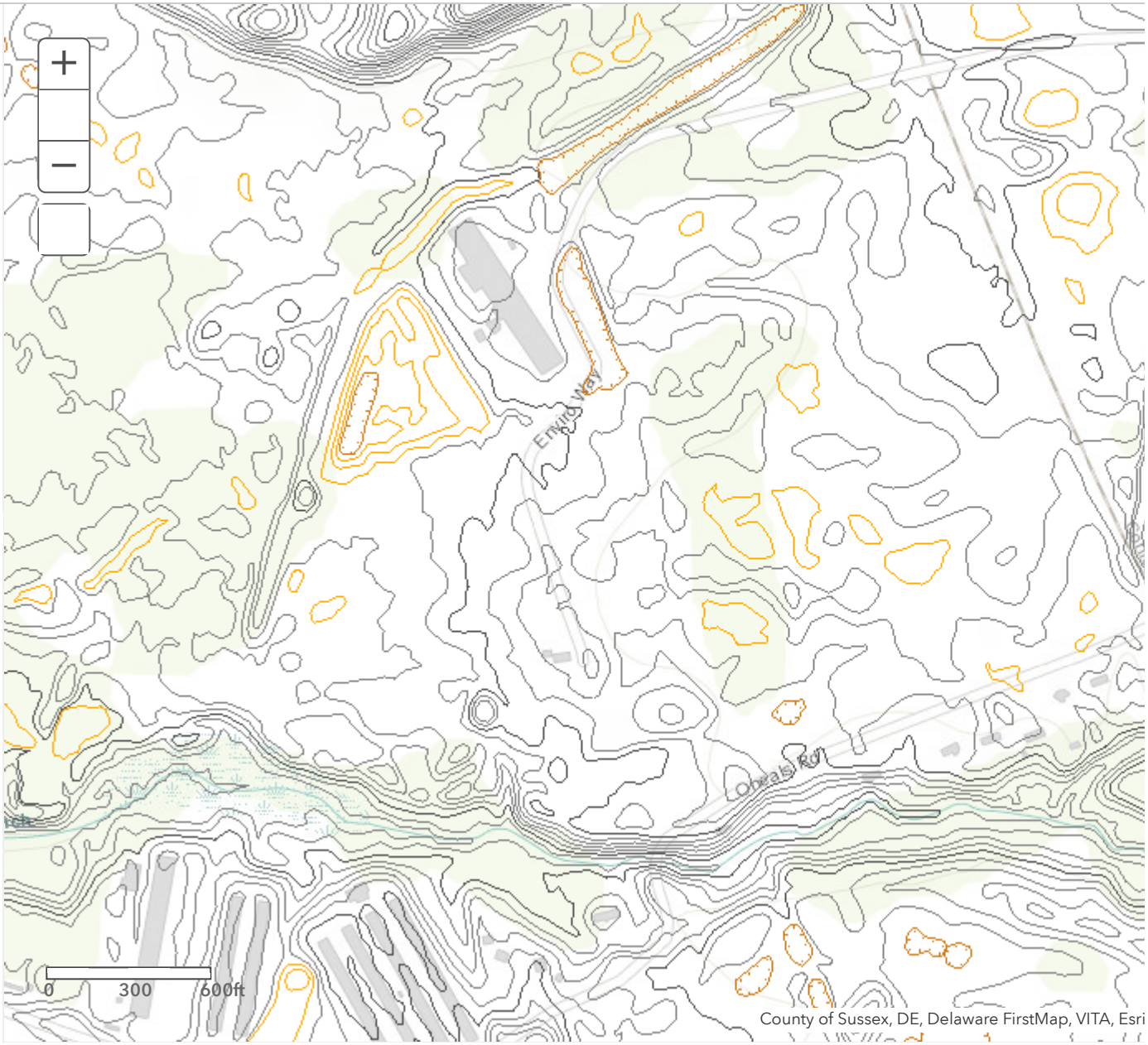
Legend

DE_Contours_2014

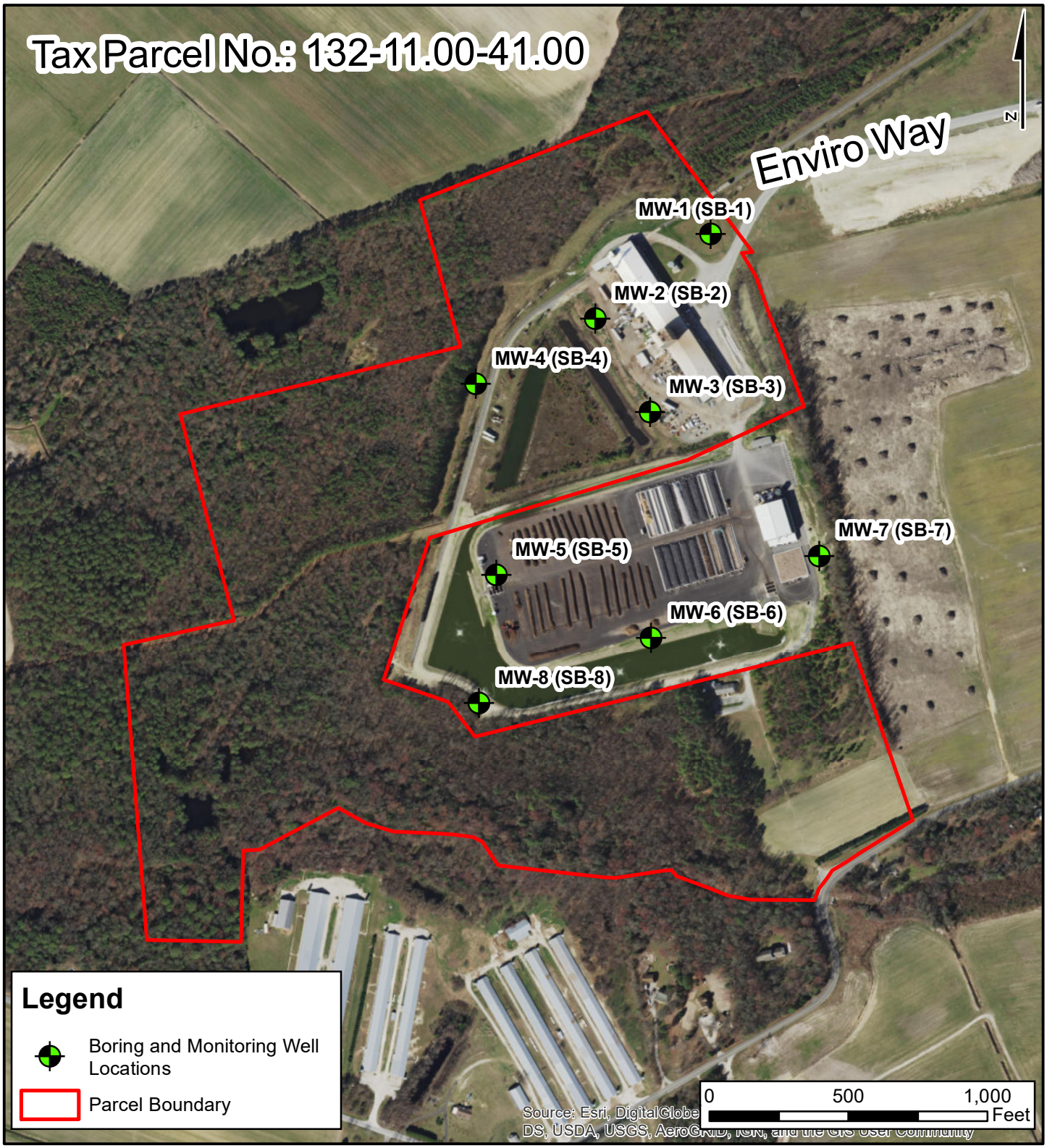
NCC_Upper
- Depression Index
- Depression Intermediate
- Normal Index
- Normal Intermediate

NCC_Lower
- Depression Index
- Depression Intermediate
- Normal Index
- Normal Intermediate

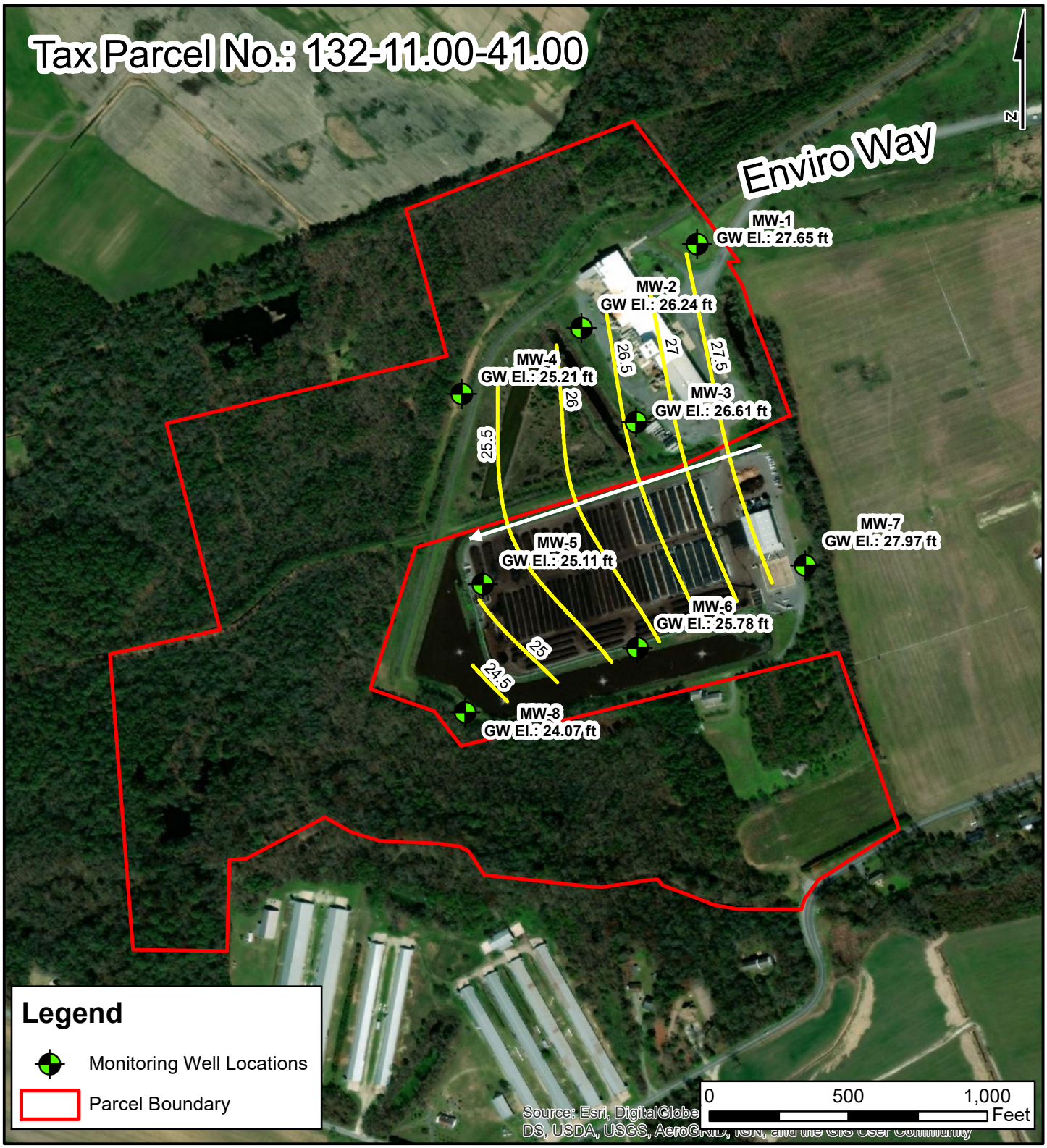
Kent_Co
- Depression Index
- Depression Intermediate
- Normal Index
- Normal Intermediate



Trust Center . Legal . Contact Esri . Report Abuse .



DATE: 06/2020	**FIGURE 3** **SOIL BORING AND MONITOR WELL LOCATION SKETCH** BIOENERGY DEVELOPMENT GROUP SEAFORD~SUSSEX COUNTY~DELAWARE	DESIGNED BY: MAN	DUFFIELD ASSOCIATES Soil, Water & the Environment 5400 LIMESTONE ROAD WILMINGTON, DE 19808-1232 TEL. (302)239-6634 FAX (302)239-8485 OFFICES IN PENNSYLVANIA, SOUTHERN DELAWARE, MARYLAND AND NEW JERSEY EMAIL: DUFFIELD@DUFFNET.COM
SCALE: AS SHOWN		DRAWN BY: JLF	
PROJECT NO. 12393.ED		CHECKED BY: SFC	
FIGURE 3		FILE: 12393.ED.Boring_Well _Locations.mxd	



DATE: 11/09/2020	**FIGURE 4** **GROUNDWATER FLOW SKETCH**	DESIGNED BY: JLF	DUFFIELD ASSOCIATES Soil, Water & the Environment
SCALE: AS SHOWN		DRAWN BY: JLF	5400 LIMESTONE ROAD WILMINGTON, DE 19808-1232 TEL. (302)239-6634 FAX (302)239-8485
PROJECT NO. 12393.ED	BIOENERGY DEVELOPMENT GROUP	CHECKED BY: SFC	OFFICES IN PENNSYLVANIA, SOUTHERN DELAWARE, MARYLAND AND NEW JERSEY
FIGURE 4	SEAFORD~SUSSEX COUNTY~DELAWARE	FILE: 12393.ED.GWFlow Sketch.2020.11.mxd	EMAIL: DUFFIELD@DUFFNET.COM

APPENDIX 1

PROPERTY BOUNDARIES (SUSSEX COUNTY TAX MAP IMAGE)

SUSSEX COUNTY
DELAWARE

Print Help

Hide search results

Search results

Clear Selected

Selected Features: Parcels (1)

1) 132-11.00-41.00 Zoom

Book	5195
Page	306
Owner Name	BDG DE LLC
Mailing Address	9250 BENDIX RD N
City	COLUMBIA
State	MD
Description	NW/RT 487
Description 2	1555'NE/RT 487 SW/50
Description 3	EASEMENT ENVIRO WAY
Land Code	CO
Town Code	00
CAP	0
BLDG Improvement	1089000

Selected Features (1)

SUSSEX COUNTY
DELAWARE

Print Help

Hide search results

Search results

Clear Selected

Selected Features: Parcels (1)

1) 132-11.00-41.02 Zoom

Book	5195
Page	306
Owner Name	BDG DE LLC
Mailing Address	9250 BENDIX RD N
City	COLUMBIA
State	MD
Description	W/RT 13 A
Description 2	SW/ 50' EASEMENT
Description 3	PARCEL A
Land Code	CO
Town Code	00
CAP	0
BLDG Improvement	0
LND Improvement	133100

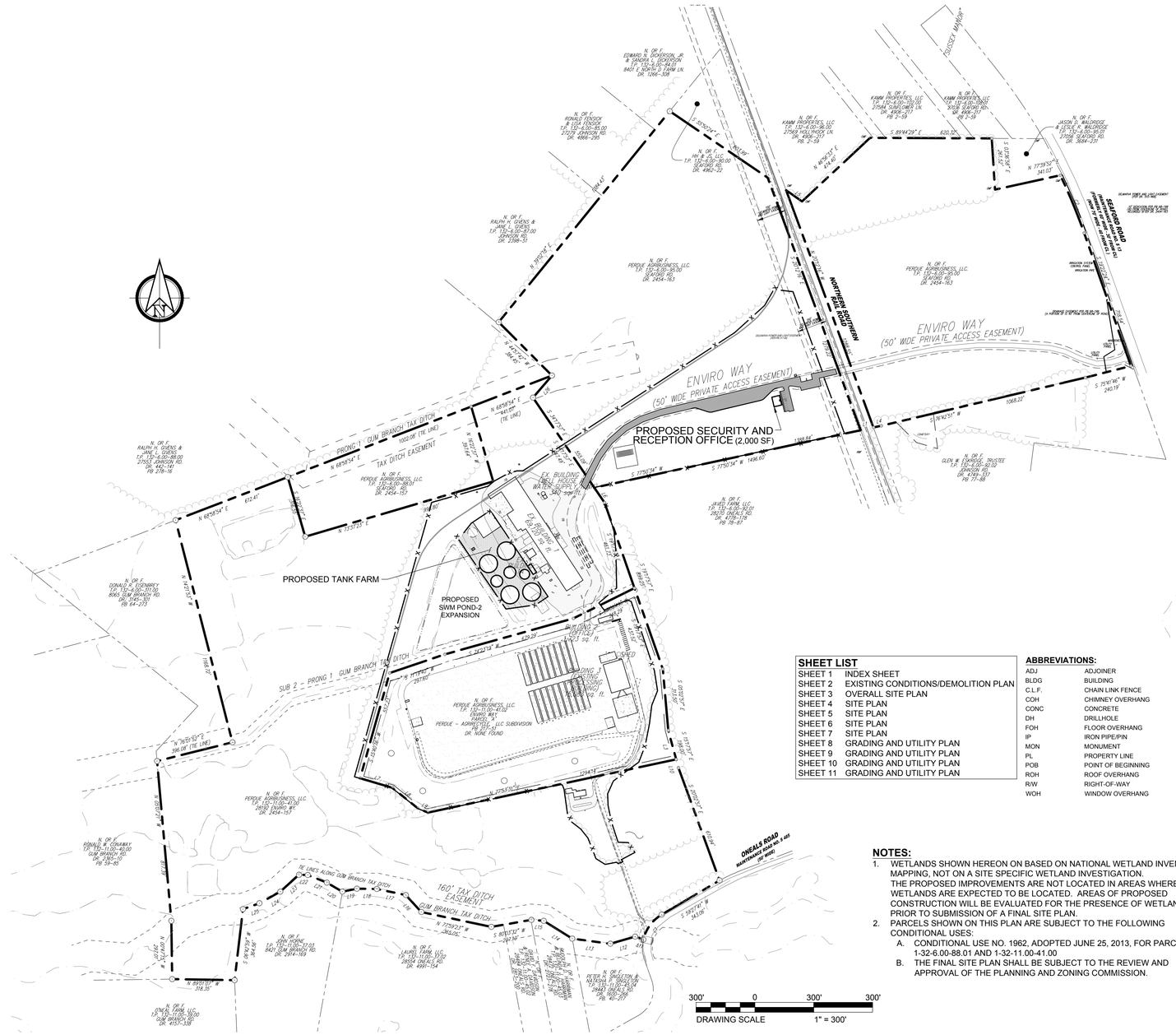
Selected Features (1)

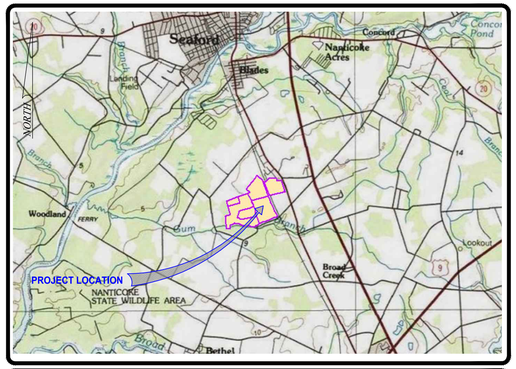
APPENDIX 2

PRELIMINARY SITE PLANS AND ADJACENT PROPERTIES

BIOENERGY DEVELOPMENT GROUP
PRELIMINARY SITE PLANS

BLADES, SUSSEX COUNTY, DELAWARE





MAP: USGS — LOCATION MAP — SCALE: 1" = 6000'

GENERAL NOTE

1. Tax Parcel No.		132-6.00-88.01	132-6.00-95.00	132-11.00-41.00	132-11.00-41.02	
2. Source of Title		DR. 2454-157	DR. 2454-163	DR. 2454-157	SEPARATE DEED NOT RECORDED	
3. Supporting Documents:					REFER TO PB 220-49	
4. Parcel Address		OFF ENVIRO WAY SEAFORD, DE 19973	SEAFORD ROAD SEAFORD, DE 19973	28338 ENVIRO WAY SEAFORD, DE 19973	ENVIRO WAY SEAFORD, DE 19973	
5. Area:						
6. Zoning		SUSSEX COUNTY, DELAWARE				
	Zoned:	AR-1	AR-1	AR-1	AR-1	
	Lot Area (Septic)	32,670 SQ. FT.	32,670 SQ. FT.	32,670 SQ. FT.	32,670 SQ. FT.	
	Lot Width (Septic)	100' (150' FRONTING ROAD)	100' (150' FRONTING ROAD)	100' (150' FRONTING ROAD)	100' (150' FRONTING ROAD)	
	Lot Depth (Septic)	100'	100'	100'	100'	
	Front Yard:	40'	40'	40'	40'	
	Side Yard:	15'	15'	15'	15'	
	Rear Yard:	20'	20'	20'	20'	
	Lot Width Minimum:	100' (150' FRONTING ROAD)	100' (150' FRONTING ROAD)	100' (150' FRONTING ROAD)	100' (150' FRONTING ROAD)	
	Height Maximum:	42'	42'	42'	42'	
		A ZONING CERTIFICATION LETTER OR REPORT WAS NOT RECEIVED FOR THIS SURVEY. THE ZONING SHOWN HEREON IS FROM A CURSORY REVIEW OF THE ZONING CODE OF SUSSEX COUNTY, DELAWARE, CHAPTER 115, ARTICLE IV, SECTION 115-25 (AS OF JULY 25, 2019). NOTE: IT IS STRONGLY ADVISED TO CONTACT THE JURISDICTIONAL CONTROLLING AUTHORITIES FOR UP TO DATE INFORMATION, INTERPRETATIONS AND VERIFICATION OF THE MOST RECENT ZONING CODE, ASSOCIATED REGULATIONS AND RECENTLY PROPOSED ORDINANCES.				
7. Building Data:	Existing Buildings	BLDG 1	BLDG 1A	BLDG 2	BLDG 3	TOTAL
		69,120 +/- SF	1,602 +/- SF	1,729 +/- SF	15,,083 +/- SF	87,528 +/- SF
	Proposed Buildings	SECURITY OFFICE				
		2,000 SF				2,000 SF
8. Parking Data:	Existing Spaces					15 (INCL. 1 ADA SP.)
	Proposed Spaces	1 PARKING SPACE / 200 SF GFA				10 (INCL. 1 ADA SP.)
						25 SPACES
		THE EXISTING PARKING SPACE COUNT REFERS TO MARKED SPACES ONLY. THE SITE HAS SIGNIFICANT AREAS OF PAVEMENT CONSISTING OF GRAVEL, ASPHALT AND DIRT THAT COULD BE USED FOR PARKING.				
9: Flood Zone Designations:		FLOOD ZONE DESIGNATION: SUBJECT PROPERTY IS LOCATED IN FLOOD ZONE X(UNSHADED) AND HAS BEEN DETERMINED TO BE OUTSIDE OF THE 100 YEAR FLOODPLAIN PER FIRM MAP NO.10005C0401 K, PANEL NO. 401 OF 660, DATED MARCH 16, 2015 (REVISED)				
10. Record Plans:		NONE	NONE	NONE	PB 217-49	
		A PORTION OF THIS PROPERTY IS SHOWN ON THE RECORD MINOR SUBDIVISION PLAN TITLED: "SUBDIVISION OF THE LANDS OF PERDUE - AGRIRECYCLE, LLC", IN PLAT BOOK 217, PAGE 49, DATED JULY 17, 2015.				
12. Utilities:		COMCAST: No Response VERIZON: No Response DELMARVA POWER UTILIQUEST: No Response CHESAPEAKE UTILITIES: Response Received. Utilities Exhibit Provided and plotted. CROWN CASTLE: No Response PLEASE NOTE THAT OTHER UTILITIES, NOT READILY VISIBLE, NOT SHOWN ON THE PLANS OR UTILITIES PLACED BY THIRD PARTY AGENTS, MAY BE PRESENT.				
13. Vertical Datum:		NAVD 88 NAVD				
14. Bearing Reference:		NAD 83, DELAWARE STATE PLANE				
15. Owner Data:		BIOENRGY DEVELOPMENT GROUP, LLC 9250 BENDIX ROAD COLUMBIA, MD 21045				
16. Water Service:		EXISTING PRIVATE WELL				
17. Sewer Service:		EXISTING SEPTIC TO BE ABANDONED. PROPOSED PUBLIC SYSTEM (NEW SUSSEX COUNTY DISTRICT)				

SHEET LIST

SHEET 1	INDEX SHEET
SHEET 2	EXISTING CONDITIONS/DEMOLITION PLAN
SHEET 3	OVERALL SITE PLAN
SHEET 4	SITE PLAN
SHEET 5	SITE PLAN
SHEET 6	SITE PLAN
SHEET 7	SITE PLAN
SHEET 8	GRADING AND UTILITY PLAN
SHEET 9	GRADING AND UTILITY PLAN
SHEET 10	GRADING AND UTILITY PLAN
SHEET 11	GRADING AND UTILITY PLAN

ABBREVIATIONS:

ADJ	ADJOINER
BLDG	BUILDING
C.L.F.	CHAIN LINK FENCE
COH	CHIMNEY OVERHANG
CONC	CONCRETE
DH	DRILLHOLE
FOH	FLOOR OVERHANG
IP	IRON PIPE/PIN
MON	MONUMENT
PL	PROPERTY LINE
POB	POINT OF BEGINNING
ROH	ROOF OVERHANG
R/W	RIGHT-OF-WAY
WOH	WINDOW OVERHANG

NOTES:

1. WETLANDS SHOWN HEREON ON BASED ON NATIONAL WETLAND INVENTORY MAPPING, NOT ON A SITE SPECIFIC WETLAND INVESTIGATION. THE PROPOSED IMPROVEMENTS ARE NOT LOCATED IN AREAS WHERE WETLANDS ARE EXPECTED TO BE LOCATED. AREAS OF PROPOSED CONSTRUCTION WILL BE EVALUATED FOR THE PRESENCE OF WETLANDS PRIOR TO SUBMISSION OF A FINAL SITE PLAN.
2. PARCELS SHOWN ON THIS PLAN ARE SUBJECT TO THE FOLLOWING CONDITIONAL USES:
   A. CONDITIONAL USE NO. 1962, ADOPTED JUNE 25, 2013, FOR PARCELS 1-32-6.00-88.01 AND 1-32-11.00-41.00
   B. THE FINAL SITE PLAN SHALL BE SUBJECT TO THE REVIEW AND APPROVAL OF THE PLANNING AND ZONING COMMISSION.

LEGEND

PROPERTY LINE - SUBJECT
PROPERTY LINE - ADJACENT
BUILDING SETBACK LINE
EASEMENT - PRIVATE ACCESS
EASEMENT - CROSS ACCESS
EASEMENT - DP&L
EASEMENT - TAX DITCH
EASEMENT - UTILITY
UTILITY LINE - OVERHEAD
TAX DITCH DISTRICT LIMIT
STREAM / POND LINE
RAILROAD TRACKS
TRAIL - DIRT
TREE / SHRUB LINE
PIPELINE - ABOVE GRADE
UTILITY EASEMENT FOR GAS LINE PER MSS UTILITY
WALL - CONCRETE

PROPERTY CORNER - SUBJECT
PROPERTY CORNER - ADJACENT
CONTROL - REBAR FOUND
CONTROL - CONCRETE MONUMENT
A/C COMPRESSOR
BOLLARD
ELECTRIC BOX
ELECTRIC BOX
FIBER OPTICS POST
FIRE - STANDPIPE
FIRE - WATER TANK
FLAGPOLE
GAS LINE SIGN
GAS MANHOLE
GAS PIPE
GUY WIRE SUPPORT
HYDRANT / MANHOLE MACHINERY
WATER - VALVE
WATER - WELL
HOLE W/ PIPE
HOSE
HEAT TRACE
HOIST
HOIST
LIGHT - FLOOD
LOCKOUT BOX
MACHINERY AREA
MACHINERY - POND
MANHOLE
OVERHEAD PIPE
SIGN
SMALL PIPE
SWITCH BOX
SUMP PUMP
TRUCK OFFLOAD
UTILITY - POLE / TOWER
VALVE

EXISTING GRAVEL
EXISTING CONCRETE
PROPOSED ASPHALT
PROPOSED GABC
PROPOSED BUILDING
WETLANDS

OWNER'S CERTIFICATION:

I, _____, HEREBY CERTIFY THAT I AM THE OWNER OF THE PROPERTY DESCRIBED AND SHOWN ON THIS PLAN, THAT THE PLAN WAS MADE AT MY DIRECTION, AND THAT I ACKNOWLEDGE THE SAME TO BE MY ACT AND DESIRE THE PLAN TO BE RECORDED ACCORDING TO LAW.

_____ _____, 2020
PROPERTY OWNER DATE

ENGINEER'S CERTIFICATION:

I, STEPHEN J. GORSKI, HEREBY CERTIFY THAT I AM A REGISTERED ENGINEER IN THE STATE OF DELAWARE, THAT THE INFORMATION SHOWN HEREON HAS BEEN PREPARED UNDER MY SUPERVISION AND TO MY BEST KNOWLEDGE AND BELIEF REPRESENTS GOOD ENGINEERING PRACTICES AS REQUIRED BY THE APPLICABLE LAWS OF THE STATE OF DELAWARE.

_____, 2020 _____
DATE STEPHEN J. GORSKI, P.E.
REGISTRATION # 12625

SUSSEX COUNTY CERTIFICATION

APPROVED: SUSSEX COUNTY COUNCIL DOES NOT IMPLY THE APPROVAL OF OTHER GOVERNMENTAL AGENCIES.

_____ _____
PRESIDENT DATE

APPROVED: THE COUNTY PLANNING AND ZONING COMMISSION OF SUSSEX COUNTY.

_____ _____
NAME DATE

DUFFIELD ASSOCIATES
Soil, Water & the Environment
5400 LIMESTONE ROAD
WILMINGTON, DE 19808-1232
TEL: 302.239.6634
FAX: 302.239.8485
OFFICES IN DELAWARE, MARYLAND, PENNSYLVANIA AND NEW JERSEY
WEB: HTTP://DUFFNET.COM
E-MAIL: DUFFIELD@DUFFNET.COM

CHECKED BY: SJG
FILE NAME: Prelim12393CF.Index
DESIGNED BY: SCH/JJL
DRAWN BY: SMC/JJL
STEPHEN J. GORSKI, P.E.
STATE: DELAWARE P.E.#12625

No.	REVISION	CHK'D BY	DRN'R

PRELIMINARY NOT FOR CONSTRUCTION

OWNER: BIOENERGY DEVELOPMENT GROUP, LLC
9250 BENDIX ROAD
COLUMBIA, MD 21045

INDEX SHEET
PRELIMINARY SITE PLAN
BIOENERGY DEVELOPMENT GROUP, LLC
SUSSEX COUNTY ~ DELAWARE

DATE: 13 APRIL 2020
SCALE: AS SHOWN
PROJECT NO. 12393.EA
SHEET: 1 OF 11

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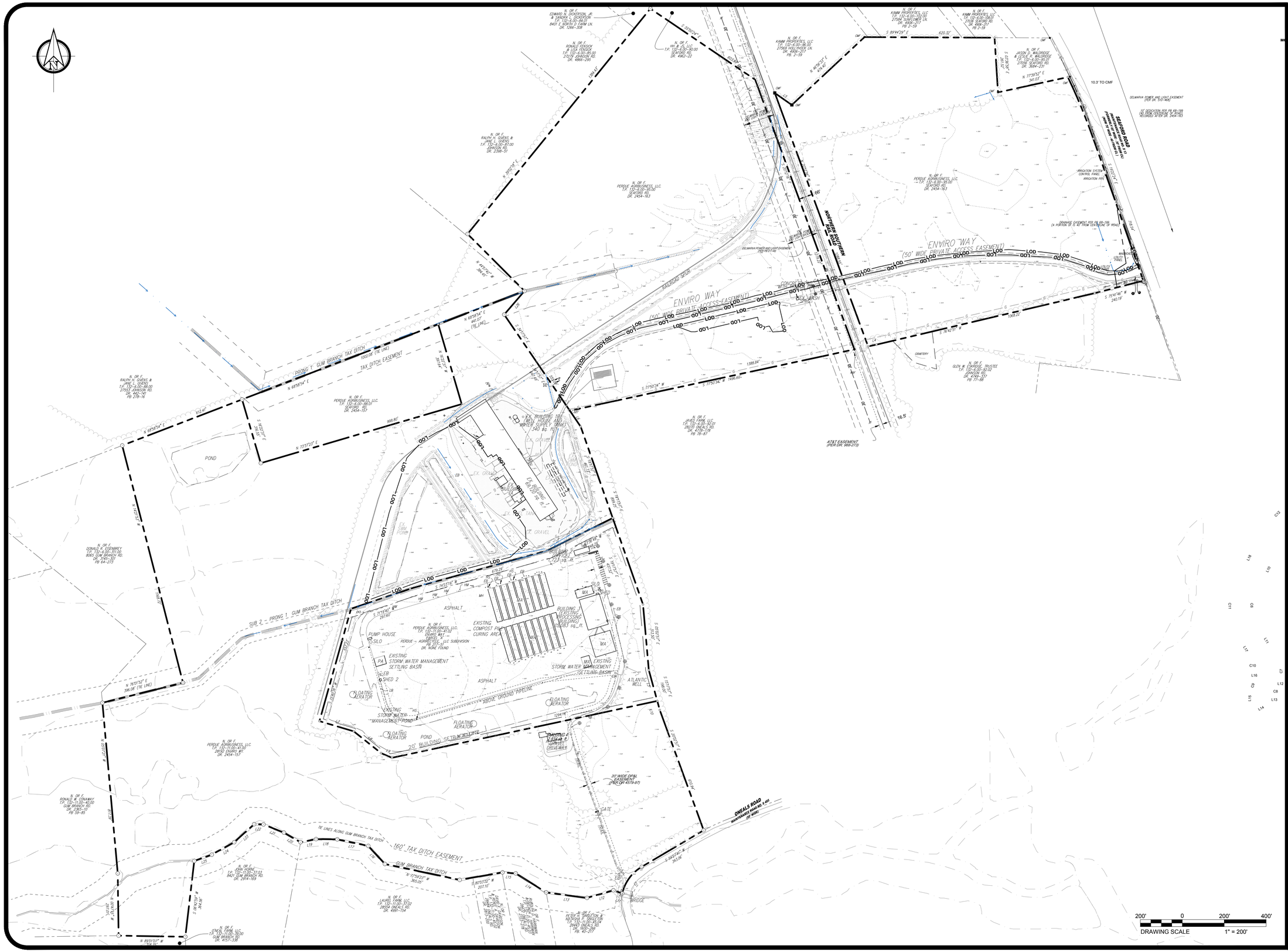

DUFFIELD ASSOCIATES
Soil, Water & the Environment

5400 LIMESTONE ROAD
WILMINGTON, DE 19808-1232
TEL: 302.239.6634
FAX: 302.239.8485

OFFICES IN DELAWARE, MARYLAND, PENNSYLVANIA AND NEW JERSEY
WEB: HTTP://DUFFNET.COM
E-MAIL: DUFFIELD@DUFFNET.COM

DESIGNED BY:	CHECKED BY:
SCH/JJL	SJG
DRAWN BY:	FILE NAME:
SMC/JJL	Prelim12393CF-ExistDemo

STEPHEN J. GORSKI, P.E.

STATE: DELAWARE P.E.#12625

No.	REVISION	CHKD BY DATE

PRELIMINARY NOT FOR CONSTRUCTION

OWNER: BIOENERGY DEVELOPMENT GROUP, LLC
9250 BENDIX ROAD
COLUMBIA, MD 21045

EXISTING CONDITIONS / DEMOLITION PLAN

PRELIMINARY SITE PLAN

BIOENERGY DEVELOPMENT GROUP, LLC

SUSSEX COUNTY ~ DELAWARE

DATE:	13 APRIL 2020
SCALE:	1" = 200'
PROJECT NO.	12393.EA
SHEET:	2 OF 11

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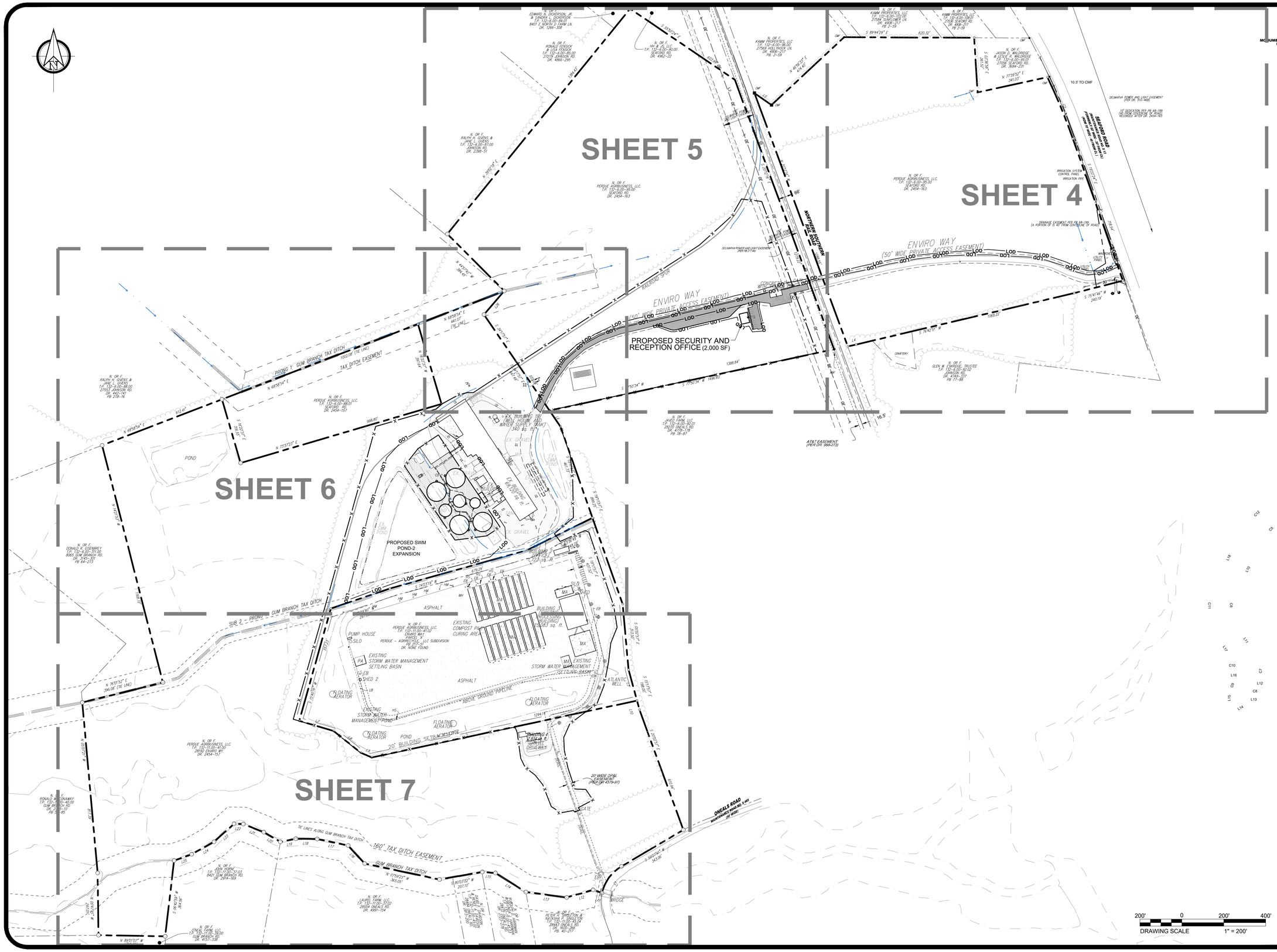

DUFFIELD ASSOCIATES
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TEL: 302.239.6634
FAX: 302.239.8485
OFFICES IN DELAWARE, MARYLAND, PENNSYLVANIA AND NEW JERSEY
WEB: HTTP://DUFFNET.COM
E-MAIL: DUFFIELD@DUFFNET.COM

DESIGNED BY: SCH/JJL	CHECKED BY: SJG
DRAWN BY: SMC/JJL	FILE NAME: Prelim12393CF-Site
STEPHEN J. GORSKI, P.E.	
STATE: DELAWARE	P.E.#12625

No.	REVISION	CHK'D BY	DWN'R

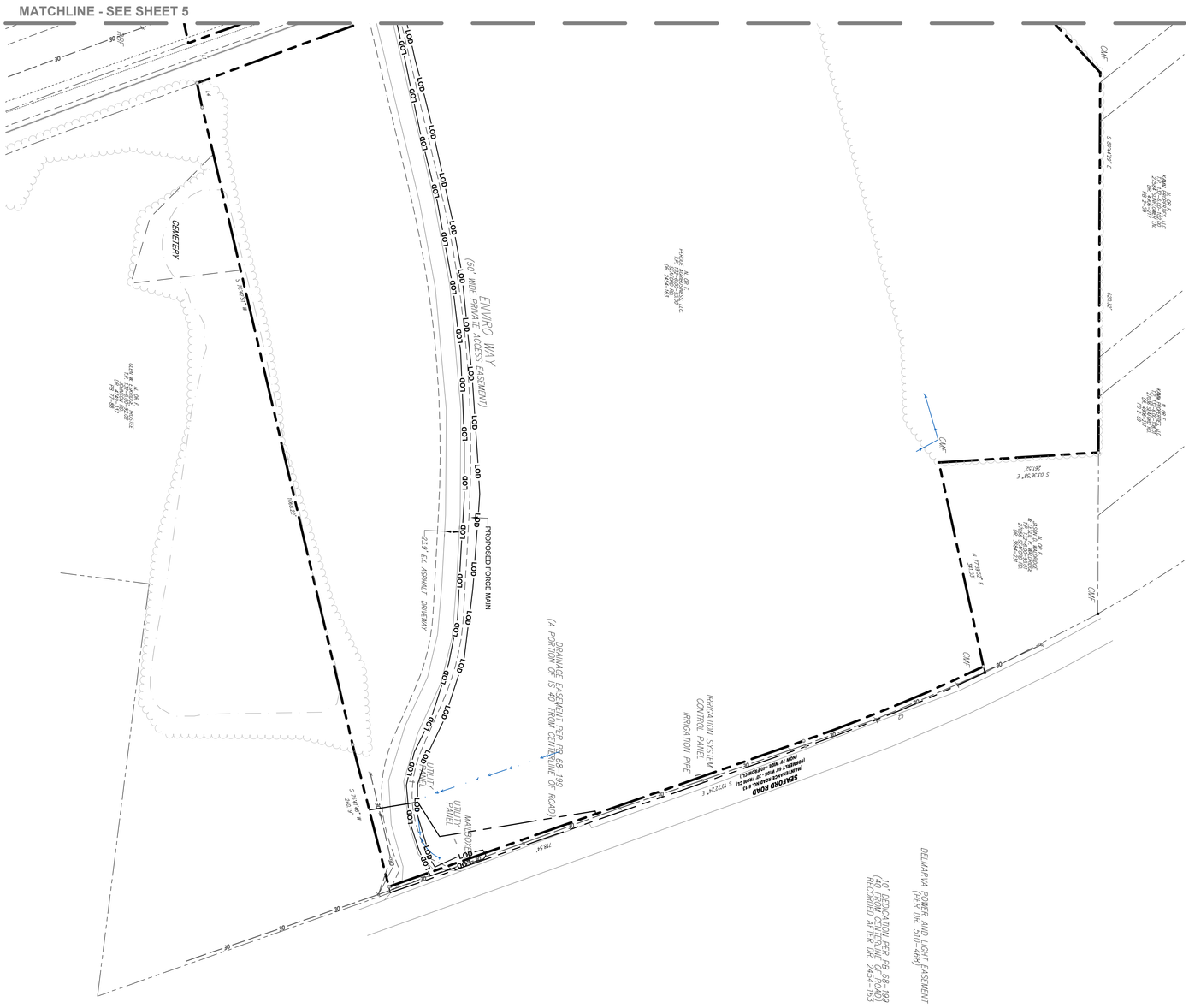
PRELIMINARY NOT FOR CONSTRUCTION

OWNER: BIOENERGY DEVELOPMENT GROUP, LLC
9250 BENDIX ROAD
COLUMBIA, MD 21045

OVERALL SITE PLAN
PRELIMINARY SITE PLAN
BIOENERGY DEVELOPMENT GROUP, LLC
SUSSEX COUNTY ~ DELAWARE

DATE:	13 APRIL 2020
SCALE:	1" = 200'
PROJECT NO.	12393.EA
SHEET:	3 OF 11

N:\Projects\12000\12393 -Bioenergy Dev\Civil\CAD\Prelim12393CF-Site.dwg, 3-OA Site, 4/13/2020 4:55:59 PM



DRAWING SCALE
100' 0 100' 200'
1" = 100'

DATE: 13 APRIL 2020
SCALE: 1" = 100'
PROJECT NO. 12393.EA
SHEET: 4 OF 11

SITE PLAN

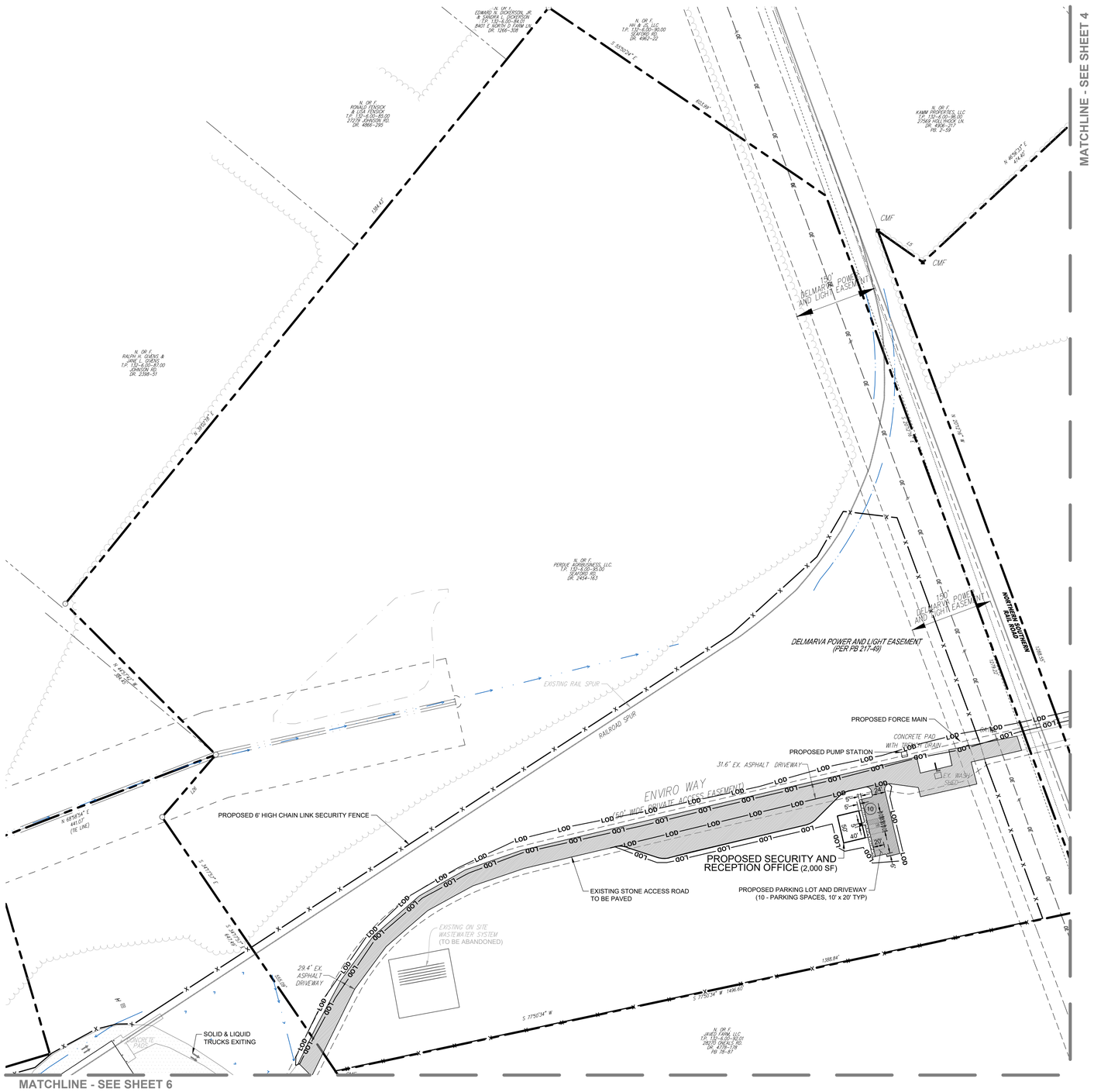
PRELIMINARY SITE PLAN

BIOENERGY DEVELOPMENT GROUP, LLC

SUSSEX COUNTY ~ DELAWARE

OWNER: BIOENERGY DEVELOPMENT GROUP, LLC
9250 BENDIX ROAD
COLUMBIA, MD 21045

No.	REVISION	CHK'D BY DATE


MATCHLINE - SEE SHEET 4
MATCHLINE - SEE SHEET 6
N. DR F.
RONALD TENSICK
& LISA TENSICK
T.P. 132-4.00-48.00
21529 JOHNSON RD.
DR. 4866-295
N. DR F.
RALPH H. GVENS &
JANE L. GVENS
T.P. 132-6.00-43.00
JOHNSON RD.
DR. 2398-51
N. DR F.
PERDUE AGRIBUSINESS, LLC.
T.P. 132-6.00-35.00
SEAFORD RD.
DR. 2404-163
N. DR F.
KAMM PROPERTIES, LLC
T.P. 132-6.00-36.00
27569 HOLLYWOOD DR.
DR. 4906-217
PB. 2-59
N. DR F.
JAMES FARM, LLC
T.P. 132-6.00-30.01
28070 ONEALS RD.
DR. 4779-178
PB 78-87
DELMARVA POWER AND LIGHT EASEMENT
(PER PB 217-49)
150' DELMARVA POWER AND LIGHT EASEMENT
NORFOLK SOUTHERN RAILROAD
EXISTING RAIL SPUR
RAILROAD SPUR
PROPOSED FORCE MAIN
CONCRETE PAD WITH DRAIN
PROPOSED PUMP STATION
31.6' EX. ASPHALT DRIVEWAY
EX. WALKWAY
ENVIRO WAY
50' WIDE PRIVATE ACCESS EASEMENT
PROPOSED 6' HIGH CHAIN LINK SECURITY FENCE
PROPOSED SECURITY AND
RECEPTION OFFICE (2,000 SF)
EXISTING STONE ACCESS ROAD
TO BE PAVED
PROPOSED PARKING LOT AND DRIVEWAY
(10 - PARKING SPACES, 10' x 20' TYP)
EXISTING ON SITE
WASTEWATER SYSTEM
(TO BE ABANDONED)
29.4' EX.
ASPHALT
DRIVEWAY
SOLID & LIQUID
TRUCKS EXITING
CONCRETE PADS
N 68°58'34" E
441.07'
(TIE LINE)
S 77°50'34" W
1,398.84'
S 77°50'34" W 1496.60'
N 77°50'34" E
1,398.84'
N 77°50'34" E
1,496.60'
S 77°50'34" E
1,398.84'
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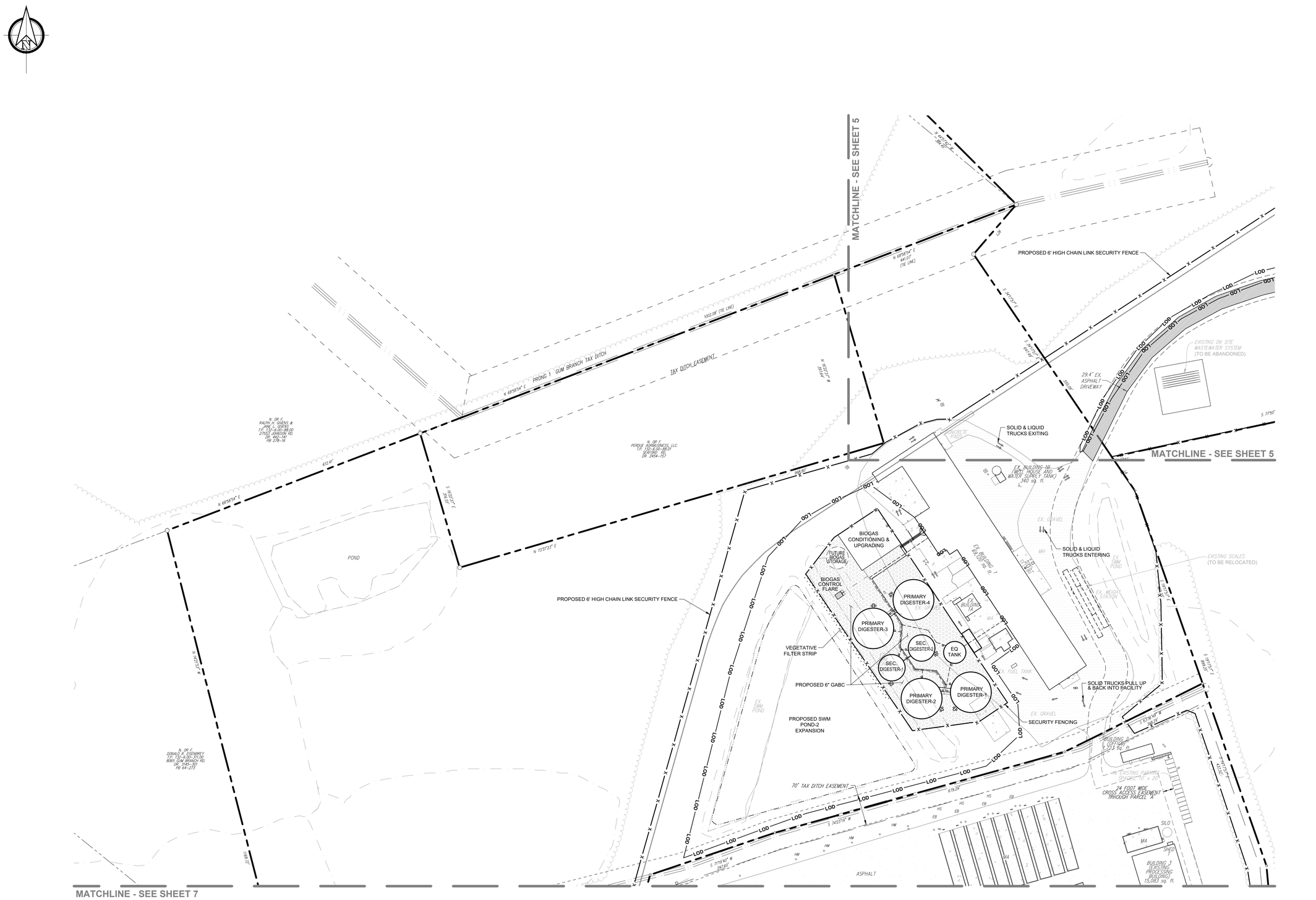
N 77°50'34" E
1,496.60'
N 77°50'34" E
1,398.84



DUFFIELD ASSOCIATES
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DESIGNED BY:	CHECKED BY:
SCH/JJL	SJG
DRAWN BY:	FILE NAME:
SMC/JJL	Prelim12393CF-Site

STEPHEN J. GORSKI, P.E.

STATE: DELAWARE P.E.#:12635

No.	REVISION	CHK'D BY DATE

PRELIMINARY NOT FOR CONSTRUCTION

OWNER: BIOENERGY DEVELOPMENT GROUP, LLC
9250 BENDIX ROAD
COLUMBIA, MD 21045

SITE PLAN
PRELIMINARY SITE PLAN
BIOENERGY DEVELOPMENT GROUP, LLC
SUSSEX COUNTY ~ DELAWARE

DATE:	13 APRIL 2020
SCALE:	1" = 100'
PROJECT NO.	12393.EA
SHEET:	6 OF 11

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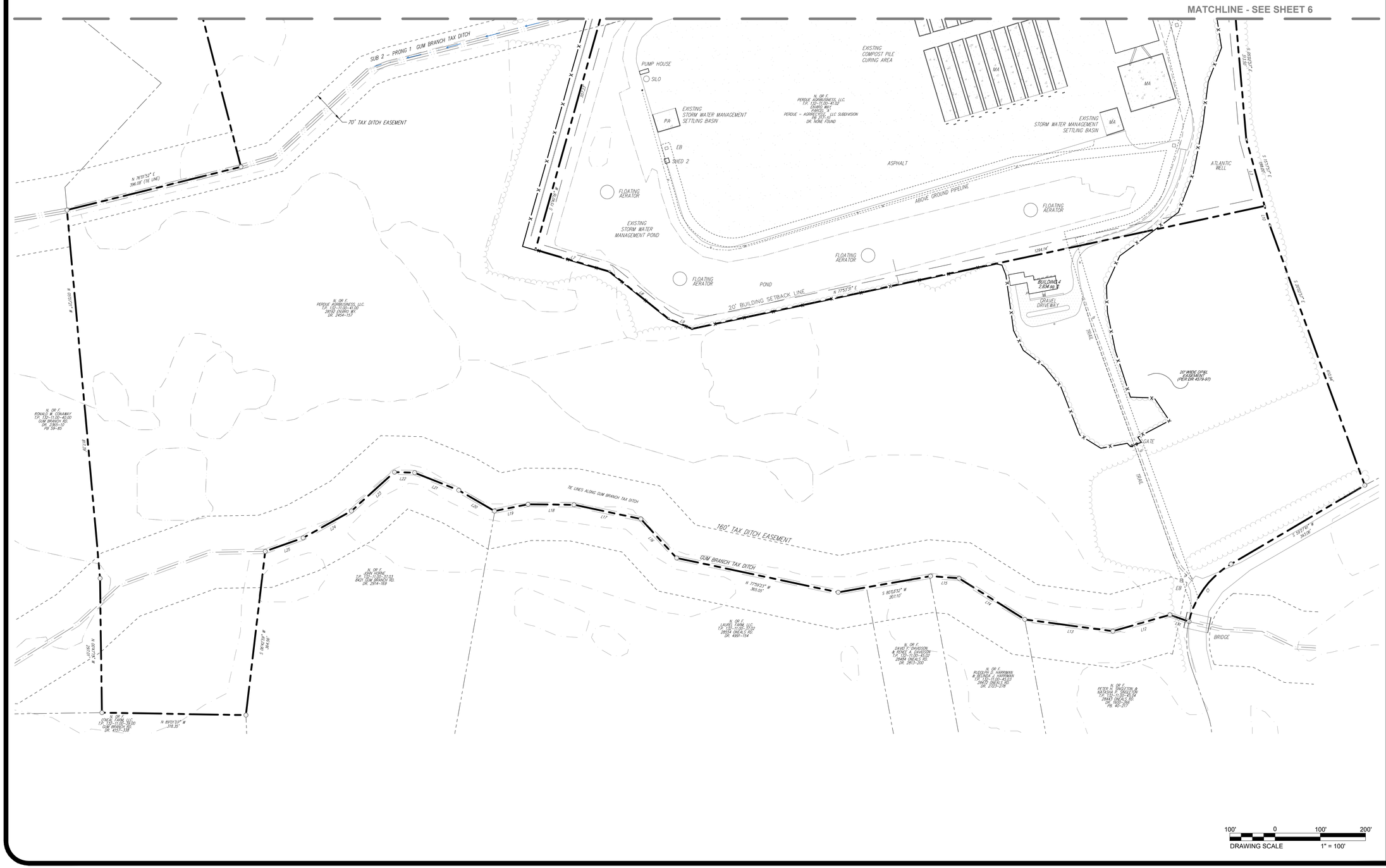

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CHECKED BY:	SJG
DESIGNED BY:	SCH/JJL
DRAWN BY:	SMC/JJL
FILE NAME:	Prelim12393CF-Site
STEPHEN J. GORSKI, P.E.	
STATE: DELAWARE	P.E.#12635

No.	REVISION	CHK'D BY DATE

PRELIMINARY NOT FOR CONSTRUCTION

OWNER: BIOENERGY DEVELOPMENT GROUP, LLC
9250 BENDIX ROAD
COLUMBIA, MD 21045

SITE PLAN
PRELIMINARY SITE PLAN
BIOENERGY DEVELOPMENT GROUP, LLC
SUSSEX COUNTY ~ DELAWARE

DATE:	13 APRIL 2020
SCALE:	1" = 100'
PROJECT NO.	12393.EA
SHEET:	7 OF 11

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DRAWING SCALE
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1" = 100'

DATE:	13 APRIL 2020
SCALE:	1" = 100'
PROJECT NO.	12393.EA
SHEET:	8 OF 11

GRADING AND UTILITY PLAN

PRELIMINARY SITE PLAN

BIOENERGY DEVELOPMENT GROUP, LLC

SUSSEX COUNTY ~ DELAWARE

OWNER: BIOENERGY DEVELOPMENT GROUP, LLC
9250 BENDIX ROAD
COLUMBIA, MD 21045

No.	REVISION	CHK'D BY DATE

DATE:	13 APRIL 2020
SCALE:	1" = 100'
PROJECT NO.	12393.EA
SHEET:	9 OF 11

GRADING AND UTILITY PLAN

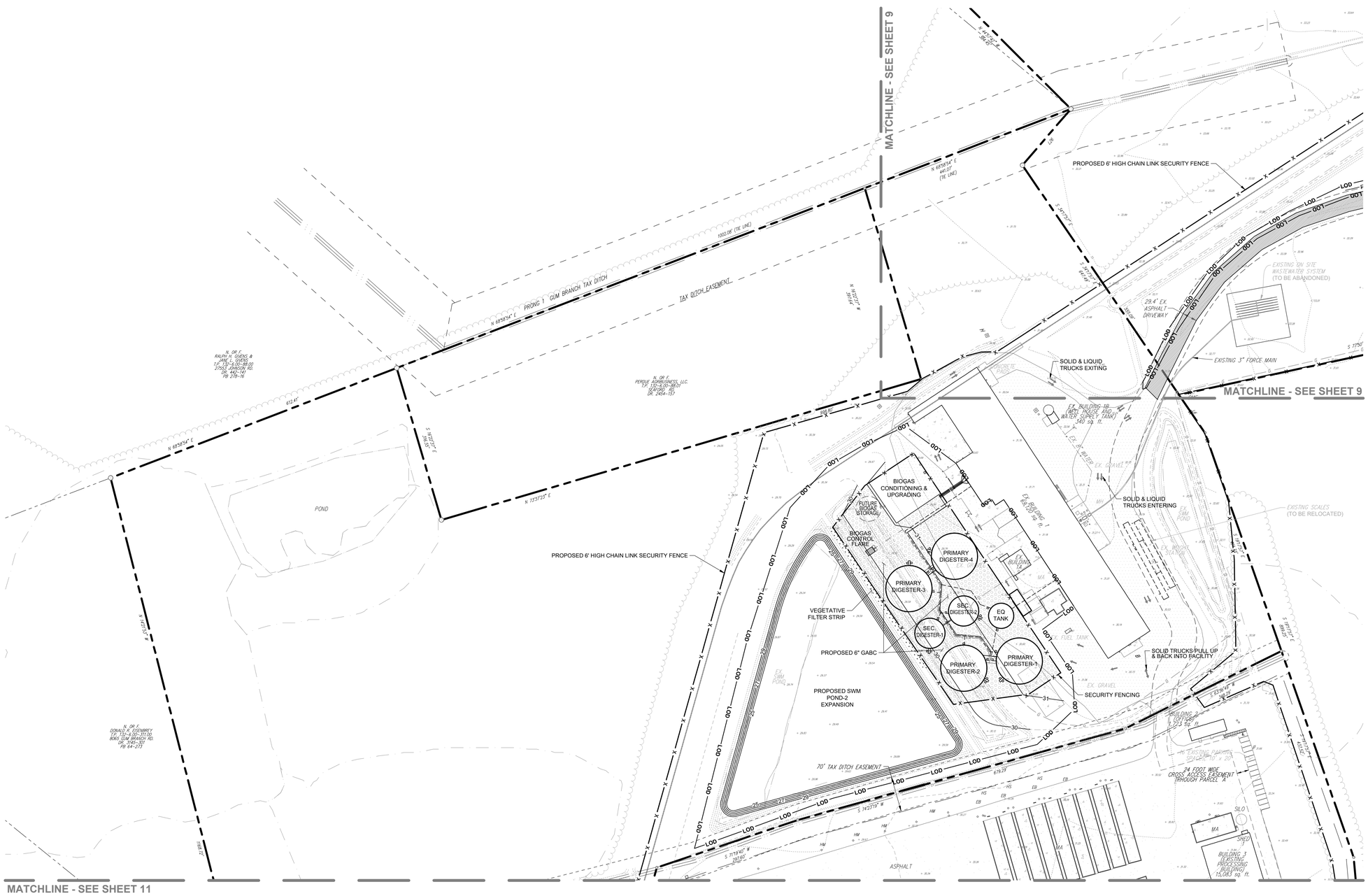
PRELIMINARY SITE PLAN

BIOENERGY DEVELOPMENT GROUP, LLC

SUSSEX COUNTY ~ DELAWARE

OWNER: BIOENERGY DEVELOPMENT GROUP, LLC
9250 BENDIX ROAD
COLUMBIA, MD 21045

No.	REVISION	CHK'D BY DATE



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Soil, Water & the Environment

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WILMINGTON, DE 19808-1232
TEL: 302.239.6634
FAX: 302.239.8485

OFFICES IN DELAWARE, MARYLAND, PENNSYLVANIA AND NEW JERSEY
WEB: HTTP://DUFFNET.COM
E-MAIL: DUFFIELD@DUFFNET.COM

DESIGNED BY: SCH/JJL	CHECKED BY: SJG
DRAWN BY: SMC/JJL	FILE NAME: Prelim12393CF-GradUtil

STEPHEN J. GORSKI, P.E.
STATE: DELAWARE P.E.#12635

No.	REVISION	CHK'D BY DRWN

PRELIMINARY NOT FOR CONSTRUCTION

OWNER: BIOENERGY DEVELOPMENT GROUP, LLC
9250 BENDIX ROAD
COLUMBIA, MD 21045

GRADING AND UTILITY PLAN
PRELIMINARY SITE PLAN
BIOENERGY DEVELOPMENT GROUP, LLC
SUSSEX COUNTY ~ DELAWARE

DATE:	13 APRIL 2020
SCALE:	1" = 100'
PROJECT NO.	12393.EA
SHEET:	10 OF 11

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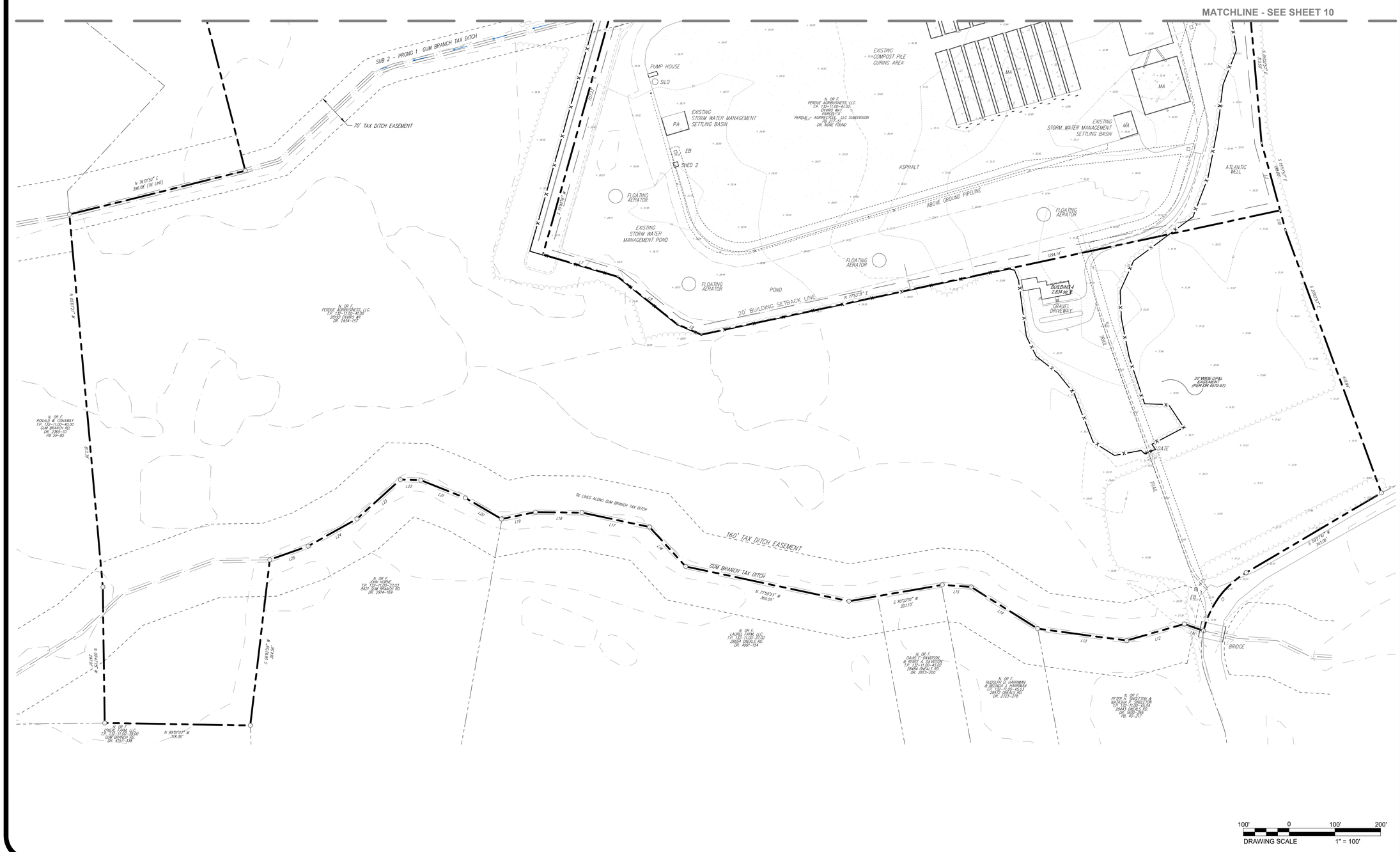

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Soil, Water & the Environment

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TEL: 302.239.6634
FAX: 302.239.8485

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WEB: HTTP://DUFFNET.COM
E-MAIL: DUFFIELD@DUFFNET.COM

DESIGNED BY: SCH/JJL	CHECKED BY: SJG
DRAWN BY: SMC/JJL	FILE NAME: Prelim12393CF-Gr
STEPHEN J. GORSKI, P.E.	
STATE: DELAWARE	P.E.#12635

No.	REVISION	CHK'D BY DATE

PRELIMINARY NOT FOR CONSTRUCTION

OWNER: BIOENERGY DEVELOPMENT GROUP, LLC
9250 BENDIX ROAD
COLUMBIA, MD 21045

GRADING AND UTILITY PLAN
PRELIMINARY SITE PLAN
BIOENERGY DEVELOPMENT GROUP, LLC
SUSSEX COUNTY ~ DELAWARE

DATE:	13 APRIL 2020
SCALE:	1" = 100'
PROJECT NO.	12393.EA
SHEET:	11 OF 11

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APPENDIX 3

SOIL BORING LOGS

DUFFIELD ASSOCIATES
Soil, Water & the Environment

SB-1/MW-1

Hydrogeologic Asessment
Bioenergy Development Group,
Planned Anaerobic Digester
Seaford, DE
Project No. 12393.ED

Date Started	: June 17, 2020	Drilling Equipment	: Truck-Mounted Diedrich D-50
Date Completed	: June 17, 2020	Drilling Methods	: Hollow Stem Augers/ Mud Rotary
Logged by	: JLF		
Weather	: Cloudy, 60s		
Driller/Agency	: M. Lyons/CGC Geoservices, LLC		

Sample Condition: Remolded
Water Levels: During Drilling

Depth in feet	Layer Depth feet	USCS	DESCRIPTION	SAMPLES	PID (D.U.)	Blows Per 6 Inches	Recovery (ft)
0		SP	Brown firm fine SAND		0.0	4-8-11-11	2.0
	2.0	SM	Light brown to dark gray silty SAND, trace clay		0.0	8-9-8-10	1.5
5			Light gray fine to medium silty SAND		0.0	5-8-10-11	2.0
	6.0	SP-SM	Light gray SAND and SILT , Lense of light gray clay with some sand @ 6ft b.e.g.s.		0.0	8-9-12-11	2.0
	8.0	SP-SC	Light grayish white coarse SAND and CLAY				
	9.0	SP-SM	Light grayish white coarse SAND and SILT		0.0	4-3-4-6	2.0
10	10.2		SAME				
	11.0	CL	Light gray CLAY, some fine sand		0.0	3-2-3-5	2.0
		SP-SM	Light grayish brown coarse SAND and SILT				
	13.0		SAME		0.0	1-0-0-0	2.0
		SP-SC	Light grayish white fine SAND and CLAY				
15			SAME		0.0	2-1-1-2	2.0
	16.0	SP-SM	Light gray to light orangish gray fine to medium SAND and SILT		0.0	1-1-2-3	2.0
	17.0	SP-SC	Light gray to light orangish gray fine to medium SAND and CLAY		0.0	1-2-4-2	2.0
20			SAME				
			SAME				
	21.0		SAME (possible staining)		0.0	2-2-2-2	1.5
		SP-SM	Light orangish brown medium to coarse SAND and SILT				
			SAME		0.0	8-5-2-5	1.5
			SAME				
	24.0	GP	Dark orangish brown coarse sandy GRAVEL, some silt		0.0	2-5-11-35	1.5
25			SAME				
	26.0	ML	Dark orangish brown SILT, some fine sand, trace clay		0.0	22-27-19-18	0.5
			NO RECOVERY				
	28.0	GP	Dark orangish brown medium to coarse SAND and GRAVEL, trace silt		0.0	17-17-12-10	1.5
30	30.0						
35							
40							

Well Construction Details:
- 2" Schedule 40 PVC Well Casing
- Bentonite Seal
- Sand Pack- #2 Well Sand
- 2" Schedule 40 PVC Well Screen

WATER LEVEL

Well Depth (ft): 4.0, 6.0, 21.0, 21.3

NOTES:
1. Boring terminated at ± 30.0 feet below existing ground surface (b.e.g.s).
2. Water level observed at approximately ± 8.0 b.e.g.s
3. Well Screen Interval: 6 ft- 21 ft b.e.g.s
4. Well Permit Number: 269874
5. Soil descriptions performed in general accordance with ASTM D 2488, the Practice for Description and Identification of Soils (Visual-Manual Procedure).

DUFFIELD ASSOCIATES
Soil, Water & the Environment

SB-2/MW-2

Hydrogeologic Asessment
Bioenergy Development Group,
Planned Anaerobic Digester
Seaford, DE
Project No. 12393.ED

Date Started	: June 18, 2020	Drilling Equipment	: Truck-Mounted Diedrich D-50
Date Completed	: June 18, 2020	Drilling Methods	: Hollow Stem Augers/ Mud Rotary
Logged by	: JLF		
Weather	: Overcast, 70s		
Driller/Agency	: M. Lyons/CGC Geoservices, LLC		

Sample Condition: Remolded
Water Levels: During Drilling

Depth in feet	Layer Depth feet	USCS	DESCRIPTION	PID (D.U.)	Blows Per 6 Inches	Recovery (ft)
0		SP	Light brown fine SAND	0.0	11-32-16-16	2.0
			SAME			
			SAME	0.0	15-15-10-10	2.0
			SAME			
	4.0	SW-SM	Light gray to light orangish brown fine SAND, some silt, trace clay	0.0	8-9-6-8	1.5
5			SAME	0.0	6-7-7-7	2.0
			SAME	0.0	5-5-6-8	2.0
			SAME			
10			SAME	0.0	5-5-4-6	2.0
			SAME			
				0.0	4-4-2-4	2.0
	13.5	GP	Light orangish brown SAND and multi-colored GRAVEL			
	14.0	SC	Light brown to brown fine to coarse clayey SAND, trace multi-colored gravel	0.0	3-3-4-5	2.0
15			SAME			
			NO RECOVERY	0.0	3-3-5-6	1.0
	18.0	GP	Light brown coarse silty SAND and GRAVEL	0.0	4-4-4-2	1.0
			NO RECOVERY			
20	20.0	SC-SM	Light orangish brown fine to medium SAND, some clay	0.0	2-3-8-8	2.0
			SAME			
	23.0	GP	Light brown to multi-colored small to large GRAVEL, some fine sand	0.0	6-7-7-13	1.5
	24.0	SC-SM	Light orangish brown fine to coarse SAND, some clay, some gravel	0.0	7-8-10-11	2.0
25	26.0	CH	Brownish orange CLAY, trace fine sand			
	27.0	GP	Medium to large multi-colored GRAVEL	0.0	3-3-5-6	2.0
	28.0	SP-SM	Light orangish brown fine SAND and SILT			
	28.5	CH	Light orangish brown CLAY, trace fine sand	0.0	6-6-8-10	2.0
	29.0	GP	Multi-colored GRAVEL, some fine sand			
30	30.0					
35						
40						

Well Construction Details:
- 2" Schedule 40 PVC Well Casing
- Bentonite Seal
- Sand Pack- #2 Well Sand
- 2" Schedule 40 PVC Well Screen

WATER LEVEL: 6.0

Well Depth (ft): 4.0, 21.0, 21.3

NOTES:
1. Boring terminated at ± 30.0 feet below existing ground surface (b.e.g.s).
2. Water level observed at approximately ± 6.6 b.e.g.s
3. Well Screen Interval: 6 ft - 21 ft b.e.g.s
4. Well Permit Number: 269875
5. Soil descriptions performed in general accordance with ASTM D 2488, the Practice for Description and Identification of Soils (Visual-Manual Procedure).

DUFFIELD ASSOCIATES
Soil, Water & the Environment

SB-3/MW-3

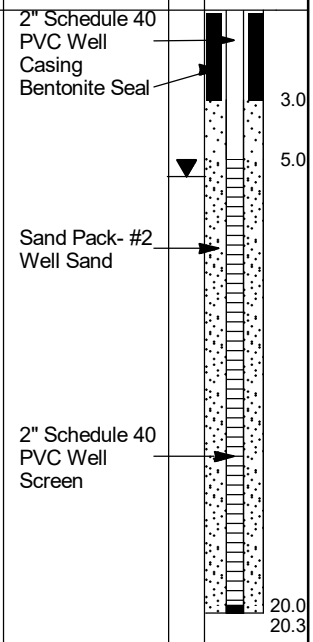
Hydrogeologic Asessment
Bioenergy Development Group,
Planned Anaerobic Digester
Seaford, DE
Project No. 12393.ED

Date Started	: June 18, 2020	Drilling Equipment	: Truck-Mounted Diedrich D-50
Date Completed	: June 18, 2020	Drilling Methods	: Hollow Stem Augers/ Mud Rotary
Logged by	: JLF		
Weather	: Cloudy, 70s		
Driller/Agency	: M. Lyons/CGC Geoservices, LLC		

Sample Condition: Remolded
Water Levels: During Drilling

Depth in feet	Layer Depth feet	USCS	DESCRIPTION	SAMPLES	PID (D.U.)	Blows Per 6 Inches	Recovery (ft)
0		SM	Light brown fine silty SAND, Lense of fine clayey sand @ 1 ft b.e.g.s		0.0	4-6-8-8	2.0
	2.0	SP	Light orangish brown fine SAND, some silt, Lense of fine clayey sand @ 2.5 ft b.e.g.s		0.0	8-5-6-8	2.0
	4.0	SC	Light orangish brown fine SAND, some clay, Lense of light gray fine sand and clay @ 4.5 ft b.e.g.s		0.0	5-5-6-6	2.0
5	6.0		SAME				
		SP	Light gray to light brown fine SAND, trace silt		0.0	3-3-1-3	2.0
	8.0	SP-SC	Light brownish gray soft CLAY and fine SAND		0.0	3-4-5-4	2.0
10	10.0	SC	Light orangish brown to light brown fine to coarse SAND some soft clay, trace gravel		0.0	2-1-2-2	2.0
	12.0	SP-SM	Dark orangish brown fine SAND and SILT, trace gravel		0.0	4-2-3-3	2.0
	14.0		Dark orangish brown fine SAND, some soft clay		0.0	4-4-4-7	2.0
15		SC	SAME		0.0	1-2-4-4	2.0
			NO RECOVERY		-	2-2-2-5	0.0
20	20.0		Light orangish brown fine to coarse SAND, some silt, trace gravel		0.0	4-7-16-12	2.0
		SM	SAME		0.0	9-10-9-9	1.5
			SAME				
25	25.0	GP	Light orangish brown fine SAND and multi-colored GRAVEL		0.0	8-9-9-11	2.0
	26.0	SC	Light orangish brown to light brown fine SAND, some clay		0.0	6-8-12-19	1.5
	27.0	CL	Light brown CLAY, some fine sand				
	28.0	SP	Dark brownish orange fine SAND, trace clay, trace gravel		0.0	12-14-19-19	2.0
30	30.0						
35							
40							

Well Construction Details



NOTES:
1. Boring terminated at ± 30.0 feet below existing ground surface (b.e.g.s).
2. Water level observed at approximately ± 5.6 b.e.g.s
3. Well Screen Interval: 5 ft - 20 ft b.e.g.s
4. Well Permit Number: 269876
5. Soil descriptions performed in general accordance with ASTM D 2488, the Practice for Description and Identification of Soils (Visual-Manual Procedure).

DUFFIELD ASSOCIATES
Soil, Water & the Environment

SB-4/MW-4

Hydrogeologic Asessment
Bioenergy Development Group,
Planned Anaerobic Digester
Seaford, DE
Project No. 12393.ED

Date Started	: June 19, 2020	Drilling Equipment	: Truck-Mounted Diedrich D-50
Date Completed	: June 19, 2020	Drilling Methods	: Hollow Stem Augers/ Mud Rotary
Logged by	: JLF		
Weather	: Sunny, 70s		
Driller/Agency	: M. Lyons/CGC Geoservices, LLC		

Sample Condition: Remolded
Water Levels: During Drilling

Depth in feet	Layer Depth feet	USCS	DESCRIPTION	SAMPLES	PID (D.U.)	Blows Per 6 Inches	Recovery (ft)
0		SM	Light brown to dark brown fine SAND, some silt		0.3	4-5-5-5	2.0
	2.0	CL	Light gray and light orangish brown CLAY, trace fine sand				
	2.5	SP	Light orangish brown to light grayish brown fine SAND, trace clay		0.2	5-6-7-7	2.0
	4.0	CL	Light gray stiff CLAY (dark orange mottling)				
5	5.0	ML	Light gray SILT, some fine sand, trace clay		0.2	7-8-8-9	2.0
	6.0	CL	Light gray stiff CLAY, Lense of dark brown fine sand and trace organics @ 7 ft b.e.g.s		0.3	10-17-22-24	2.0
	8.5		Light gray soft CLAY				
	9.0	SP	Light orangish brown to white medium to coarse SAND, trace silt		31.8-73.5	7-7-4-5	2.0
10	10.0	CL	Light gray stiff CLAY, Lense of dark orange iron @ 9 ft b.e.g.s		0.5-1.5	3-3-5-7	2.0
		SP	Light orangish white medium to coarse SAND, trace silt				
			SAME		0.2	1-4-7-7	1.0
			SAME				
			NO RECOVERY				
15			Light brown to white medium to coarse SAND, trace silt		0.2	5-7-7-8	2.0
	16.0		SAME				
		SP	Light gray to white fine to coarse SAND, some gravel, trace clay		-	6-3-3-2	1.0
	18.0	GP	Light gray to white coarse SAND and GRAVEL, some silt		0.2	3-3-3-3	1.0
20			NO RECOVERY		-	3-2-1-1	0.0
	22.0	SM	Light brownish gray fine SAND, some silt, Lense of gravel @ 23 ft b.e.g.s		0.2	5-12-13-18	1.5
25			Light gray fine SAND, some silt		0.2	19-17-13-14	2.0
	26.0	SC	Light grayish white fine SAND, some clay				
	27.0	GP	Multi-colored GRAVEL, some fine sand		0.2	10-5-5-7	1.5
	28.0	SC	Light gray fine SAND, some clay				
	29.0	GP	Light gray fine SAND and multi-colored GRAVEL		0.2	6-6-5-6	2.0
30	30.0						
35							
40							

Well Construction Details:
- 2" Schedule 40 PVC Well Casing
- Bentonite Seal
- Sand Pack- #2 Well Sand
- 3/4" Schedule 40 PVC Well Screen

WATER LEVEL

Well Depth (ft): 3.0, 5.0, 20.0, 20.3

NOTES:
1. Boring terminated at ± 30.0 feet below existing ground surface (b.e.g.s).
2. Water level observed at approximately ± 6.0 b.e.g.s
3. Well Screen Interval: 5 ft - 20 ft b.e.g.s
4. Well Permit Number: 269877
5. Soil descriptions performed in general accordance with ASTM D 2488, the Practice for Description and Identification of Soils (Visual-Manual Procedure).
6. PID background at about 0.1- 0.7 ppm

DUFFIELD ASSOCIATES
Soil, Water & the Environment

SB-5/MW-5

Hydrogeologic Asessment
Bioenergy Development Group,
Planned Anaerobic Digester
Seaford, DE
Project No. 12393.ED

Date Started	: June 24, 2020	Drilling Equipment	: Truck-Mounted Diedrich D-50
Date Completed	: June 24, 2020	Drilling Methods	: Hollow Stem Augers/ Mud Rotary
Logged by	: JLF		
Weather	: Sunny, 70s		
Driller/Agency	: M. Lyons/CGC Geoservices, LLC		

Sample Condition: Remolded
Water Levels: During Drilling

Depth in feet	Layer Depth feet	USCS	DESCRIPTION	SAMPLES	PID (D.U.)	Blows Per 6 Inches	Recovery (ft)
0			ASPHALT				
	1.0	SP	Light grayish brown fine to medium SAND, trace silt				
	2.0	SP-SM	Light gray fine to medium SAND and SILT		0.2	4-6-6-8	2.0
	2.5	SP	Light orangish brown fine SAND, trace silt				
	3.0	SP-SC	Light gray to brown soft CLAY and fine to medium SAND		0.2	3-5-6-9	2.0
5	5.0	SC	Light gray medium SAND, some soft clay				
	6.0	CL	Light gray soft CLAY, some medium sand and gravel, Lense of dark brown sand and gravel @ 6.5 ft b.e.g.s		0.2	14-13-13-15	2.0
			SAME		0.2	14-8-7-7	2.0
			SAME				
	9.5	ML	Light brown SILT, some fine sand, trace gravel		0.2	5-6-6-5	2.0
10			SAME		-	-------	1.0
	12.0	SC	Light gray to orangish gray fine to coarse SAND, some clay, trace gravel		0.2	5-4-3-3	1.5
15			SAME- Lense of dark brown soft clay, some fine mica sand @ 15 ft b.e.g.s, signs of iron deposit rings @ 15 ft b.e.g.s		0.2	3-4-6-4	2.0
			NO RECOVERY		-	7-5-6-6	0.0
	18.0	GP	Multi-colored GRAVEL and light brown coarse SAND		0.2	7-11-7-7	1.0
			NO RECOVERY				
20	20.0	CL	Light grayish brown soft CLAY, trace fine sand				
	20.5	SP-SC	Dark orangish brown fine SAND and silty CLAY, trace gravel		0.2	14-16-22-26	2.0
	22.0	ML	Dark orange and light gray mottled SILT, some sand		0.2	5-3-5-7	2.0
	24.0	GP-GM	Multi-colored GRAVEL, some soft dark orangish brown silt		0.2	3-3-7-10	1.5
25	26.0	CL	Light brownish gray CLAY, trace fine sand		0.2	5-6-7-8	2.0
			Light orangish brown soft CLAY, trace fine sand, trace silt		0.2	7-7-6-5	2.0
30	30.0						
35							
40							

Well Construction Details:
- 2" Schedule 40 PVC Well Casing
- Bentonite Seal
- Sand Pack- #2 Well Sand
- 2" Schedule 40 PVC Well Screen

WATER LEVEL

Well Depth (ft): 3.0, 5.0, 20.0, 20.3

NOTES:
1. Boring terminated at ± 30.0 feet below existing ground surface (b.e.g.s).
2. Water level observed at approximately ± 6.0 b.e.g.s
3. Well Screen Interval: 5 ft - 20 ft b.e.g.s
4. Well Permit Number: 269871
5. Soil descriptions performed in general accordance with ASTM D 2488, the Practice for Description and Identification of Soils (Visual-Manual Procedure).
6. PID background at about 0.2 ppm

DUFFIELD ASSOCIATES
Soil, Water & the Environment

SB-6/MW-6

Hydrogeologic Asessment
Bioenergy Development Group,
Planned Anaerobic Digester
Seaford, DE
Project No. 12393.ED

Date Started	: June 24, 2020	Drilling Equipment	: Truck-Mounted Diedrich D-50
Date Completed	: June 24, 2020	Drilling Methods	: Hollow Stem Augers/ Mud Rotary
Logged by	: JLF		
Weather	: Cloudy, 70s		
Driller/Agency	: M. Lyons/CGC Geoservices, LLC		

Sample Condition: Remolded
Water Levels: During Drilling

Depth in feet	Layer Depth feet	USCS	DESCRIPTION	SAMPLES	PID (D.U.)	Blows Per 6 Inches	Recovery (ft)
0		SC	Light orangish brown fine to medium SAND, some clay		0.2	5-7-7-8	2.0
	2.0		SAME				
		SM	Light orangish brown fine to medium SAND, some silt		0.2	5-4-3-3	2.0
			SAME				
5			SAME- Lense of hard light gray clay @ 6 ft b.e.g.s		2.1	2-2-3-4	2.0
			SAME		0.3	4-5-6-6	2.0
	8.0						
		SP-SM	Light orangish brown stiff SILT and fine SAND		0.3	13-14-16-15	2.0
10			Light orangish brown fine to medium SAND and stiff SILT		0.3	16-18-18-22	2.0
	11.0	ML	Light gray stiff SILT, some fine to medium sand				
	12.0	SM	Light orangish brown fine to medium SAND, some soft silt		0.3	7-10-10-12	2.0
15			SAME		0.3	8-8-8-8	2.0
	16.0	SP-SC	Light orangish brown fine SAND and soft CLAY		0.3	5-3-4-3	1.5
			NO RECOVERY		-	2-2-1-2	0.0
20			Dark orangish brown medium to coarse SAND and soft CLAY		0.3	2-2-5-7	2.0
	21.0	CL	Orangish brown soft CLAY, some medium to coarse sand				
	22.0	SC	Orangish brown fine to coarse SAND, some soft clay, trace gravel, trace silt		0.3	5-7-7-7	1.5
	24.0	GP	Orangish brown medium to coarse SAND and GRAVEL, trace silt		0.3	8-8-6-3	0.5
25	26.0		NO RECOVERY				
		CH	Orangish brown CLAY (high plasticity), some fine sand		0.3	5-8-13-13	2.0
			Orangish brown CLAY (high plasticity)				
			NO RECOVERY		-	6-7-3-4	0.0
30	30.0						
35							
40							

Well Construction Details:
- 2" Schedule 40 PVC Well Casing
- Bentonite Seal
- Sand Pack- #2 Well Sand
- 2" Schedule 40 PVC Well Screen

WATER LEVEL

Well Depth (ft): 5.0, 7.0, 22.0, 22.3

NOTES:
1. Boring terminated at ± 30.0 feet below existing ground surface (b.e.g.s).
2. Water level observed at approximately ± 11.8 b.e.g.s
3. Well Screen Interval: 7 ft - 22 ft b.e.g.s
4. Well Permit Number: 269872
5. Soil descriptions performed in general accordance with ASTM D 2488, the Practice for Description and Identification of Soils (Visual-Manual Procedure).
6. PID background at about 0.2 - 0.3 ppm

DUFFIELD ASSOCIATES
Soil, Water & the Environment

SB-7/MW-7

Hydrogeologic Asessment
Bioenergy Development Group,
Planned Anaerobic Digester
Seaford, DE
Project No. 12393.ED

Date Started	: June 23, 2020	Drilling Equipment	: Truck-Mounted Diedrich D-50
Date Completed	: June 23, 2020	Drilling Methods	: Hollow Stem Augers/ Mud Rotary
Logged by	: JLF		
Weather	: Sunny, 70s		
Driller/Agency	: J. Heil/CGC Geoservices, LLC		

Sample Condition: Remolded
Water Levels: During Drilling

Depth in feet	Layer Depth feet	USCS	DESCRIPTION	SAMPLES	PID (D.U.)	Blows Per 6 Inches	Recovery (ft)
0		SP	Light brown fine SAND, trace clay, trace organics		0.0	2-3-3-3	2.0
			SAME		1.1	2-2-2-3	2.0
5			Light orangish brown to gray fine SAND, some silt		8.0	3-3-5-7	1.5
	6.0	SP-SM	Light grayish brown soft SILT and fine SAND		3.5	7-7-8-8	2.0
	8.0	SC	Light orangish gray fine SAND, some clay		7.0	6-3-4-4	2.0
10			SAME		5.8	6-4-4-6	2.0
			SAME (trace gravel)		0.3	2-2-1-5	2.0
15			SAME		1.2	4-3-4-5	2.0
			SAME		0.2	2-2-2-3	2.0
	18.0	SP	Light orangish gray to gray medium to coarse SAND		0.2	3-3-2-3	2.0
20	20.0	GP	Light brown medium to coarse SAND and GRAVEL		0.3	2-12-19-18	1.5
	21.0	SP	Light brown fine SAND, some clay, trace gravel				
			SAME- lense of hard silt and some sand @ 23 ft b.e.g.s		0.2	17-19-30-36	1.5
	23.0	GP	Multi-colored coarse SAND and GRAVEL				
	24.0	SP	Light orangish brown fine SAND, trace clay		0.8	14-17-24-27	1.5
25	25.0	GP	Multi-colored GRAVEL, some fine sand				
	26.0	SP	Light brown fine to medium SAND, trace silt		0.2	9-9-10-11	1.0
	28.5		Orangish brown fine SAND, trace silt				
		GP	Multi-colored GRAVEL, some fine to coarse sand		0.2	8-8-10-8	1.5
30	30.0						
35							
40							

Well Construction Details:
- 2" Schedule 40 PVC Well Casing
- Bentonite Seal
- Sand Pack- #2 Well Sand
- 2" Schedule 40 PVC Well Screen

WATER LEVEL

Well Depth (ft): 5.0, 7.0, 22.0, 22.3

NOTES:
1. Boring terminated at ± 30.0 feet below existing ground surface (b.e.g.s).
2. Water level observed at approximately ± 12 ft b.e.g.s
3. Well Screen Interval: 7 ft - 22 ft b.e.g.s
4. Well Permit Number: 269873
5. Soil descriptions performed in general accordance with ASTM D 2488, the Practice for Description and Identification of Soils (Visual-Manual Procedure).

DUFFIELD ASSOCIATES
Soil, Water & the Environment

SB-8/MW-8

Hydrogeologic Asessment
Bioenergy Development Group,
Planned Anaerobic Digester
Seaford, DE
Project No. 12393.ED

Date Started	: June 19, 2020	Drilling Equipment	: Truck-Mounted Diedrich D-50
Date Completed	: June 22, 2020	Drilling Methods	: Hollow Stem Augers/ Mud Rotary
Logged by	: JLF		
Weather	: Cloudy, 80s		
Driller/Agency	: M. Lyons/CGC Geoservices, LLC		

Sample Condition: Remolded
Water Levels: During Drilling

Depth in feet	Layer Depth feet	USCS	DESCRIPTION	SAMPLES	PID (D.U.)	Blows Per 6 Inches	Recovery (ft)
0		SC	Light brown fine SAND, some clay		0.6	11-8-8-7	2.0
	2.0	SP-SC	Light gray fine to medium SAND and soft CLAY		4.2	7-6-6-10	2.0
	3.0	SM	Light orangish brown fine SAND, some silt				
5	5.0		SAME		1.0	28-25-18-14	2.0
	6.0	ML	Light gray dry hard SILT, trace fine sand				
	7.5	CL	Light gray CLAY, some fine sand		1.6	10-9-9-8	2.0
		SW-SC	Light gray CLAY and fine SAND				
			SAME (Light gray and light orangish brown)		1.4	5-5-4-3	2.0
10			SAME (White)		1.4	3-3-3-8	2.0
	12.0	SC	Light gray to white medium to coarse SAND, some clay				
	12.5	SW-SC	Light gray medium to coarse SAND and soft CLAY		0.2	1-1-1-1/12	1.0
	14.0	SP	Light brownish gray medium to coarse SAND, some soft clay, trace multi-colored gravel		4.2	2-2-4-2	1.0
15	16.0		NO RECOVERY				
		SW-SC	Brownish orange soft CLAY and fine SAND		0.2	8-9-6-9	1.5
	18.0		Light gray medium to coarse SAND and soft CLAY, some gravel				
		CL	Reddish brownish orange soft CLAY, some fine sand		0.6	5-6-3-5	1.5
20			SAME (Trace gravel)				
	21.5		SAME		0.2	8-10-9-12	2.0
	22.0	GP	Light orangish brown GAVEL, some fine sand				
		SP	Orangish brown fine SAND, some clay, trace gravel		0.5	6-14-10-15	1.0
	24.0		NO RECOVERY				
25		CL	Dark gray CLAY, trace fine sand, trace silt		0.3	9-5-4-7	2.0
	25.5	SP	Orangish brown hard fine SAND, trace clay, some large gravel				
	26.0	CH	Light gray CLAY, trace fine sand		0.2	3-4-4-7	1.5
			Light gray CLAY (High plasticity), trace gravel		0.2	3-5-7-9	2.0
30	30.0						
35							
40							

Well Construction Details:
- 2" Schedule 40 PVC Well Casing
- Bentonite Seal
- Sand Pack- #2 Well Sand
- 2" Schedule 40 PVC Well Screen

WATER LEVEL

Well Depth (ft): 3.0, 5.0, 20.0, 20.3

NOTES:
1. Boring terminated at ± 30.0 feet below existing ground surface (b.e.g.s).
2. Water level observed at approximately ± 5.2 b.e.g.s
3. Well Screen Interval: 5 ft - 20 ft b.e.g.s
4. Well Permit Number: 269878
5. Soil descriptions performed in general accordance with ASTM D 2488, the Practice for Description and Identification of Soils (Visual-Manual Procedure).
6. PID background at 0.2 ppm

APPENDIX 4

MONITOR WELL PERMITS AND WELL COMPLETION REPORTS

DELAWARE
DIVISION OF WATER RESOURCES
Working for YOU to Provide "Clean Water for Today and Tomorrow"

PERMIT
269874 through 269878

Tax Map Number: 1-32-11.00-0041.00

DRILLER COPY

Pursuant to provisions of Title 7, Delaware Code, Chapter 60, permission is hereby granted to:

BDG DE LLC
9250 Bendix Road North, Columbia, MD 21045 US

to construct, operate and maintain 5 Standard Monitor Well(s) in a total of 5 boring(s)

This permit is only valid for construction upon obtaining an Authorization Number from Delaware DNREC.

Construction must be completed on or before 5/11/2021, one year from permit issuance date.

A permit extension can be obtained on or before the date above by contacting Delaware DNREC.

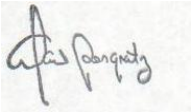
Construction must be done by a person duly licensed by the Delaware DNREC for such activity.

All current regulations governing well construction shall be followed.

All attached permit conditions shall be complied with.

The applicant is responsible for obtaining all additionally required permits and approvals.

Should the well identifcation tag become detached and irrecoverable from the well(s), the property owner is responsible to contact the Water Supply section of DNREC at 302-739-9944 for a replacement.



5/11/2020

AUTHORIZED SIGNATURE DATE

Authorization Number:

To obtain authorization please call toll free: 1-866-276-2353

DELAWARE
DIVISION OF WATER RESOURCES
Working for YOU to Provide "Clean Water for Today and Tomorrow"

PERMIT
269874 through 269878

Well Driller Responsible Conditions

§16 The well(s) shall be adequately developed.

§18 The driller is responsible for decontaminating drilling equipment to prevent cross-contamination.

§50 At such time when this well must be abandoned , an abandonment report, signed by the well driller in responsible charge of the work, must be submitted to the Water Supply Section within 30 days of abandonment of the well(s).

§63 A well completion report shall be submitted to the Water Supply Section within 30 days of completion of well construction.

§69 At least 1 foot of dry bentonite pellets shall be placed above the gravel pack.

§79 The well pit cover shall be made of a material approved by the Department. The identification tag, supplied by the Department, shall be permanently attached to the well pit cover. The well pit cover shall be maintained at or slightly above the natural ground surface.

§80 The well pit shall be constructed in accordance with the approved plans and specifications.

§84 The area surrounding the monitor well shall be restored to its original condition immediately upon completion and/or abandonment of the well.

§87 The well driller or well driver is required to have at the drilling site an approved authorization number that must accompany the approved well permit.

§90 Well(s) shall be flush mounted with natural ground surface and shall be constructed with a 6 inch radius cement apron around the top of each well. The well cap(s) shall be secured with a lock, and shall carry an identifying marker.

§104 The well driller or well driver is required to have at the drilling site a copy of the signed well permit or, in the case of verbal permits, the permit number.

§105 The top of the gravel pack shall extend at least 1 foot above the top of the well screen. If the well is influenced by the water table, a minimum of 2 feet of a dry, granular or pelleted bentonite plug placed above the gravel pack is recommended. An approved cement and bentonite mix shall be used to grout either the top of the gravel pack or from the top of the bentonite plug to the ground surface.

DELAWARE
DIVISION OF WATER RESOURCES
Working for YOU to Provide "Clean Water for Today and Tomorrow"

PERMIT
269874 through 269878

Owner/Well Driller Combined Responsibility Conditions

§1 The approval of this permit does not relieve the responsible party from the requirement for obtaining all permits that are required by federal, state, county, and local governments. The responsible party shall comply with any and all federal, state, county, and local statutes, ordinances, zoning procedures, orders, regulations, rules, as a condition of the issuance of this permit.

§2 The issuance of this permit does not guarantee the performance of the permitted well to the standards required by the project. The Department has no knowledge of subsurface conditions or of the constructability of the proposed well.

§3 This permit is valid only for the specific operations and processes applied for and indicated on the application form and attached drawings. Any unauthorized deviations from the approved project or violations of permit conditions may constitute grounds for revocation. Upon revocation, the well will be ordered abandoned.

§11 The well shall be equipped with a locking well cap.

§52 If identifiable contamination is detected during construction, and the contamination was not anticipated or evaluated during the permit application and approval process, the well driller shall cease work and notify the Emergency Response Hotline immediately by calling 1-800-662-8802, followed by the Water Supply Section 302-739-9944.

§54 Representatives of DNREC, the Delaware Geological Survey or the U.S. Geological Survey may inspect the well and/or conduct tests such as but not limited to geophysical logging and sampling, at any reasonable time after serving advance notice.

§72 The well(s) shall not be chlorinated.

§81 Only a licensed Well Driller may install the well pit and/or modify the upper terminus of the well.

DELAWARE
DIVISION OF WATER RESOURCES
Working for YOU to Provide "Clean Water for Today and Tomorrow"

PERMIT
269874 through 269878

Tax Map Number: 1-32-11.00-0041.00

OWNER COPY

Pursuant to provisions of Title 7, Delaware Code, Chapter 60, permission is hereby granted to:

BDG DE LLC
9250 Bendix Road North, Columbia, MD 21045 US

to construct, operate and maintain 5 Standard Monitor Well(s) in a total of 5 boring(s)

This permit is only valid for construction upon obtaining an Authorization Number from Delaware DNREC.

Construction must be completed on or before 5/11/2021, one year from permit issuance date.

A permit extension can be obtained on or before the date above by contacting Delaware DNREC.

Construction must be done by a person duly licensed by the Delaware DNREC for such activity.

All current regulations governing well construction shall be followed.

All attached permit conditions shall be complied with.

The applicant is responsible for obtaining all additionally required permits and approvals.

Should the well identifcation tag become detached and irrecoverable from the well(s), the property owner is responsible to contact the Water Supply section of DNREC at 302-739-9944 for a replacement.

5/11/2020

AUTHORIZED SIGNATURE DATE

DIVISION OF WATER RESOURCES

Working for YOU to Provide "Clean Water for Today and Tomorrow"

PERMIT
269874 through 269878

Owner/Well Driller Combined Responsibility Conditions

§1 The approval of this permit does not relieve the responsible party from the requirement for obtaining all permits that are required by federal, state, county, and local governments. The responsible party shall comply with any and all federal, state, county, and local statutes, ordinances, zoning procedures, orders, regulations, rules, as a condition of the issuance of this permit.

§2 The issuance of this permit does not guarantee the performance of the permitted well to the standards required by the project. The Department has no knowledge of subsurface conditions or of the constructability of the proposed well.

§3 This permit is valid only for the specific operations and processes applied for and indicated on the application form and attached drawings. Any unauthorized deviations from the approved project or violations of permit conditions may constitute grounds for revocation. Upon revocation, the well will be ordered abandoned.

§11 The well shall be equipped with a locking well cap.

§52 If identifiable contamination is detected during construction, and the contamination was not anticipated or evaluated during the permit application and approval process, the well driller shall cease work and notify the Emergency Response Hotline immediately by calling 1-800-662-8802, followed by the Water Supply Section 302-739-9944.

§54 Representatives of DNREC, the Delaware Geological Survey or the U.S. Geological Survey may inspect the well and/or conduct tests such as but not limited to geophysical logging and sampling, at any reasonable time after serving advance notice.

§72 The well(s) shall not be chlorinated.

§81 Only a licensed Well Driller may install the well pit and/or modify the upper terminus of the well.

Owner Responsible Conditions

§25 The well(s) shall be capped securely at all times.

§57 Water taken from this well is not to be used for human consumption.

§58 The well shall not be used for the processing or preparation of food for sale.

§64 This permit and all conditions shall transfer to future owners of this property, identified by Tax ID# 1-32-11.00-0041.00.

DELAWARE
DIVISION OF WATER RESOURCES
Working for YOU to Provide "Clean Water for Today and Tomorrow"

PERMIT
269871 through 269873

Tax Map Number: 1-32-11.00-0041.02

DRILLER COPY

Pursuant to provisions of Title 7, Delaware Code, Chapter 60, permission is hereby granted to:

BDG DE LLC
9250 Bendix Road North, Columbia, MD 21045 US

to construct, operate and maintain 3 Standard Monitor Well(s) in a total of 3 boring(s)

This permit is only valid for construction upon obtaining an Authorization Number from Delaware DNREC.

Construction must be completed on or before 5/11/2021, one year from permit issuance date.

A permit extension can be obtained on or before the date above by contacting Delaware DNREC.

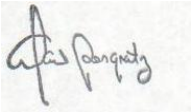
Construction must be done by a person duly licensed by the Delaware DNREC for such activity.

All current regulations governing well construction shall be followed.

All attached permit conditions shall be complied with.

The applicant is responsible for obtaining all additionally required permits and approvals.

Should the well identifcation tag become detached and irrecoverable from the well(s), the property owner is responsible to contact the Water Supply section of DNREC at 302-739-9944 for a replacement.



5/11/2020

AUTHORIZED SIGNATURE DATE

Authorization Number:

To obtain authorization please call toll free: 1-866-276-2353

DELAWARE
DIVISION OF WATER RESOURCES
Working for YOU to Provide "Clean Water for Today and Tomorrow"

PERMIT
269871 through 269873

Well Driller Responsible Conditions

§16 The well(s) shall be adequately developed.

§18 The driller is responsible for decontaminating drilling equipment to prevent cross-contamination.

§50 At such time when this well must be abandoned , an abandonment report, signed by the well driller in responsible charge of the work, must be submitted to the Water Supply Section within 30 days of abandonment of the well(s).

§63 A well completion report shall be submitted to the Water Supply Section within 30 days of completion of well construction.

§69 At least 1 foot of dry bentonite pellets shall be placed above the gravel pack.

§79 The well pit cover shall be made of a material approved by the Department. The identification tag, supplied by the Department, shall be permanently attached to the well pit cover. The well pit cover shall be maintained at or slightly above the natural ground surface.

§80 The well pit shall be constructed in accordance with the approved plans and specifications.

§84 The area surrounding the monitor well shall be restored to its original condition immediately upon completion and/or abandonment of the well.

§87 The well driller or well driver is required to have at the drilling site an approved authorization number that must accompany the approved well permit.

§90 Well(s) shall be flush mounted with natural ground surface and shall be constructed with a 6 inch radius cement apron around the top of each well. The well cap(s) shall be secured with a lock, and shall carry an identifying marker.

§104 The well driller or well driver is required to have at the drilling site a copy of the signed well permit or, in the case of verbal permits, the permit number.

§105 The top of the gravel pack shall extend at least 1 foot above the top of the well screen. If the well is influenced by the water table, a minimum of 2 feet of a dry, granular or pelleted bentonite plug placed above the gravel pack is recommended. An approved cement and bentonite mix shall be used to grout either the top of the gravel pack or from the top of the bentonite plug to the ground surface.

DELAWARE
DIVISION OF WATER RESOURCES
Working for YOU to Provide "Clean Water for Today and Tomorrow"

PERMIT
269871 through 269873

Owner/Well Driller Combined Responsibility Conditions

§1 The approval of this permit does not relieve the responsible party from the requirement for obtaining all permits that are required by federal, state, county, and local governments. The responsible party shall comply with any and all federal, state, county, and local statutes, ordinances, zoning procedures, orders, regulations, rules, as a condition of the issuance of this permit.

§2 The issuance of this permit does not guarantee the performance of the permitted well to the standards required by the project. The Department has no knowledge of subsurface conditions or of the constructability of the proposed well.

§3 This permit is valid only for the specific operations and processes applied for and indicated on the application form and attached drawings. Any unauthorized deviations from the approved project or violations of permit conditions may constitute grounds for revocation. Upon revocation, the well will be ordered abandoned.

§11 The well shall be equipped with a locking well cap.

§52 If identifiable contamination is detected during construction, and the contamination was not anticipated or evaluated during the permit application and approval process, the well driller shall cease work and notify the Emergency Response Hotline immediately by calling 1-800-662-8802, followed by the Water Supply Section 302-739-9944.

§54 Representatives of DNREC, the Delaware Geological Survey or the U.S. Geological Survey may inspect the well and/or conduct tests such as but not limited to geophysical logging and sampling, at any reasonable time after serving advance notice.

§72 The well(s) shall not be chlorinated.

§81 Only a licensed Well Driller may install the well pit and/or modify the upper terminus of the well.

DELAWARE
DIVISION OF WATER RESOURCES
Working for YOU to Provide "Clean Water for Today and Tomorrow"

PERMIT
269871 through 269873

Tax Map Number: 1-32-11.00-0041.02

OWNER COPY

Pursuant to provisions of Title 7, Delaware Code, Chapter 60, permission is hereby granted to:

BDG DE LLC
9250 Bendix Road North, Columbia, MD 21045 US

to construct, operate and maintain 3 Standard Monitor Well(s) in a total of 3 boring(s)

This permit is only valid for construction upon obtaining an Authorization Number from Delaware DNREC.

Construction must be completed on or before 5/11/2021, one year from permit issuance date.

A permit extension can be obtained on or before the date above by contacting Delaware DNREC.

Construction must be done by a person duly licensed by the Delaware DNREC for such activity.

All current regulations governing well construction shall be followed.

All attached permit conditions shall be complied with.

The applicant is responsible for obtaining all additionally required permits and approvals.

Should the well identifcation tag become detached and irrecoverable from the well(s), the property owner is responsible to contact the Water Supply section of DNREC at 302-739-9944 for a replacement.

5/11/2020

AUTHORIZED SIGNATURE DATE

DIVISION OF WATER RESOURCES

Working for YOU to Provide "Clean Water for Today and Tomorrow"

PERMIT
269871 through 269873

Owner/Well Driller Combined Responsibility Conditions

§1 The approval of this permit does not relieve the responsible party from the requirement for obtaining all permits that are required by federal, state, county, and local governments. The responsible party shall comply with any and all federal, state, county, and local statutes, ordinances, zoning procedures, orders, regulations, rules, as a condition of the issuance of this permit.

§2 The issuance of this permit does not guarantee the performance of the permitted well to the standards required by the project. The Department has no knowledge of subsurface conditions or of the constructability of the proposed well.

§3 This permit is valid only for the specific operations and processes applied for and indicated on the application form and attached drawings. Any unauthorized deviations from the approved project or violations of permit conditions may constitute grounds for revocation. Upon revocation, the well will be ordered abandoned.

§11 The well shall be equipped with a locking well cap.

§52 If identifiable contamination is detected during construction, and the contamination was not anticipated or evaluated during the permit application and approval process, the well driller shall cease work and notify the Emergency Response Hotline immediately by calling 1-800-662-8802, followed by the Water Supply Section 302-739-9944.

§54 Representatives of DNREC, the Delaware Geological Survey or the U.S. Geological Survey may inspect the well and/or conduct tests such as but not limited to geophysical logging and sampling, at any reasonable time after serving advance notice.

§72 The well(s) shall not be chlorinated.

§81 Only a licensed Well Driller may install the well pit and/or modify the upper terminus of the well.

Owner Responsible Conditions

§25 The well(s) shall be capped securely at all times.

§57 Water taken from this well is not to be used for human consumption.

§58 The well shall not be used for the processing or preparation of food for sale.

§64 This permit and all conditions shall transfer to future owners of this property, identified by Tax ID# 1-32-11.00-0041.02.

MAIL TO:

WATER SUPPLY SECTION
DIVISION OF WATER
RESOURCES
89 KINGS HIGHWAY
DOVER, DELAWARE 19901

PHONE: 302-739-9944
FAX: 302-739-7764

STATE OF DELAWARE
DEPARTMENT OF NATURAL RESOURCES
AND ENVIRONMENTAL CONTROL

WELL COMPLETION REPORT

http://www.dnrec.state.de.us/

APPLICATION MUST BE SUBMITTED AND PERMIT RECEIVED BEFORE DRILLING IS STARTED.

- OFFICIAL USE ONLY -

PAGE # _____ OF _____ PAGES

PERMIT #: _____

Owner: BDG DE LLC
Address: 9250 Bendix Road North
Columbia MD US 21045
Telephone:
Email:
Permit #: 269874
Local ID: MW-1
Licensed Preparer / WC: CGC Geoservices
License #: 5522
Well Driller in Charge:
License #: 5689
Construction Method: Augered
Total Depth of Excavation: 21.00 feet
Construction Date: 6/17/2020

Casing	Top	Bottom	Diameter	Material
Inner Casing	0.00	6.00	2.00	PVC

Screen Material: PVC **Diameter:** 2.00
Top: 6.00 **Bottom:** 21.00
Type of Grout: Bentonite/Cement Mixture
Top: 0.00 **Bottom:** 6.00
Gravel Pack Interval:
Top: 6.00 **Bottom:** 21.00
Type of Non-Grout Backfill of Well Annulus: None
Top: 0.00 **Bottom:** 0.00
Screen Slot Size: 2
Gravel Pack Size: 2
Static Water Level: 8.00 ft. Below Ground Surface
Date: 6/17/2020
Pumping Water Level: 8.0000 ft.
Date: 6/25/2020
After: 1.00 hrs.
Pumping at: 1.00 GPM
Was a Geophysical Log Taken? No

I HEREBY AFFIRM THE INFORMATION I HAVE SUBMITTED IS ACCURATE AND CORRECT.

Signature - Licensed Preparer/Well Contractor **Date**

Signature - Property Owner **Date**

LOCATION MAP - ROAD MAP

County: Sussex
Tax Parcel: 1-32-11.00-0041.00
Lot #:

WELL HEAD COMPLETION

Type: Pad Mount
Other:
Well Head Completed: 1.00 in.
Below Ground Surface
Was the Well Tag attached in accordance with current regulations?
Yes
Comments:

X: 183681.51
Y: 67074.33

Ref#: 45811

MAIL TO:

WATER SUPPLY SECTION
DIVISION OF WATER RESOURCES
89 KINGS HIGHWAY
DOVER, DELAWARE 19901

PHONE: 302-739-9944
FAX: 302-739-7764

STATE OF DELAWARE
DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL

WELL COMPLETION REPORT

http://www.dnrec.state.de.us/

APPLICATION MUST BE SUBMITTED AND PERMIT RECEIVED BEFORE DRILLING IS STARTED.

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PERMIT #: _____

FORMATION LOG

Formation Type:	Fine Sand	**Other:**	
Formation Type With:	Silt	**Other:**	
From:	0.00	**To:**	18.00
Color:	Brown/ Gray		
Texture	Fine	**Other:**	
To:	Fine	**Other:**	
Cement:		**Other**	
Sorting:		**Other:**	
Hardness:		**Other:**	
Comment:			

Formation Type:	Clay	**Other:**	
Formation Type With:	Sand	**Other:**	
From:	18.00	**To:**	21.00
Color:	Gray		
Texture		**Other:**	
To:		**Other:**	
Cement:		**Other**	
Sorting:		**Other:**	
Hardness:		**Other:**	
Comment:			

Formation Type:	Coarse Sand	**Other:**	
Formation Type With:	Silt	**Other:**	
From:	21.00	**To:**	30.00
Color:	Brown, orange		
Texture	Coarse	**Other:**	
To:	Coarse	**Other:**	
Cement:		**Other**	
Sorting:		**Other:**	
Hardness:		**Other:**	
Comment:			

Ref#: 45811

MAIL TO:

WATER SUPPLY SECTION
DIVISION OF WATER RESOURCES
89 KINGS HIGHWAY
DOVER, DELAWARE 19901

PHONE: 302-739-9944
FAX: 302-739-7764

STATE OF DELAWARE
DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL

WELL COMPLETION REPORT

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APPLICATION MUST BE SUBMITTED AND PERMIT RECEIVED BEFORE DRILLING IS STARTED.

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PERMIT #: _____

Owner: BDG DE LLC
Address: 9250 Bendix Road North
Columbia MD US 21045
Telephone:
Email:
Permit #: 269875
Local ID: MW-2
Licensed Preparer / WC: CGC Geoservices
License #: 5522
Well Driller in Charge:
License #: 5689
Construction Method: Augered
Total Depth of Excavation: 21.00 feet
Construction Date: 6/18/2020

Casing	Top	Bottom	Diameter	Material
Inner Casing	0.00	6.00	2.00	PVC

Screen Material: PVC **Diameter:** 2.00
Top: 6.00 **Bottom:** 21.00
Type of Grout: Bentonite/Cement Mixture
Top: 0.00 **Bottom:** 6.00
Gravel Pack Interval:
Top: 6.00 **Bottom:** 21.00
Type of Non-Grout Backfill of Well Annulus: None
Top: 0.00 **Bottom:** 0.00
Screen Slot Size: 10
Gravel Pack Size: 2
Static Water Level: 7.00 ft. Below Ground Surface
Date: 6/18/2020
Pumping Water Level: 7.0000 ft.
Date: 6/25/2020
After: 1.00 hrs.
Pumping at: 1.00 GPM
Was a Geophysical Log Taken? No

I HEREBY AFFIRM THE INFORMATION I HAVE SUBMITTED IS ACCURATE AND CORRECT.

Signature - Licensed Preparer/Well Contractor **Date**

Signature - Property Owner **Date**

LOCATION MAP - ROAD MAP

County: Sussex
Tax Parcel: 1-32-11.00-0041.00
Lot #:

WELL HEAD COMPLETION

Type: Pad Mount
Other:
Well Head Completed: 1.00 in.
Below Ground Surface
Was the Well Tag attached in accordance with current regulations?
Yes
Comments:

X: 183583.72
Y: 66972.16

Ref#: 45812

MAIL TO:

WATER SUPPLY SECTION
DIVISION OF WATER RESOURCES
89 KINGS HIGHWAY
DOVER, DELAWARE 19901

PHONE: 302-739-9944
FAX: 302-739-7764

STATE OF DELAWARE
DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL

WELL COMPLETION REPORT

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PERMIT #: _____

FORMATION LOG

Formation Type:	Fine Sand	**Other:**	
Formation Type With:	Silt	**Other:**	
From:	0.00	**To:**	26.00
Color:	Brown, orange		
Texture	Fine	**Other:**	
To:	Fine	**Other:**	
Cement:		**Other**	
Sorting:		**Other:**	
Hardness:		**Other:**	
Comment:			

Formation Type:	Clay	**Other:**	
Formation Type With:	Sand	**Other:**	
From:	26.00	**To:**	30.00
Color:	Brown, orange		
Texture		**Other:**	
To:		**Other:**	
Cement:		**Other**	
Sorting:		**Other:**	
Hardness:		**Other:**	
Comment:			

Ref#: 45812

MAIL TO:

WATER SUPPLY SECTION
DIVISION OF WATER
RESOURCES
89 KINGS HIGHWAY
DOVER, DELAWARE 19901

PHONE: 302-739-9944
FAX: 302-739-7764

STATE OF DELAWARE
DEPARTMENT OF NATURAL RESOURCES
AND ENVIRONMENTAL CONTROL

WELL COMPLETION REPORT

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APPLICATION MUST BE SUBMITTED AND PERMIT RECEIVED BEFORE DRILLING IS STARTED.

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PERMIT #: _____

Owner:	BDG DE LLC
Address:	9250 Bendix Road North
	Columbia MD US 21045
Telephone:	
Email:	
Permit #:	269876
Local ID:	MW-3
Licensed Preparer / WC:	CGC Geoservices
License #:	5522
Well Driller in Charge:	
License #:	5689
Construction Method:	Augered
Total Depth of Excavation:	20.00 feet
Construction Date:	6/18/2020

Casing	Top	Bottom	Diameter	Material
Inner Casing	0.00	5.00	2.00	PVC

Screen Material:	PVC	**Diameter:**	2.00
Top:	5.00	**Bottom:**	20.00
Type of Grout:	Bentonite/Cement Mixture		
Top:	0.00	**Bottom:**	5.00
Gravel Pack Interval:			
Top:	5.00	**Bottom:**	20.00
Type of Non-Grout Backfill of Well Annulus:			None
Top:	0.00	**Bottom:**	0.00
Screen Slot Size:	10		
Gravel Pack Size:	2		
Static Water Level:	6.00 ft.		Below Ground Surface
Date:	6/18/2020		
Pumping Water Level:	6.0000 ft.		
Date:	6/25/2020		
After:	1.00 hrs.		
Pumping at:	1.00 GPM		
Was a Geophysical Log Taken?		No	

I HEREBY AFFIRM THE INFORMATION I HAVE SUBMITTED IS ACCURATE AND CORRECT.

Signature - Licensed Preparer/Well Contractor **Date**

Signature - Property Owner **Date**

LOCATION MAP - ROAD MAP

County:	Sussex
Tax Parcel:	1-32-11.00-0041.00
Lot #:	

WELL HEAD COMPLETION

Type:	Pad Mount
Other:	
Well Head Completed:	1.00 in.

Below Ground Surface

Was the Well Tag attached in accordance with current regulations?
Yes

Comments:

X:	183645.87
Y:	66875.02

Ref#: 45813

MAIL TO:

WATER SUPPLY SECTION
DIVISION OF WATER RESOURCES
89 KINGS HIGHWAY
DOVER, DELAWARE 19901

PHONE: 302-739-9944
FAX: 302-739-7764

STATE OF DELAWARE
DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL

WELL COMPLETION REPORT

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PERMIT #: _____

FORMATION LOG

Formation Type:	Fine Sand	**Other:**	
Formation Type With:	Silt	**Other:**	
From:	0.00	**To:**	8.00
Color:	Brown		
Texture	Fine	**Other:**	
To:	Fine	**Other:**	
Cement:		**Other**	
Sorting:		**Other:**	
Hardness:		**Other:**	
Comment:			

Formation Type:	Clay	**Other:**	
Formation Type With:	Sand	**Other:**	
From:	8.00	**To:**	10.00
Color:	Brown, orange		
Texture		**Other:**	
To:		**Other:**	
Cement:		**Other**	
Sorting:		**Other:**	
Hardness:		**Other:**	
Comment:			

Formation Type:	Fine Sand	**Other:**	
Formation Type With:	Silt	**Other:**	
From:	10.00	**To:**	30.00
Color:	Brown, orange		
Texture	Fine	**Other:**	
To:	Fine	**Other:**	
Cement:		**Other**	
Sorting:		**Other:**	
Hardness:		**Other:**	
Comment:			

Ref#: 45813

MAIL TO:

WATER SUPPLY SECTION
DIVISION OF WATER
RESOURCES
89 KINGS HIGHWAY
DOVER, DELAWARE 19901

PHONE: 302-739-9944
FAX: 302-739-7764

STATE OF DELAWARE
DEPARTMENT OF NATURAL RESOURCES
AND ENVIRONMENTAL CONTROL

WELL COMPLETION REPORT

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APPLICATION MUST BE SUBMITTED AND PERMIT RECEIVED BEFORE DRILLING IS STARTED.

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PERMIT #: _____

Owner: BDG DE LLC
Address: 9250 Bendix Road North
Columbiz MD US 21045
Telephone:
Email:
Permit #: 269877
Local ID: MW-4
Licensed Preparer / WC: CGC Geoservices
License #: 5522
Well Driller in Charge:
License #: 5689
Construction Method: Augered
Total Depth of Excavation: 20.00 feet
Construction Date: 6/19/2020

Casing	Top	Bottom	Diameter	Material
Inner Casing	0.00	5.00	2.00	PVC

Screen Material: PVC **Diameter:** 2.00
Top: 5.00 **Bottom:** 20.00
Type of Grout: Bentonite/Cement Mixture
Top: 0.00 **Bottom:** 5.00
Gravel Pack Interval:
Top: 5.00 **Bottom:** 20.00
Type of Non-Grout Backfill of Well Annulus: None
Top: 0.00 **Bottom:** 0.00
Screen Slot Size: 10
Gravel Pack Size: 2
Static Water Level: 6.00 ft. Below Ground Surface
Date: 6/19/2020
Pumping Water Level: 6.0000 ft.
Date: 6/19/2020
After: 1.00 hrs.
Pumping at: 1.00 GPM
Was a Geophysical Log Taken? No

I HEREBY AFFIRM THE INFORMATION I HAVE SUBMITTED IS ACCURATE AND CORRECT.

Signature - Licensed Preparer/Well Contractor **Date**

Signature - Property Owner **Date**

LOCATION MAP - ROAD MAP

County: Sussex
Tax Parcel: 1-32-11.00-0041.00
Lot #:

WELL HEAD COMPLETION

Type: Pad Mount
Other:
Well Head Completed: 1.00 in.
Below Ground Surface
Was the Well Tag attached in accordance with current regulations?
Yes
Comments:

X: 183376.02
Y: 66887.31

Ref#: 45814

MAIL TO:

WATER SUPPLY SECTION
DIVISION OF WATER
RESOURCES
89 KINGS HIGHWAY
DOVER, DELAWARE 19901

PHONE: 302-739-9944
FAX: 302-739-7764

STATE OF DELAWARE
DEPARTMENT OF NATURAL RESOURCES
AND ENVIRONMENTAL CONTROL

WELL COMPLETION REPORT

http://www.dnrec.state.de.us/

APPLICATION MUST BE SUBMITTED AND PERMIT RECEIVED BEFORE DRILLING IS STARTED.

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PERMIT #: _____

FORMATION LOG

Formation Type:	Coarse Sand	**Other:**	
Formation Type With:	Silt	**Other:**	
From:	0.00	**To:**	30.00
Color:	Brown		
Texture	Coarse	**Other:**	
To:	Coarse	**Other:**	
Cement:		**Other**	
Sorting:		**Other:**	
Hardness:		**Other:**	
Comment:			

Ref#: 45814

MAIL TO:

WATER SUPPLY SECTION
DIVISION OF WATER
RESOURCES
89 KINGS HIGHWAY
DOVER, DELAWARE 19901

PHONE: 302-739-9944
FAX: 302-739-7764

STATE OF DELAWARE
DEPARTMENT OF NATURAL RESOURCES
AND ENVIRONMENTAL CONTROL

WELL COMPLETION REPORT

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APPLICATION MUST BE SUBMITTED AND PERMIT RECEIVED BEFORE DRILLING IS STARTED.

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PERMIT #: _____

Owner: BDG DE LLC
Address: 9250 Bendix Road North
Columbia MD US 21045
Telephone:
Email:
Permit #: 269871
Local ID: MW-5
Licensed Preparer / WC: CGC Geoservices
License #: 5522
Well Driller in Charge:
License #: 5689
Construction Method: Augered
Total Depth of Excavation: 20.00 feet
Construction Date: 6/24/2020

Casing	Top	Bottom	Diameter	Material
Inner Casing	0.00	5.00	2.00	PVC

Screen Material: PVC **Diameter:** 2.00
Top: 5.00 **Bottom:** 20.00
Type of Grout: Bentonite/Cement Mixture
Top: 0.00 **Bottom:** 5.00
Gravel Pack Interval:
Top: 5.00 **Bottom:** 20.00
Type of Non-Grout Backfill of Well Annulus: None
Top: 0.00 **Bottom:** 0.00
Screen Slot Size: 10
Gravel Pack Size: 2
Static Water Level: 6.00 ft. Below Ground Surface
Date: 6/24/2020
Pumping Water Level: 6.0000 ft.
Date: 6/25/2020
After: 1.00 hrs.
Pumping at: 1.00 GPM
Was a Geophysical Log Taken? No

I HEREBY AFFIRM THE INFORMATION I HAVE SUBMITTED IS ACCURATE AND CORRECT.

Signature - Licensed Preparer/Well Contractor **Date**

Signature - Property Owner **Date**

LOCATION MAP - ROAD MAP

County: Sussex
Tax Parcel: 1-32-11.00-0041.02
Lot #:

WELL HEAD COMPLETION

Type: Pad Mount
Other:
Well Head Completed: 1.00 in.
Below Ground Surface
Was the Well Tag attached in accordance with current regulations?
Yes
Comments:

X: 183440.25
Y: 66723.52

Ref#: 45817

MAIL TO:

WATER SUPPLY SECTION
DIVISION OF WATER
RESOURCES
89 KINGS HIGHWAY
DOVER, DELAWARE 19901

PHONE: 302-739-9944
FAX: 302-739-7764

STATE OF DELAWARE
DEPARTMENT OF NATURAL RESOURCES
AND ENVIRONMENTAL CONTROL

WELL COMPLETION REPORT

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APPLICATION MUST BE SUBMITTED AND PERMIT RECEIVED BEFORE DRILLING IS STARTED.

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PERMIT #: _____

FORMATION LOG

Formation Type:	Fine Sand	**Other:**	
Formation Type With:	Silt	**Other:**	
From:	0.00	**To:**	30.00
Color:	Brown, orange		
Texture	Fine	**Other:**	
To:	Fine	**Other:**	
Cement:		**Other**	
Sorting:		**Other:**	
Hardness:		**Other:**	
Comment:			

Ref#: 45817

MAIL TO:

WATER SUPPLY SECTION
DIVISION OF WATER
RESOURCES
89 KINGS HIGHWAY
DOVER, DELAWARE 19901

PHONE: 302-739-9944
FAX: 302-739-7764

STATE OF DELAWARE
DEPARTMENT OF NATURAL RESOURCES
AND ENVIRONMENTAL CONTROL

WELL COMPLETION REPORT

http://www.dnrec.state.de.us/

APPLICATION MUST BE SUBMITTED AND PERMIT RECEIVED BEFORE DRILLING IS STARTED.

- OFFICIAL USE ONLY -

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PERMIT #: _____

Owner:	BDG DE LLC
Address:	9250 Bendix Road North
	Columbia MD US 21045
Telephone:	
Email:	
Permit #:	269872
Local ID:	MW-6
Licensed Preparer / WC:	CGC Geoservices
License #:	5522
Well Driller in Charge:	
License #:	5689
Construction Method:	Augered
Total Depth of Excavation:	22.00 feet
Construction Date:	6/24/2020

Casing	Top	Bottom	Diameter	Material
Inner Casing	0.00	7.00	2.00	PVC

Screen Material:	PVC	**Diameter:**	2.00
Top:	7.00	**Bottom:**	22.00
Type of Grout:	Bentonite/Cement Mixture		
Top:	0.00	**Bottom:**	7.00
Gravel Pack Interval:			
Top:	7.00	**Bottom:**	22.00
Type of Non-Grout Backfill of Well Annulus:			None
Top:	0.00	**Bottom:**	0.00
Screen Slot Size:	10		
Gravel Pack Size:	2		
Static Water Level:	12.00 ft.		Below Ground Surface
Date:	6/24/2020		
Pumping Water Level:	12.0000 ft.		
Date:	6/25/2020		
After:	1.00 hrs.		
Pumping at:	1.00 GPM		
Was a Geophysical Log Taken?		No	

I HEREBY AFFIRM THE INFORMATION I HAVE SUBMITTED IS ACCURATE AND CORRECT.

Signature - Licensed Preparer/Well Contractor **Date**

Signature - Property Owner **Date**

LOCATION MAP - ROAD MAP

County:	Sussex
Tax Parcel:	1-32-11.00-0041.02
Lot #:	

WELL HEAD COMPLETION

Type:	Pad Mount
Other:	
Well Head Completed:	1.00 in.

Below Ground Surface

Was the Well Tag attached in accordance with current regulations?
Yes

Comments:

X:	183617.79
Y:	66656.58

Ref#: 45818

MAIL TO:

WATER SUPPLY SECTION
DIVISION OF WATER RESOURCES
89 KINGS HIGHWAY
DOVER, DELAWARE 19901

PHONE: 302-739-9944
FAX: 302-739-7764

STATE OF DELAWARE
DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL

WELL COMPLETION REPORT

http://www.dnrec.state.de.us/

APPLICATION MUST BE SUBMITTED AND PERMIT RECEIVED BEFORE DRILLING IS STARTED.

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PAGE # _____ OF _____ PAGES

PERMIT #: _____

FORMATION LOG

Formation Type:	Fine Sand	**Other:**	
Formation Type With:	Silt	**Other:**	
From:	0.00	**To:**	26.00
Color:	Brown, orange		
Texture	Fine	**Other:**	
To:	Fine	**Other:**	
Cement:		**Other**	
Sorting:		**Other:**	
Hardness:		**Other:**	
Comment:			

Formation Type:	Clay	**Other:**	
Formation Type With:	Sand	**Other:**	
From:	26.00	**To:**	30.00
Color:	Orange		
Texture		**Other:**	
To:		**Other:**	
Cement:		**Other**	
Sorting:		**Other:**	
Hardness:		**Other:**	
Comment:			

Ref#: 45818

MAIL TO:

WATER SUPPLY SECTION
DIVISION OF WATER
RESOURCES
89 KINGS HIGHWAY
DOVER, DELAWARE 19901

PHONE: 302-739-9944
FAX: 302-739-7764

STATE OF DELAWARE
DEPARTMENT OF NATURAL RESOURCES
AND ENVIRONMENTAL CONTROL

WELL COMPLETION REPORT

http://www.dnrec.state.de.us/

APPLICATION MUST BE SUBMITTED AND PERMIT RECEIVED BEFORE DRILLING IS STARTED.

- OFFICIAL USE ONLY -

PAGE # _____ OF _____ PAGES

PERMIT #: _____

Owner: BDG DE LLC
Address: 9250 Bendix Road North
Columbia MD US 21045
Telephone:
Email:
Permit #: 269873
Local ID: MW-7
Licensed Preparer / WC: CGC Geoservices
License #: 5522
Well Driller in Charge:
License #: 5689
Construction Method: Augered
Total Depth of Excavation: 22.00 feet
Construction Date: 6/23/2020

Casing	Top	Bottom	Diameter	Material
Inner Casing	0.00	7.00	2.00	PVC

Screen Material: PVC **Diameter:** 2.00
Top: 7.00 **Bottom:** 22.00
Type of Grout: Bentonite/Cement Mixture
Top: 0.00 **Bottom:** 7.00
Gravel Pack Interval:
Top: 7.00 **Bottom:** 22.00
Type of Non-Grout Backfill of Well Annulus: None
Top: 0.00 **Bottom:** 0.00
Screen Slot Size: 10
Gravel Pack Size: 2
Static Water Level: 12.00 ft. Below Ground Surface
Date: 6/23/2020
Pumping Water Level: 12.0000 ft.
Date: 6/25/2020
After: 1.00 hrs.
Pumping at: 1.00 GPM
Was a Geophysical Log Taken? No

I HEREBY AFFIRM THE INFORMATION I HAVE SUBMITTED IS ACCURATE AND CORRECT.

Signature - Licensed Preparer/Well Contractor **Date**

Signature - Property Owner **Date**

LOCATION MAP - ROAD MAP

County: Sussex
Tax Parcel: 1-32-11.00-0041.02
Lot #:

WELL HEAD COMPLETION

Type: Pad Mount
Other:
Well Head Completed: 1.00 in.
Below Ground Surface
Was the Well Tag attached in accordance with current regulations?
Yes
Comments:

X: 183813.58
Y: 66735.96

Ref#: 45819

MAIL TO:

WATER SUPPLY SECTION
DIVISION OF WATER
RESOURCES
89 KINGS HIGHWAY
DOVER, DELAWARE 19901

PHONE: 302-739-9944
FAX: 302-739-7764

STATE OF DELAWARE
DEPARTMENT OF NATURAL RESOURCES
AND ENVIRONMENTAL CONTROL

WELL COMPLETION REPORT

http://www.dnrec.state.de.us/

APPLICATION MUST BE SUBMITTED AND PERMIT RECEIVED BEFORE DRILLING IS STARTED.

- OFFICIAL USE ONLY -

PAGE # _____ OF _____ PAGES

PERMIT #: _____

FORMATION LOG

Formation Type:	Coarse Sand	**Other:**	
Formation Type With:	Clay	**Other:**	
From:	0.00	**To:**	30.00
Color:	Gray, brown, orange		
Texture	Coarse	**Other:**	
To:	Coarse	**Other:**	
Cement:		**Other**	
Sorting:		**Other:**	
Hardness:		**Other:**	
Comment:			

Ref#: 45819

MAIL TO:

WATER SUPPLY SECTION
DIVISION OF WATER
RESOURCES
89 KINGS HIGHWAY
DOVER, DELAWARE 19901

PHONE: 302-739-9944
FAX: 302-739-7764

STATE OF DELAWARE
DEPARTMENT OF NATURAL RESOURCES
AND ENVIRONMENTAL CONTROL

WELL COMPLETION REPORT

http://www.dnrec.state.de.us/

APPLICATION MUST BE SUBMITTED AND PERMIT RECEIVED BEFORE DRILLING IS STARTED.

- OFFICIAL USE ONLY -

PAGE # _____ OF _____ PAGES

PERMIT #: _____

Owner:	BDG DE LLC
Address:	9250 Bendix Road North
	Columbia MD US 21045
Telephone:	
Email:	
Permit #:	269878
Local ID:	MW-8
Licensed Preparer / WC:	CGC Geoservices
License #:	5522
Well Driller in Charge:	
License #:	5689
Construction Method:	Augered
Total Depth of Excavation:	20.00 feet
Construction Date:	6/22/2020

Casing	Top	Bottom	Diameter	Material
Inner Casing	0.00	5.00	2.00	PVC

Screen Material:	PVC	**Diameter:**	2.00
Top:	5.00	**Bottom:**	20.00
Type of Grout:	Bentonite/Cement Mixture		
Top:	0.00	**Bottom:**	5.00
Gravel Pack Interval:			
Top:	5.00	**Bottom:**	20.00
Type of Non-Grout Backfill of Well Annulus:			None
Top:	0.00	**Bottom:**	0.00

Screen Slot Size:	10	
Gravel Pack Size:	2	
Static Water Level:	5.00 ft.	Below Ground Surface
Date:	6/22/2020	
Pumping Water Level:	6.0000 ft.	
Date:	6/25/2020	
After:	1.00 hrs.	
Pumping at:	1.00 GPM	
Was a Geophysical Log Taken?	No	

I HEREBY AFFIRM THE INFORMATION I HAVE SUBMITTED IS ACCURATE AND CORRECT.

Signature - Licensed Preparer/Well Contractor **Date**

Signature - Property Owner **Date**

LOCATION MAP - ROAD MAP

County:	Sussex
Tax Parcel:	1-32-11.00-0041.00
Lot #:	

WELL HEAD COMPLETION

Type:	Pad Mount
Other:	
Well Head Completed:	1.00 in.

Below Ground Surface

Was the Well Tag attached in accordance with current regulations?
Yes

Comments:

X:	183376.02
Y:	66553.14

Ref#: 45815

MAIL TO:

WATER SUPPLY SECTION
DIVISION OF WATER RESOURCES
89 KINGS HIGHWAY
DOVER, DELAWARE 19901

PHONE: 302-739-9944
FAX: 302-739-7764

STATE OF DELAWARE
DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL

WELL COMPLETION REPORT

http://www.dnrec.state.de.us/

APPLICATION MUST BE SUBMITTED AND PERMIT RECEIVED BEFORE DRILLING IS STARTED.

- OFFICIAL USE ONLY -

PAGE # _____ OF _____ PAGES

PERMIT #: _____

FORMATION LOG

Formation Type:	Fine Sand	**Other:**	
Formation Type With:	Clay	**Other:**	
From:	0.00	**To:**	10.00
Color:	Brown		
Texture	Fine	**Other:**	
To:	Fine	**Other:**	
Cement:		**Other**	
Sorting:		**Other:**	
Hardness:		**Other:**	
Comment:			

Formation Type:	Clay	**Other:**	
Formation Type With:	Sand	**Other:**	
From:	10.00	**To:**	12.00
Color:	White, gray		
Texture		**Other:**	
To:		**Other:**	
Cement:		**Other**	
Sorting:		**Other:**	
Hardness:		**Other:**	
Comment:			

Formation Type:	Fine Sand	**Other:**	
Formation Type With:	Silt	**Other:**	
From:	12.00	**To:**	30.00
Color:	orange, brown		
Texture	Fine	**Other:**	
To:	Fine	**Other:**	
Cement:		**Other**	
Sorting:		**Other:**	
Hardness:		**Other:**	
Comment:			

Ref#: 45815

APPENDIX 5

WELL DEVELOPMENT FIELD SHEETS

DUFFIELD ASSOCIATES, INC.
LOW FLOW SAMPLING
DATA SHEET

Site: Bioenergy Development Group, Planned Anaerobic Digester Project No.: 12393.EO Personnel: JLF (Jessica)
Date: 6/24/20 Weather: Sunny, 78°F Last Sampled: Developing Well Post-Installation

Monitoring Well #: ~~#~~ MW-1 Well Depth: 30 feet Top of Casing Elevation: Screened Interval: feet below top of casing
Well Permit #: Well Diameter: 2 inches feet PID Readings: parts per million

Free Product Present: Yes/No
Depth to Free Product: feet below top of casing Pump Intake Depth: feet below top of casing
Thickness of Free Product: inches Depth to Water Before Pump Installation: feet below top of casing

Time:	Purging	Sampling	pH Reading	pH Change*	Specific Conductivity (mS/cm) Reading	Specific Conductivity (mS/cm) Change*	Redox Potential (mv) Reading	Redox Potential (mv) Change*	Dissolved Oxygen (mg/l) Reading	Dissolved Oxygen (mg/l) Change*	~~Turbidity (NTU)~~ ORP Reading	~~Turbidity (NTU)~~ ORP Change*	Temperature (C°) Reading	Temperature (C°) Change*	Pumping Rate (ml/min)	Depth to Water (ft below TOC)
0841	x		6.45		0.181				7.77		157.6		15.9			
0851	X		5.18		0.150				11.81		157.7		16.4			
0901	X		5.52		0.141				11.29		140.2		15.7			
0911	X		5.52		0.136				15.02		133.4		15.58			

Comments: Arrived-0840 Started pumping → ~~0815~~ 0841
Stopped pumping → 0915 JLF 11/30/21

ORP → Oxidation Reduction Potential

*INDICATOR PARAMETERS HAVE STABILIZED WHEN THREE (3) CONSECUTIVE READINGS (5 -6 MINUTES APART) ARE WITHIN: +/- 0.1 FOR Ph; +/- 3% FOR SPECIFIC CONDUCTIVITY AND TEMPERATURE; +/- 10 MV FOR REDOX POTENTIAL, AND +/- 10% FOR DISSOLVED OXYGEN AND TURBIDITY

WATER DRAWDOWN <0.3 FEET DURING PURGING, FLOW RATE ~250 ML/MIN

SHEET ___ OF ___

DUFFIELD ASSOCIATES, INC.
LOW FLOW SAMPLING
DATA SHEET

Site: Bioenergy Development Group, Planned Anaerobic Digester Project No.: 12393.ED Personnel: JLF (Jessica)
Date: 6/24/20 Weather: 80s Sunny Last Sampled: Developing Well Post-Installation

Monitoring Well #: MW-3 Well Depth: 30 feet Top of Casing Elevation: Screened Interval: feet below top of casing
Well Permit #: Well Diameter: 2 inches feet PID Readings: parts per million

Free Product Present: Yes/No
Depth to Free Product: feet below top of casing Pump Intake Depth: feet below top of casing
Thickness of Free Product: inches Depth to Water Before Pump Installation: feet below top of casing

Time:	Purging	Sampling	pH Reading	pH Change*	Specific Conductivity (mS/cm) Reading	Specific Conductivity (mS/cm) Change*	Redox Potential (mv) Reading	Redox Potential (mv) Change*	Dissolved Oxygen (mg/l) Reading	Dissolved Oxygen (mg/l) Change*	ORP Turbidity (NTU) Reading	ORP Turbidity (NTU) Change*	Temperature (C°) Reading	Temperature (C°) Change*	Pumping Rate (ml/min)	Depth to Water (ft below TOC)
0928	x		6.18		0.402				9.81		124.1		16.7			
0938	X		6.32		0.342				14.29		97.3		16.4			
0948	X		5.65		0.316				5.09		86.3		16.4			
0958	X		5.25		0.307				4.82		89.3		16.4			
1008	X		5.16		0.296				8.74		84.2		16.5			
1018	X		5.01		0.290				4.80		85.3		16.3			
1028	X		5.05		0.289				5.84		119.4		16.7			

Comments: Start → 0926
readings taken about 10-15 seconds after probe was inserted into bottle
ORP → Oxidation Reduction Potential

*INDICATOR PARAMETERS HAVE STABILIZED WHEN THREE (3) CONSECUTIVE READINGS (5 -6 MINUTES APART) ARE WITHIN: +/- 0.1 FOR Ph; +/- 3% FOR SPECIFIC CONDUCTIVITY AND TEMPERATURE; +/- 10 MV FOR REDOX POTENTIAL, AND +/- 10% FOR DISSOLVED OXYGEN AND TURBIDITY.

WATER DRAWDOWN <0.3 FEET DURING PURGING, FLOW RATE ~250 ML/MIN

SHEET ___ OF ___

DUFFIELD ASSOCIATES, INC.
LOW FLOW SAMPLING
DATA SHEET

Site: Bioenergy Development Group, Planned Anaerobic Digester Project No.: 12393.ED Personnel: JLF (Jessica)
Date: 6/24/20 Weather: 80s Sunny Last Sampled: Developing Well Post-Installation

Monitoring Well #: MW-2 Well Depth: 30 feet Top of Casing Elevation: Screened Interval: feet below top of casing
Well Permit #: Well Diameter: 2 inches feet PID Readings: parts per million

Free Product Present: Yes/No
Depth to Free Product: feet below top of casing Pump Intake Depth: feet below top of casing
Thickness of Free Product: inches Depth to Water Before Pump Installation: feet below top of casing

Time:	Purging	Sampling	pH Reading	pH Change*	Specific Conductivity (mS/cm) Reading	Specific Conductivity (mS/cm) Change*	Redox Potential (mv) Reading	Redox Potential (mv) Change*	Dissolved Oxygen (mg/l) Reading	Dissolved Oxygen (mg/l) Change*	~~Turbidity (NTU)~~ ORP Reading	~~Turbidity (NTU)~~ ORP Change*	Temperature (C°) Reading	Temperature (C°) Change*	Pumping Rate (ml/min)	Depth to Water (ft below TOC)
1040	x		6.48		0.547				7.42		72.3		17.6			
1050	X		7.07		0.297				11.97		61.6		17.8			
1100	X		7.28		0.267				13.63		94.2		17.2			
1110	X		6.66		0.253				11.45		108.8		17.2			
1120	X		6.20		0.246				12.08		72.1		17.2			
1130	X		6.35		0.245				14.09		81.4		17.6			
1140	X		[illegible]	6.34	0.241				14.28		42.2		17.6			

Comments:
Start → 1040
readings taken about 10-15 seconds after probe was inserted

ORP- oxidation reduction Potential (mV) millivolts

*INDICATOR PARAMETERS HAVE STABILIZED WHEN THREE (3) CONSECUTIVE READINGS (5 -6 MINUTES APART) ARE WITHIN: +/- 0.1 FOR Ph; +/- 3% FOR SPECIFIC CONDUCTIVITY AND TEMPERATURE, +/- 10 MV FOR REDOX POTENTIAL, AND +/- 10% FOR DISSOLVED OXYGEN AND TURBIDITY.

WATER DRAWDOWN <0.3 FEET DURING PURGING, FLOW RATE ~250 ML/MIN

SHEET ___ OF ___

DUFFIELD ASSOCIATES, INC.
LOW FLOW SAMPLING
DATA SHEET

Site: Bioenergy Development Group, Planned Anaerobic Digester Project No.: 12393.ED Personnel: JLF (Jessica)
Date: 6/24/20 Weather: 80s Sunny Last Sampled: Developing Well Post-Installation

Monitoring Well #: MW-4 Well Depth: 30 feet Top of Casing Elevation: Screened Interval: feet below top of casing
Well Permit #: Well Diameter: 2 inches feet PID Readings: parts per million

Free Product Present: Yes/No
Depth to Free Product: feet below top of casing Pump Intake Depth: feet below top of casing
Thickness of Free Product: inches Depth to Water Before Pump Installation: feet below top of casing

Time:	Purging	Sampling	pH Reading	pH Change*	Specific Conductivity (mS/cm) Reading	Specific Conductivity (mS/cm) Change*	Redox Potential (mv) Reading	Redox Potential (mv) Change*	Dissolved Oxygen (mg/l) Reading	Dissolved Oxygen (mg/l) Change*	ORP ~~Turbidity (NTU)~~ Reading	ORP ~~Turbidity (NTU)~~ Change*	Temperature (C°) Reading	Temperature (C°) Change*	Pumping Rate (ml/min)	Depth to Water (ft below TOC)
1153	x		6.40		0.433				15.71		26.3		17.8			
1203	X		6.25		0.281				13.04		23.7		18.3			
1213	X		6.50		0.240				15.02		49.4		17.9			
1223	X		5.87		0.218				14.53		49.1		16.3			
1233	X		6.35		0.207				16.22		44.1		19.1			
1243	X		6.15		0.197				14.25		42.4		17.9			
1253	X		5.66		0.192				13.55		42.2		17.0			

Comments: Start→1153 ORP→ Oxidation Reduction Potential

*INDICATOR PARAMETERS HAVE STABILIZED WHEN THREE (3) CONSECUTIVE READINGS(5-6 MINUTES APART) ARE WITHIN: +/- 0.1 FOR Ph; +/- 3% FOR SPECIFIC CONDUCTIVITY AND TEMPERATURE, +/- 10 MV FOR REDOX POTENTIAL, AND +/- 10% FOR DISSOLVED OXYGEN AND TURBIDITY.

WATER DRAWDOWN <0.3 FEET DURING PURGING, FLOW RATE ~250 ML/MIN

SHEET ___ OF ___

DUFFIELD ASSOCIATES, INC.
LOW FLOW SAMPLING
DATA SHEET

Site: Bioenergy Development Group, Planned Anaerobic Digester Project No.: 12393.ED Personnel: JLF (Jessica)
Date: 6/24/20 Weather: 80s Sunny Last Sampled: Developing Well Post-Installation

Monitoring Well #: MW-8 Well Depth: 30 feet Top of Casing Elevation: Screened Interval: feet below top of casing
Well Permit #: Well Diameter: 2 inches feet PID Readings: parts per million

Free Product Present: Yes/No
Depth to Free Product: feet below top of casing Pump Intake Depth: feet below top of casing
Thickness of Free Product: inches Depth to Water Before Pump Installation: feet below top of casing

Time	Purging	Sampling	pH		Specific Conductivity (mS/cm)		Redox Potential (mv)		Dissolved Oxygen (mg/l)		ORP ~~Turbidity (NTU)~~		Temperature (C°)		Pumping Rate (ml/min)	Depth to Water (ft below TOC)
			Reading	Change*	Reading	Change*	Reading	Change*	Reading	Change*	Reading	Change*	Reading	Change*		
1322	X		6.16		0.398				12.73		73.7		20.7			
1332	X		6.39		0.213				16.80		47.7		16.5			
1342	X		6.99		0.157				16.06		16.6		20.7			
1352	X		6.20		0.123				15.89		70.0		17.8			
1402	X		6.20		0.115				13.80		35.6		18.2			
1412	X		6.00		0.105				12.45		44.0		16.9			
1422	X		5.91		0.101				14.21		36.6		19.3			

Comments: Start → 1322

ORP → Oxidation Reduction Potential

Screen may be clogged → start & stop once water was back in well

readings taken 10-15 seconds after probe

*INDICATOR PARAMETERS HAVE STABILIZED WHEN THREE (3) CONSECUTIVE READINGS (5 -6 MINUTES APART) ARE WITHIN: +/- 0.1 FOR Ph; +/- 3% FOR SPECIFIC CONDUCTIVITY AND TEMPERATURE, +/- 10 MV FOR REDOX POTENTIAL, AND +/- 10% FOR DISSOLVED OXYGEN AND TURBIDITY

WATER DRAWDOWN <0.3 FEET DURING PURGING, FLOW RATE ~250 ML/MIN

SHEET ___ OF ___

APPENDIX 6

MONITOR WELL SURVEY MAP

THIS PLAN IS INTENDED TO SHOW FIELD DATA SURVEYED ON JULY 2, 2020. DATUM IS DELAWARE STATE PLANE NAD 83 NAVD 88.

Point Table

Point #	Elevation	Northing	Easting	Description
1	30.94	220113.32	602637.66	MWELL MW-1 PVC El. 30.69' - Ground El. 30.9'
2	30.04	219805.71	602240.78	MWELL MW-2 PVC El. 29.80' - Ground El. 30.0'
3	29.34	219450.12	602446.32	MWELL MW-3 PVC El. 28.97' - Ground El. 29.3'
4	28.39	219582.48	601791.57	MWELL MW-4 PVC El. 28.14' - Ground El. 28.4'
5	28.82	218898.12	601845.97	MWELL MW-5 PVC El. 28.56' - Ground El. 28.7'
6	35.14	218695.43	602453.39	MWELL MW-6 PVC El. 34.89' - Ground El. 35.1'
7	32.05	218973.64	603053.43	MWELL MW-7 PVC El. 31.74' - Ground El. 31.9'
8	26.68	218506.42	601572.28	MWELL MW-8 PVC El. 26.42' - Ground El. 26.5'

SCALE 1"=500' JULY 9, 2020

MONITORING WELLS EXHIBIT PLAN

PREPARED FOR

DUFFIELD ASSOCIATES, INC.

KNOWN AS

BIOENERGY INNOVATION CENTER

ALSO KNOWN AS

#28338 ENVIRO WAY

TAX PARCEL NO. 132-11.00-41.00

SEAFORD - SUSSEX COUNTY - DELAWARE

GRAPHIC SCALE (FEET)

0 500 1000 1500

TRANSITION
ENGINEERING
SURVEYING
(302) 983-7008
MIDDLETOWN
DELAWARE

JOHN J. TRAYNOR III REGISTERED NO. 507 PROFESSIONAL LAND SURVEYOR DELAWARE

APPROVED

PROJECT NO.: DAI: 033.306.01	
CAD FILE: BioSite-MWs_Exh.dwg	
DRAWN BY: ERG	CHECKED BY: JJT
DWG. NO.: V.01	SHEET. NO.: 1 OF 1

APPENDIX 7

GROUNDWATER MONITORING FIELD SHEETS

DUFFIELD ASSOCIATES, INC.
LOW FLOW SAMPLING
DATA SHEET

Site: Bioenergy Development Group, Planned Anaerobic Digester Project No.: 12393.ED Personnel: JLF (Jessica)
Date: 6/30/20 Weather: 80s clear/sunny Last Sampled: Developing Well Post-Installation

Monitoring Well #: MW-1 Well Depth: 30 feet Top of Casing Elevation: Screened Interval: feet below top of casing
Well Permit #: Well Diameter: 2 inches feet PID Readings: parts per million

Free Product Present: Yes/No
Depth to Free Product: feet below top of casing Pump Intake Depth: feet below top of casing
Thickness of Free Product: inches Depth to Water Before Pump Installation: 5.91 feet below top of casing

Time:	Purging	Sampling	pH Reading	pH Change*	Specific Conductivity (mS/cm) Reading	Specific Conductivity (mS/cm) Change*	Redox Potential (mv) Reading	Redox Potential (mv) Change*	Dissolved Oxygen (mg/l) Reading	Dissolved Oxygen (mg/l) Change*	Turbidity (NTU) Reading	Turbidity (NTU) Change*	Temperature (C°) Reading	Temperature (C°) Change*	Pumping Rate (ml/min)	Depth to Water (ft below TOC)
1015	x		5.09		0.118		244		5.40		0.0		17.24			
1020	X		4.79		0.119		277		5.20		942		17.22			
1025	X		4.76		0.119		286		5.15		645		17.15			
1030	X		4.76		0.120		294		5.08		383		16.65			
1035	X		4.76		0.120		259		4.94		305		16.64			
1040	X		4.76		0.120		313		4.90		164		16.60			
1045		X	4.79		0.120		318		4.81		103		16.65			

Comments:
Water level → 5.91 Ft Start pumping → 1015
Top of casing MW-1 sample time @ 0700 MS/MSD @ 0700

*INDICATOR PARAMETERS HAVE STABILIZED WHEN THREE (3) CONSECUTIVE READINGS (5 -6 MINUTES APART) ARE WITHIN: +/- 0.1 FOR Ph; +/- 3% FOR SPECIFIC CONDUCTIVITY AND TEMPERATURE; +/- 10 MV FOR REDOX POTENTIAL, AND +/- 10% FOR DISSOLVED OXYGEN AND TURBIDITY.

WATER DRAWDOWN <0.3 FEET DURING PURGING, FLOW RATE ~250 ML/MIN

SHEET ___ OF ___

DUFFIELD ASSOCIATES, INC.
LOW FLOW SAMPLING
DATA SHEET

Site: Bioenergy Development Group, Planned Anaerobic Digester Project No.: 12393.ED Personnel: JLF (Jessica)
Date: Weather: Last Sampled: Developing Well Post-Installation

Monitoring Well #: MW-2 Well Depth: 30 feet Top of Casing Elevation: Screened Interval: feet below top of casing
Well Permit #: Well Diameter: 2 inches feet PID Readings: parts per million

Free Product Present: Yes/No
Depth to Free Product: feet below top of casing Pump Intake Depth: feet below top of casing
Thickness of Free Product: inches Depth to Water Before Pump Installation: 6.95 feet below top of casing

Time:	Purging	Sampling	pH Reading	pH Change*	Specific Conductivity (mS/cm) Reading	Specific Conductivity (mS/cm) Change*	Redox Potential (mv) Reading	Redox Potential (mv) Change*	Dissolved Oxygen (mg/l) Reading	Dissolved Oxygen (mg/l) Change*	Turbidity (NTU) Reading	Turbidity (NTU) Change*	Temperature (C°) Reading	Temperature (C°) Change*	Pumping Rate (ml/min)	Depth to Water (ft below TOC)
1125	X		4.92		0.314		181		2.89		0.0		17.64			
1130	X		4.51		0.307		212		2.13		0.0		17.03			
1135	X		4.44		0.296		224		2.21		706		16.94			
1140	X		4.66		0.290		216		2.21		388		16.88			
1145	X		4.71		0.288		218		2.17		221		16.99			
1150	X		4.53		0.281		229		2.15		83.0		16.83			
~~1155~~																
1210	X		4.98		0.274		222		2.35		372		16.77			
1215	X		4.70		0.275		239		2.35		273		16.70			

Comments:
Water level → 6.95 Ft
Top of casing
Stopped pumping at 1155 due to low battery
Started again 1210
DUP @ 1140
MW-2 @ 1130

*INDICATOR PARAMETERS HAVE STABILIZED WHEN THREE (3) CONSECUTIVE READINGS (5-6 MINUTES APART) ARE WITHIN: +/- 0.1 FOR Ph; +/- 3% FOR SPECIFIC CONDUCTIVITY AND TEMPERATURE; +/- 10 MV FOR REDOX POTENTIAL, AND +/- 10% FOR DISSOLVED OXYGEN AND TURBIDITY.

WATER DRAWDOWN <0.3 FEET DURING PURGING, FLOW RATE ~250 ML/MIN

SHEET ___ OF ___

DUFFIELD ASSOCIATES, INC.
LOW FLOW SAMPLING
DATA SHEET

Site: Bioenergy Development Group, Planned Anaerobic Digester Project No.: 12393.ED Personnel: JLF (Jessica)
Date: 6/30/20 Weather: 88°F Sunny Last Sampled: Developing Well Post-Installation

Monitoring Well #: MW-3 Well Depth: 30 feet Top of Casing Elevation: Screened Interval: feet below top of casing
Well Permit #: Well Diameter: 2 inches feet PID Readings: parts per million

Free Product Present: Yes/No
Depth to Free Product: feet below top of casing Pump Intake Depth: feet below top of casing
Thickness of Free Product: inches Depth to Water Before Pump Installation: 5.70 feet below top of casing

Time:	Purging	Sampling	pH Reading	pH Change*	Specific Conductivity (mS/cm) Reading	Specific Conductivity (mS/cm) Change*	Redox Potential (mv) Reading	Redox Potential (mv) Change*	Dissolved Oxygen (mg/l) Reading	Dissolved Oxygen (mg/l) Change*	Turbidity (NTU) Reading	Turbidity (NTU) Change*	Temperature (C°) Reading	Temperature (C°) Change*	Pumping Rate (ml/min)	Depth to Water (ft below TOC)
1245	x		5.72		0.424		220		3.51		0.0		21.27			
1250	X		5.39		0.449		247		2.03		0.0		17.85			
1255	X		5.22		0.445		268		0.95		730		17.53			
1300	X		5.14		0.429		273		0.77		564		17.40			
1305	X		5.02		0.429		284		0.48		212		17.22			
1310	X		5.08		0.393		286		0.42		149		17.28			
1315	X		5.07		0.397		289		0.31		82.8		17.23			

Comments:
Water level → 5.70 ft
Top of casing
MW-3 sample collected @ 1310

*INDICATOR PARAMETERS HAVE STABILIZED WHEN THREE (3) CONSECUTIVE READINGS (5 -6 MINUTES APART) ARE WITHIN: +/- 0.1 FOR Ph, +/- 3% FOR SPECIFIC CONDUCTIVITY AND TEMPERATURE; +/- 10 MV FOR REDOX POTENTIAL, AND +/- 10% FOR DISSOLVED OXYGEN AND TURBIDITY.

WATER DRAWDOWN <0.3 FEET DURING PURGING, FLOW RATE ~250 ML/MIN

SHEET ___ OF ___

DUFFIELD ASSOCIATES, INC.
LOW FLOW SAMPLING
DATA SHEET

Site: Bioenergy Development Group, Planned Anaerobic Digester Project No.: 12393.ED Personnel: JLF (Jessica)
Date: Weather: Last Sampled: First Sampling Event

Monitoring Well #: MW-4 Well Depth: 30 feet Top of Casing Elevation: Screened Interval: feet below top of casing
Well Permit #: Well Diameter: 2 inches feet PID Readings: parts per million

Free Product Present: Yes/No
Depth to Free Product: feet below top of casing
Thickness of Free Product: inches
Pump Intake Depth: ~25 feet below top of casing
Depth to Water Before Pump Installation: feet below top of casing

Time:	Purging	Sampling	pH Reading	pH Change*	Specific Conductivity (mS/cm) Reading	Specific Conductivity (mS/cm) Change*	Redox Potential (mv) Reading	Redox Potential (mv) Change*	Dissolved Oxygen (mg/l) Reading	Dissolved Oxygen (mg/l) Change*	Turbidity (NTU) Reading	Turbidity (NTU) Change*	Temperature (C°) Reading	Temperature (C°) Change*	Pumping Rate (ml/min)	Depth to Water (ft below TOC)
1400	X		5.44		0.201		220		3.27		0.0		19.96			
1405	X		4.69		0.201		256		2.40		0.0		16.32			
1410	X		4.54		0.187		262		2.76		763		16.05			
1415	X		4.49		0.184		264		2.95		399		15.97			
1420	X		4.47		0.189		265		3.07		237		15.87			
1425		X	4.45		0.186		267		3.21		173		15.81			
~~1430~~																

Comments:
Water Level @ __ feet from top of casing
Sample taken @ 1415 (on label)

Water level -> 6.48 FT

*INDICATOR PARAMETERS HAVE STABILIZED WHEN THREE (3) CONSECUTIVE READINGS (5 -6 MINUTES APART) ARE WITHIN: +/- 0.1 FOR Ph; +/- 3% FOR SPECIFIC CONDUCTIVITY AND TEMPERATURE; +/- 10 MV FOR REDOX POTENTIAL; AND +/- 10% FOR DISSOLVED OXYGEN AND TURBIDITY.

WATER DRAWDOWN <0.3 FEET DURING PURGING, FLOW RATE ~250 ML/MIN

SHEET ___ OF ___

DUFFIELD ASSOCIATES, INC.
LOW FLOW SAMPLING
DATA SHEET

Site: Bioenergy Development Group, Planned Anaerobic Digester Project No.: 12393.ED Personnel: JLF (Jessica)
Date: 7/2/20 Weather: 80s, Sunny Last Sampled: First Sampling Event

Monitoring Well #: ~~MW-4~~ MW-5 Well Depth: 30 feet Top of Casing Elevation: Screened Interval: feet below top of casing
Well Permit #: Well Diameter: 2 inches feet PID Readings: parts per million

Free Product Present: Yes/No
Depth to Free Product: feet below top of casing
Thickness of Free Product: inches
Pump Intake Depth: ~25 feet below top of casing
Depth to Water Before Pump Installation: ~~[illegible]~~ feet below top of casing

Time:	Purging	Sampling	pH Reading	pH Change*	Specific Conductivity (mS/cm) Reading	Specific Conductivity (mS/cm) Change*	Redox Potential (mv) Reading	Redox Potential (mv) Change*	Dissolved Oxygen (mg/l) Reading	Dissolved Oxygen (mg/l) Change*	Turbidity (NTU) Reading	Turbidity (NTU) Change*	Temperature (C°) Reading	Temperature (C°) Change*	Pumping Rate (ml/min)	Depth to Water (ft below TOC)
1115	X		5.62		0.211		231		2.67		0.0		25.12			
1120	X		5.46		0.148		245		1.01		0.0		23.84			
1125	X		5.44		0.137		251		1.02		1000		23.78			
1130	X		5.40		0.129		258		1.03		799		23.68			
1135		X	5.36		0.122		263		1.09		520		23.60			

Comments: ~~[illegible]~~ 6.42
Water Level @ __ feet from top of casing
Sample taken @ _____
MW-5 @ 1130

*INDICATOR PARAMETERS HAVE STABILIZED WHEN THREE (3) CONSECUTIVE READINGS (5 -6 MINUTES APART) ARE WITHIN: +/- 0.1 FOR Ph; +/- 3% FOR SPECIFIC CONDUCTIVITY AND TEMPERATURE; +/- 10 MV FOR REDOX POTENTIAL; AND +/- 10% FOR DISSOLVED OXYGEN AND TURBIDITY.

WATER DRAWDOWN <0.3 FEET DURING PURGING, FLOW RATE ~250 ML/MIN

SHEET ___ OF ___

DUFFIELD ASSOCIATES, INC.
LOW FLOW SAMPLING
DATA SHEET

Site: Bioenergy Development Group, Planned Anaerobic Digester Project No.: 12393.ED Personnel: JLF (Jessica)
Date: 7/2/20 Weather: 80s, Sunny Last Sampled: First Sampling Event

Monitoring Well #: MW-6 Well Depth: 30 feet Top of Casing Elevation: Screened Interval: feet below top of casing
Well Permit #: Well Diameter: 2 inches feet PID Readings: parts per million

Free Product Present: Yes/No
Depth to Free Product: feet below top of casing
Thickness of Free Product: inches
Pump Intake Depth: ~25 feet below top of casing
Depth to Water Before Pump Installation: feet below top of casing

Time:	Purging	Sampling	pH Reading	pH Change*	Specific Conductivity (mS/cm) Reading	Specific Conductivity (mS/cm) Change*	Redox Potential (mv) Reading	Redox Potential (mv) Change*	Dissolved Oxygen (mg/l) Reading	Dissolved Oxygen (mg/l) Change*	Turbidity (NTU) Reading	Turbidity (NTU) Change*	Temperature (C°) Reading	Temperature (C°) Change*	Pumping Rate (ml/min)	Depth to Water (ft below TOC)
1202	X		4.94		0.191		289		4.74		676		24.69			
1207	X		4.81		0.186		284		5.22		270		21.66			
1212	X		4.77		0.162		304		5.13		508		21.07			
1217	X		4.62		0.149		315		4.97		791		20.83			
1222		X	4.65		0.150		317		4.88		529		19.64			

Comments:
Water Level @ __ feet from top of casing 11.91FT
Sample taken @ _____
MW-6 @ 1230

*INDICATOR PARAMETERS HAVE STABILIZED WHEN THREE (3) CONSECUTIVE READINGS (5 -6 MINUTES APART) ARE WITHIN: +/- 0.1 FOR Ph; +/- 3% FOR SPECIFIC CONDUCTIVITY AND TEMPERATURE; +/- 10 MV FOR REDOX POTENTIAL; AND +/- 10% FOR DISSOLVED OXYGEN AND TURBIDITY.

WATER DRAWDOWN <0.3 FEET DURING PURGING, FLOW RATE ~250 ML/MIN

SHEET ___ OF ___

DUFFIELD ASSOCIATES, INC.
LOW FLOW SAMPLING
DATA SHEET

Site: Bioenergy Development Group, Planned Anaerobic Digester Project No.: 12393.ED Personnel: JLF (Jessica)
Date: 7/2/20 Weather: 70s, Sunny Last Sampled: First Sampling Event

Monitoring Well #: MW-7 Well Depth: 30 feet Top of Casing Elevation: Screened Interval: feet below top of casing
Well Permit #: Well Diameter: 2 inches feet PID Readings: parts per million

Free Product Present: Yes/No
Depth to Free Product: feet below top of casing
Thickness of Free Product: inches
Pump Intake Depth: ~25 feet below top of casing
Depth to Water Before Pump Installation: 7.30 feet below top of casing

Time:	Purging	Sampling	pH Reading	pH Change*	Specific Conductivity (mS/cm) Reading	Specific Conductivity (mS/cm) Change*	Redox Potential (mv) Reading	Redox Potential (mv) Change*	Dissolved Oxygen (mg/l) Reading	Dissolved Oxygen (mg/l) Change*	Turbidity (NTU) Reading	Turbidity (NTU) Change*	Temperature (C°) Reading	Temperature (C°) Change*	Pumping Rate (ml/min)	Depth to Water (ft below TOC)
0855	X		5.15		0.187		288		2.94		355		15.00			
0900	X		5.04		0.189		291		2.19		244		16.69			
0905	X		5.12		0.187		285		2.06		290		17.30			
0910	X		5.17		0.185		281		1.96		215		16.66			
0915	X		5.15		0.185		281		1.86		188		16.68			
0920	X		5.16		0.185		280		1.90		120		16.42			
0925	X	X	5.13		0.184		280		1.75		102		16.20			
~~0930~~		X														

Comments: 7.30
Water Level @ __ feet from top of casing
Sample taken @ _____
MW-7 @ 0930

*INDICATOR PARAMETERS HAVE STABILIZED WHEN THREE (3) CONSECUTIVE READINGS (5 -6 MINUTES APART) ARE WITHIN: +/-0.1 FOR PH; +/- 3% FOR SPECIFIC CONDUCTIVITY AND TEMPERATURE; +/- 10 MV FOR REDOX POTENTIAL; AND +/- 10% FOR DISSOLVED OXYGEN AND TURBIDITY.

WATER DRAWDOWN <0.3 FEET DURING PURGING, FLOW RATE ~250 ML/MIN

SHEET ___ OF ___

DUFFIELD ASSOCIATES, INC.
LOW FLOW SAMPLING
DATA SHEET

Site: Bioenergy Development Group, Planned Anaerobic Digester Project No.: 12393.ED Personnel: JLF (Jessica)
Date: 7/2/20 Weather: 70s, Sunny Last Sampled: First Sampling Event

Monitoring Well #: MW-8 Well Depth: 30 feet Top of Casing Elevation: Screened Interval: feet below top of casing
Well Permit #: Well Diameter: 2 inches feet PID Readings: parts per million

Free Product Present: Yes/No
Depth to Free Product: feet below top of casing
Thickness of Free Product: inches
Pump Intake Depth: ~25 feet below top of casing
Depth to Water Before Pump Installation: 6.42 feet below top of casing

Time:	Purging	Sampling	pH Reading	pH Change*	Specific Conductivity (mS/cm) Reading	Specific Conductivity (mS/cm) Change*	Redox Potential (mv) Reading	Redox Potential (mv) Change*	Dissolved Oxygen (mg/l) Reading	Dissolved Oxygen (mg/l) Change*	Turbidity (NTU) Reading	Turbidity (NTU) Change*	Temperature (C°) Reading	Temperature (C°) Change*	Pumping Rate (ml/min)	Depth to Water (ft below TOC)
0812	X		5.40		0.163		264		4.80		769		17.97			
0817	X		5.30		0.157		271		2.78		600		17.06			
0822	X		5.30		0.155		281		2.55		616		16.90			
0827	X		5.32		0.145		282		2.32		279		16.69			
0832	X		5.24		0.147		300		2.81		477		16.81			
0837	X		5.17		0.137		305		2.48		519		16.50			
0842		X	5.15		0.130		307		2.32		147		16.40			
1005	X		5.15		0.127		324		4.21		442		16.54			
1010	X		4.92		0.122		329		3.27		177		16.47			
1015			4.93		0.120		334		2.97		39.7		16.42			

Comments:
Water Level @ 4.90 feet from top of casing
Sample taken @ MW-8 @ 0845

Ran dry after 30mins. Started sampling @
↳ Battery died

*INDICATOR PARAMETERS HAVE STABILIZED WHEN THREE (3) CONSECUTIVE READINGS (5 -6 MINUTES APART) ARE WITHIN: +/- 0.1 FOR Ph; +/- 3% FOR SPECIFIC CONDUCTIVITY AND TEMPERATURE; +/- 10 MV FOR REDOX POTENTIAL; AND +/- 10% FOR DISSOLVED OXYGEN AND TURBIDITY.

WATER DRAWDOWN <0.3 FEET DURING PURGING, FLOW RATE ~250 ML/MIN

SHEET ___ OF ___

DUFFIELD ASSOCIATES, INC.
LOW FLOW SAMPLING
DATA SHEET

Site: Bioenergy Development Group, Planned Anaerobic Digester Project No.: 12393.ED Personnel: JLF (Jessica)
Date: 4/9/2020 Weather: 75F Sunny Last Sampled: First Sampling Event

Monitoring Well #: MW-1 Well Depth: 30 feet Top of Casing Elevation: _____ feet Screened Interval: _____ feet below top of casing
Well Permit #: _____ Well Diameter: 2 inches PID Readings: _____ parts per million

Free Product Present: Yes/No
Depth to Free Product: _____ feet below top of casing
Thickness of Free Product: _____ inches
Pump Intake Depth: ~25 feet below top of casing
Depth to Water Before Pump Installation: 3.04 feet below top of casing

Time:	Purging	Sampling	pH Reading	pH Change*	Specific Conductivity (mS/cm) Reading	Specific Conductivity (mS/cm) Change*	Redox Potential (mv) Reading	Redox Potential (mv) Change*	Dissolved Oxygen (mg/l) Reading	Dissolved Oxygen (mg/l) Change*	Turbidity (NTU) Reading	Turbidity (NTU) Change*	Temperature (C°) Reading	Temperature (C°) Change*	Pumping Rate (ml/min)	Depth to Water (ft below TOC)
1214	x		4.89		0.094		279		8.87		558		20.00			
1215	X		4.57		0.092		291		10.40		665		18.26			
1216	X		4.49		0.097		296		8.77		564		17.93			
1217	X		4.46		0.100		298		7.68		153		17.88			
1218	X		4.44		0.101		299		7.27		513		17.84			
1219	X		4.45		0.101		299		7.11		31.3		17.83			
1220	X	X	4.45		0.102		300		6.92		25.5		17.81			
1221		X	4.46		0.102		300		6.71		23.3		17.82			

Comments:
Water Level @ 3.04 feet from top of casing
Sample taken @ 1220

Purged 3 w.v. w/ waterpump.

*INDICATOR PARAMETERS HAVE STABILIZED WHEN THREE (3) CONSECUTIVE READINGS (5 -6 MINUTES APART) ARE WITHIN: +/- 0.1 FOR Ph; +/- 3% FOR SPECIFIC CONDUCTIVITY AND TEMPERATURE; +/- 10 MV FOR REDOX POTENTIAL; AND +/- 10% FOR DISSOLVED OXYGEN AND TURBIDITY.

WATER DRAWDOWN <0.3 FEET DURING PURGING, FLOW RATE ~250 ML/MIN

SHEET ___ OF ___

DUFFIELD ASSOCIATES, INC.
LOW FLOW SAMPLING
DATA SHEET

Site: Bioenergy Development Group, Planned Anaerobic Digester Project No.: 12393.ED Personnel: JLF (Jessica)
Date: _____ Weather: _____ Last Sampled: First Sampling Event

Monitoring Well #: MW-2 Well Depth: 30 feet Top of Casing Elevation: _____ feet Screened Interval: _____ feet below top of casing
Well Permit #: _____ Well Diameter: 2 inches PID Readings: _____ parts per million

Free Product Present: Yes/No
Depth to Free Product: _____ feet below top of casing
Thickness of Free Product: _____ inches
Pump Intake Depth: ~25 feet below top of casing
Depth to Water Before Pump Installation: 3.56 feet below top of casing

Time:	Purging	Sampling	pH Reading	pH Change*	Specific Conductivity (mS/cm) Reading	Specific Conductivity Change*	Redox Potential (mv) Reading	Redox Potential Change*	Dissolved Oxygen (mg/l) Reading	Dissolved Oxygen Change*	Turbidity (NTU) Reading	Turbidity Change*	Temperature (C°) Reading	Temperature Change*	Pumping Rate (ml/min)	Depth to Water (ft below TOC)
1033	x		4.91		0.312		257		7.30		–		20.85			
1035	X		4.81		0.299		264		6.54		0.0		19.53			
1036	X		4.81		0.278		267		1.69		472		19.50			
1038	X		4.81		0.269		268		1.91		142 ~~481~~		19.46			
1040	X		4.81		0.257		270		2.34		40.2		19.41			
1041		X	4.82		0.258		270		2.45		252		19.45			

Comments:
Water Level @ 3.56 feet from top of casing
Sample taken @ 1030

Purged 3 wellvolumes w/ whaler pump

*INDICATOR PARAMETERS HAVE STABILIZED WHEN THREE (3) CONSECUTIVE READINGS (5 -6 MINUTES APART) ARE WITHIN: +/- 0.1 FOR Ph; +/- 3% FOR SPECIFIC CONDUCTIVITY AND TEMPERATURE; +/- 10 MV FOR REDOX POTENTIAL; AND +/- 10% FOR DISSOLVED OXYGEN AND TURBIDITY.

WATER DRAWDOWN <0.3 FEET DURING PURGING, FLOW RATE ~250 ML/MIN

SHEET ___ OF ___

DUFFIELD ASSOCIATES, INC.
LOW FLOW SAMPLING
DATA SHEET

Site: Bioenergy Development Group, Planned Anaerobic Digester Project No.: 12393.ED Personnel: JLF (Jessica)
Date: _____ Weather: _____ Last Sampled: First Sampling Event

Monitoring Well #: MW-3 Well Depth: 30 feet Top of Casing Elevation: _____ feet Screened Interval: _____ feet below top of casing
Well Permit #: _____ Well Diameter: 2 inches PID Readings: _____ parts per million

Free Product Present: Yes/No
Depth to Free Product: _____ feet below top of casing
Thickness of Free Product: _____ inches
Pump Intake Depth: ~25 feet below top of casing
Depth to Water Before Pump Installation: 2.36 feet below top of casing

Time:	Purging	Sampling	pH Reading	pH Change*	Specific Conductivity (mS/cm) Reading	Specific Conductivity (mS/cm) Change*	Redox Potential (mv) Reading	Redox Potential (mv) Change*	Dissolved Oxygen (mg/l) Reading	Dissolved Oxygen (mg/l) Change*	Turbidity (NTU) Reading	Turbidity (NTU) Change*	Temperature (C°) Reading	Temperature (C°) Change*	Pumping Rate (ml/min)	Depth to Water (ft below TOC)
1135	x		4.92		0.190		279		3.80		956		20.21			
1136	x		4.68		0.198		291		1.60		1090		18.58			
1138	x		4.65		0.200		292		0.347		120		18.48			
1140	X		4.68		0.202		290		0.27		61.51		18.47			
1141		X	4.78		0.203		289		0.29		29.2		18.43			

Comments:
Water Level @ 2.36 feet from top of casing
Sample taken @ 1145

Purged 3 W.V.
w/ whaler pump.

*INDICATOR PARAMETERS HAVE STABILIZED WHEN THREE (3) CONSECUTIVE READINGS (5 -6 MINUTES APART) ARE WITHIN: +/- 0.1 FOR Ph; +/- 3% FOR SPECIFIC CONDUCTIVITY AND TEMPERATURE; +/- 10 MV FOR REDOX POTENTIAL; AND +/- 10% FOR DISSOLVED OXYGEN AND TURBIDITY.

WATER DRAWDOWN <0.3 FEET DURING PURGING, FLOW RATE ~250 ML/MIN

SHEET ___ OF ___

DUFFIELD ASSOCIATES, INC.
LOW FLOW SAMPLING
DATA SHEET

Site: Bioenergy Development Group, Planned Anaerobic Digester Project No.: 12393.ED Personnel: JLF (Jessica)

Date: 11/9/20 Weather: _____ Last Sampled: First Sampling Event

Monitoring Well #: MW-4 Well Depth: 30 feet Top of Casing Elevation: _____ feet Screened Interval: _____ feet below top of casing

Well Permit #: _____ Well Diameter: 2 inches PID Readings: _____ parts per million

Free Product Present: Yes/No

Depth to Free Product: _____ feet below top of casing

Thickness of Free Product: _____ inches

Pump Intake Depth: ~25 feet below top of casing

Depth to Water Before Pump Installation: 2.93 feet below top of casing

Time:	Purging	Sampling	pH Reading	pH Change*	Specific Conductivity (mS/cm) Reading	Specific Conductivity (mS/cm) Change*	Redox Potential (mv) Reading	Redox Potential (mv) Change*	Dissolved Oxygen (mg/l) Reading	Dissolved Oxygen (mg/l) Change*	Turbidity (NTU) Reading	Turbidity (NTU) Change*	Temperature (C°) Reading	Temperature (C°) Change*	Pumping Rate (ml/min)	Depth to Water (ft below TOC)
1455	x		5.12		0.225		277		4.87		26.8		18.00			
1457			5.06		0.190		284		5.16		28.5		17.65			
1459			5.07		0.190		284		5.20		23.0		17.64			
1501			5.06		0.188		286		5.26		2.6		17.61			
1505			5.07		.193		288		5.50		1.8		17.61			
1510			5.09		.189		291		5.38		0		17.57			
1515			4.94		.192		300		5.47		2.3		17.63			

Comments:
Water Level @ 2.93 feet from top of casing
Sample taken @ 1515

Low Flow w/ Peristaltic Pump

*INDICATOR PARAMETERS HAVE STABILIZED WHEN THREE (3) CONSECUTIVE READINGS (5 -6 MINUTES APART) ARE WITHIN: +/- 0.1 FOR Ph; +/- 3% FOR SPECIFIC CONDUCTIVITY AND TEMPERATURE; +/- 10 MV FOR REDOX POTENTIAL; AND +/- 10% FOR DISSOLVED OXYGEN AND TURBIDITY.

WATER DRAWDOWN <0.3 FEET DURING PURGING, FLOW RATE ~250 ML/MIN

SHEET ___ OF ___

DUFFIELD ASSOCIATES, INC.
LOW FLOW SAMPLING
DATA SHEET

Site: Bioenergy Development Group, Planned Anaerobic Digester Project No.: 12393.ED Personnel: JLF (Jessica) / Adam

Date: 11/9/20 Weather: 70°F Sunny Last Sampled: ~~First Sampling Event~~ Sampling Event 2

Monitoring Well #: MW-5 Well Depth: ~~30~~ 32 feet Top of Casing Elevation: _____ feet Screened Interval: _____ feet below top of casing

Well Permit #: _____ Well Diameter: 2 inches PID Readings: _____ parts per million

Free Product Present: Yes/No

Depth to Free Product: _____ feet below top of casing

Thickness of Free Product: _____ inches

Pump Intake Depth: ~25 feet below top of casing

Depth to Water Before Pump Installation: 3.45 feet below top of casing

Time:	Purging	Sampling	pH Reading	pH Change*	Specific Conductivity (mS/cm) Reading	Specific Conductivity (mS/cm) Change*	Redox Potential (mv) Reading	Redox Potential (mv) Change*	Dissolved Oxygen (mg/l) Reading	Dissolved Oxygen (mg/l) Change*	Turbidity (NTU) Reading	Turbidity (NTU) Change*	Temperature (C°) Reading	Temperature (C°) Change*	Pumping Rate (ml/min)	Depth to Water (ft below TOC)
0912	x		4.57		0.093		254		7.30		487		24.16			
0913	x		4.91		0.093		240		2.51		528		24.25			
0915	x		5.02		0.093		324		2.22		324		24.30			
0916		X	5.16		0.094		233		2.06		181		24.32			

Comments:
Water Level @ 3.45 feet from top of casing
Sample taken @ 0915

Purge 3 well volumes. w/ whaler sub. pump.

Sampled @ 0915

*INDICATOR PARAMETERS HAVE STABILIZED WHEN THREE (3) CONSECUTIVE READINGS (5 -6 MINUTES APART) ARE WITHIN: +/- 0.1 FOR Ph; +/- 3% FOR SPECIFIC CONDUCTIVITY AND TEMPERATURE; +/- 10 MV FOR REDOX POTENTIAL; AND +/- 10% FOR DISSOLVED OXYGEN AND TURBIDITY.

WATER DRAWDOWN <0.3 FEET DURING PURGING, FLOW RATE ~250 ML/MIN

SHEET ___ OF ___

DUFFIELD ASSOCIATES, INC.
LOW FLOW SAMPLING
DATA SHEET

Site: Bioenergy Development Group, Planned Anaerobic Digester Project No.: 12393.ED Personnel: JLF (Jessica)
Date: 11/9/20 Weather: 75°F Sunny Last Sampled: First Sampling Event

Monitoring Well #: MW-6 Well Depth: 30 feet Top of Casing Elevation: Screened Interval: _____ feet below top of casing
Well Permit #: Well Diameter: 2 inches _____ feet PID Readings: _____ parts per million

Free Product Present: Yes/No
Depth to Free Product: _____ feet below top of casing Pump Intake Depth: ~25 feet below top of casing
Thickness of Free Product: _____ inches Depth to Water Before Pump Installation: 9.11 feet below top of casing

Time:	Purging	Sampling	pH Reading	pH Change*	Specific Conductivity (mS/cm) Reading	Specific Conductivity Change*	Redox Potential (mv) Reading	Redox Potential Change*	Dissolved Oxygen (mg/l) Reading	Dissolved Oxygen Change*	Turbidity (NTU) Reading	Turbidity Change*	Temperature (C°) Reading	Temperature Change*	Pumping Rate (ml/min)	Depth to Water (ft below TOC)
1343	X		4.66		.172		286		5.60		0		21.26			
1345			4.67		.123		288		5.53		500		20.43			
1347			4.68		.119		288		5.22		76.8		20.21			
1349			4.71		.119		288		4.66		21.6		20.18			
1351																

Comments:
Water Level @ 9.11 feet from top of casing
Sample taken @ 1350

Purged 3 wellvolumes w/ water pump

*INDICATOR PARAMETERS HAVE STABILIZED WHEN THREE (3) CONSECUTIVE READINGS (5 -6 MINUTES APART) ARE WITHIN: +/- 0.1 FOR Ph; +/- 3% FOR SPECIFIC CONDUCTIVITY AND TEMPERATURE; +/- 10 MV FOR REDOX POTENTIAL; AND +/- 10% FOR DISSOLVED OXYGEN AND TURBIDITY.

WATER DRAWDOWN <0.3 FEET DURING PURGING, FLOW RATE ~250 ML/MIN

SHEET ___ OF ___

DUFFIELD ASSOCIATES, INC.
LOW FLOW SAMPLING
DATA SHEET

Site: Bioenergy Development Group, Planned Anaerobic Digester Project No.: 12393.ED Personnel: JLF (Jessica)
Date: 11/9/20 Weather: Last Sampled: First Sampling Event

Monitoring Well #: MW-7 Well Depth: 30 feet Top of Casing Elevation: Screened Interval: _____ feet below top of casing
Well Permit #: Well Diameter: 2 inches _____ feet PID Readings: _____ parts per million

Free Product Present: Yes/No
Depth to Free Product: _____ feet below top of casing Pump Intake Depth: ~25 feet below top of casing
Thickness of Free Product: _____ inches Depth to Water Before Pump Installation: 3.77 feet below top of casing

Time:	Purging	Sampling	pH Reading	pH Change*	Specific Conductivity (mS/cm) Reading	Specific Conductivity (mS/cm) Change*	Redox Potential (mv) Reading	Redox Potential (mv) Change*	Dissolved Oxygen (mg/l) Reading	Dissolved Oxygen (mg/l) Change*	Turbidity (NTU) Reading	Turbidity (NTU) Change*	Temperature (C°) Reading	Temperature (C°) Change*	Pumping Rate (ml/min)	Depth to Water (ft below TOC)
1255	x		1.80		0.144		288		5.41		926		8.03			
1257	x		4.67		0.147		294		3.20		332		17.18			
1259	x		4.59		0.147		298		2.67		88.9		17.38			
1301	x		4.57		0.147		300		2.52		14.1		17.21			
1303		x	4.58		0.147		300		2.30		3.0		17.27			

Comments:
Water Level @ 3.77 feet from top of casing
Sample taken @ 1315

Purged 3 W.V.
w/ whaler pump

*INDICATOR PARAMETERS HAVE STABILIZED WHEN THREE (3) CONSECUTIVE READINGS (5 -6 MINUTES APART) ARE WITHIN: +/- 0.1 FOR Ph; +/- 3% FOR SPECIFIC CONDUCTIVITY AND TEMPERATURE; +/- 10 MV FOR REDOX POTENTIAL; AND +/- 10% FOR DISSOLVED OXYGEN AND TURBIDITY.

WATER DRAWDOWN <0.3 FEET DURING PURGING, FLOW RATE ~250 ML/MIN

SHEET ___ OF ___

DUFFIELD ASSOCIATES, INC.
LOW FLOW SAMPLING
DATA SHEET

Site: Bioenergy Development Group, Planned Anaerobic Digester Project No.: 12393.ED Personnel: JLF (Jessica)
Date: 11/9/20 Weather: Last Sampled: First Sampling Event

Monitoring Well #: MW-8 Well Depth: 30 feet Top of Casing Elevation: Screened Interval: feet below top of casing
Well Permit #: Well Diameter: 2 inches feet PID Readings: parts per million

Free Product Present: Yes/No
Depth to Free Product: feet below top of casing Pump Intake Depth: ~25 feet below top of casing
Thickness of Free Product: inches Depth to Water Before Pump Installation: 2.35 feet below top of casing

Time:	Purging	Sampling	pH Reading	pH Change*	Specific Conductivity (mS/cm) Reading	Specific Conductivity (mS/cm) Change*	Redox Potential (mv) Reading	Redox Potential (mv) Change*	Dissolved Oxygen (mg/l) Reading	Dissolved Oxygen (mg/l) Change*	Turbidity (NTU) Reading	Turbidity (NTU) Change*	Temperature (C°) Reading	Temperature (C°) Change*	Pumping Rate (ml/min)	Depth to Water (ft below TOC)
~~1415~~	X		~~4.79~~				~~300~~				~~147~~		~~19.14~~			
1416			4.69		.118		300		2.06		222		17.33			
1418			4.73		.122		298		2.32		639		16.95			
1420			4.61		.118		304		2.32		564		17.15			
1422			4.60		.115		305		2.65		815		17.18			
1424			4.61		.113		306		2.33		115		17.17			

Comments:
Water Level @ 2.35 feet from top of casing
Sample taken @ 1430

Purged 3 w.v. w/ whaler pump.

*INDICATOR PARAMETERS HAVE STABILIZED WHEN THREE (3) CONSECUTIVE READINGS (5 -6 MINUTES APART) ARE WITHIN: +/- 0.1 FOR Ph; +/- 3% FOR SPECIFIC CONDUCTIVITY AND TEMPERATURE; +/- 10 MV FOR REDOX POTENTIAL; AND +/- 10% FOR DISSOLVED OXYGEN AND TURBIDITY.

WATER DRAWDOWN <0.3 FEET DURING PURGING, FLOW RATE ~250 ML/MIN

SHEET ___ OF ___

APPENDIX 8

LABORATORY REPORTS

Analytical data comprising the Appendix 8 section is included in this website posting as “8.1-HydroGeo Report Appendix 8”.

APPENDIX 9

LABORATORY ANALYSIS SUMMARY TABLES

Bioenergy
Hydrogeologic Suitability Report
Summary of Laboratory Analysis for Groundwater Samples

Parameter	Monitoring Date				DNREC HSCA Screening or Regulatory Levels for Groundwater
	MW-1	MW-2	MW-3	MW-4	
Nitrates (Mg/L)	4.95	10.0	9.14	4.60	10 Mg/L*
Total Nitrogen (Mg/L)	5.16	10.22	9.68	4.78	-
Kjeldahl Nitrogen (Mg/L)	0.21	0.22	0.54	0.18	-
Chlorides (Mg/L)	19.0	46.8	50.5	32.3	250**
Sulfides (Mg/L)	0.163	0.0832	<0.01	<0.01	-
Chemical Oxygen Demand (Mg/L)	<10.0	<10.0	<10.0	<10.0	-
Total Dissolved Solids (Mg/L)	100	210	268	118	500**
Total Suspended Solids (Mg/L)	126	182	35.0	179	-
Total Phosphorus (Mg/L)	<0.05	<0.05	<0.05	<0.05	-
Chloroform (ug/L)	<0.33	<0.33	<0.33	<0.33	0.22
Toluene (ug/L)	0.58	<0.38	<0.38	<0.38	110
Aluminum (ug/L)	115	275	413	224	2,000
Arsenic (ug/L)	<0.73	<0.73	1.1j	<0.73	0.052
Barium (ug/L)	114	181	73.8	180	380
Beryllium (ug/L)	0.29j	0.32j	0.41j	0.36j	2.5
Cadmium (ug/L)	<0.81	<0.81	<0.81	<0.81	0.92
Calcium (ug/L)	8,750	22,300	24,100	8,100	-
Cobalt (ug/L)	1.7j	4.6	4.6	3.5j	0.6
Copper (ug/L)	6.2	<2.0	3.3j	<2.0	80
Iron (ug/L)	<51.1	76.7j	64.9	51.1j	300**
Lead (ug/L)	<0.55	<0.55	0.84j	<0.55	15
Manganese (ug/L)	43.6	141	420	113	43/50**
Magnesium (ug/L)	3,000	9,410	7,660	4,020	-
Nickel (ug/L)	<2.4	3.7j	3.0j	5.2	39
Potassium (ug/L)	1,610	2,570	25,600	2,670	-
Sodium (ug/L)	5,500	7,090	15,700	14,600	-
Thallium (ug/L)	<0.16	<0.16	0.18j	<0.16	0.02
Zinc (ug/L)	19.8	18.9	24.0	36.0	600

Notes:
1. Mg/L = milligrams per liter.
2. ug/L = micrograms per liter.
3. *EPA MCL = Environmental Protection Agency, Maximum Contaminant Level permissible in public water systems.
4. ** Indicates Secondary Standard, non-enforceable for aesthetic effects (i.e. taste, odor).
5. j = Estimated concentration detected above reporting limit but below method detection limit.
6. Green highlighted results exceed DNREC Screening Levels or EPA Drinking Water Standard.

Bioenergy
Hydrogeologic Suitability Report
Summary of Laboratory Analysis for Groundwater Samples

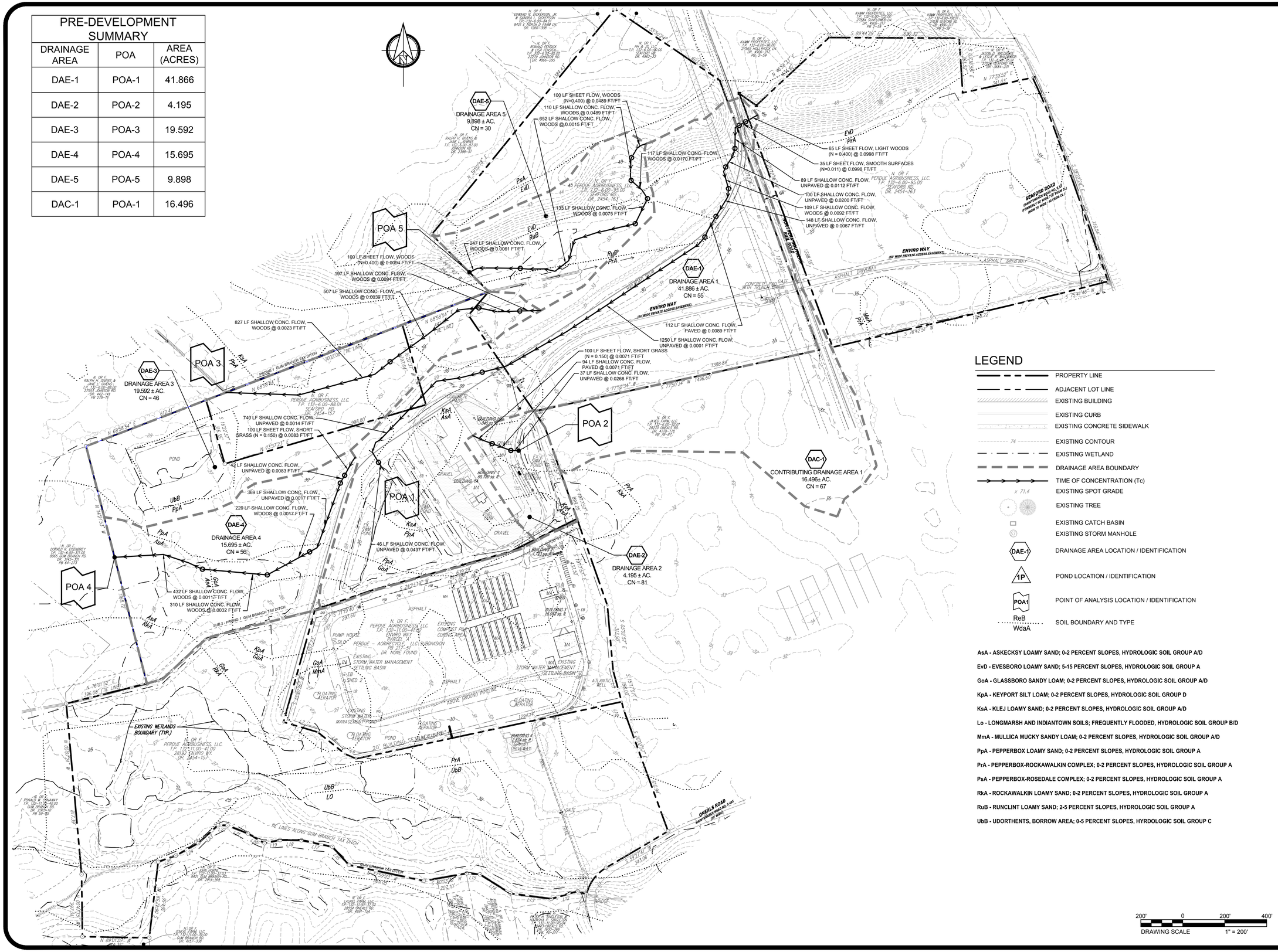
Parameter	Monitoring Date				DNREC HSCA Screening or Regulatory Levels for Groundwater
	MW-5	MW-6	MW-7	MW-8	
Fecal Coliform #/100 ml	<2	<2	<2	<2	Any Detect
Nitrates (Mg/L)	1.29	7.77	10.7	9.88	10 Mg/L*
Total Nitrogen (Mg/L)	1.77	8.20	11.07	10.28	-
Kjeldahl Nitrogen (Mg/L)	0.48	0.43	0.37	0.40	-
Chlorides (Mg/L)	16.0	13.6	14.6	16.0	250**
Sulfides (Mg/L)	1.47	0.245	2.12	6.37	-
Chemical Oxygen Demand (Mg/L)	<10.0	11.9	<10.0	<10.0	-
Total Dissolved Solids (Mg/L)	116	123	158	112	500**
Total Suspended Solids (Mg/L)	595	595	26.0	159	-
Total Phosphorus (Mg/L)	0.05	0.08	<0.05	<0,05	-
Toluene (ug/L)	11.0	11.0	<0.38	<0.38	110
Aluminum (ug/L)	64.5	46.3	156	104	2,000
Arsenic (ug/L)	<0.89	<0.89	<0.89	<0.89	0.052
Barium (ug/L)	144	200	249	138	380
Beryllium (ug/L)	<0.098	<0.098	0.17j	<0.098	2.5
Cadmium (ug/L)	<0.16	<0.16	0.19j	<0.16	0.92
Calcium (ug/L)	6,580	9,720	13,700	6,950	-
Cobalt (ug/L)	3.8	4.9	4.8	3.3j	0.6
Iron (ug/L)	49.6	20.8j	36.0	81.1j	300**
Lead (ug/L)	0.12j	<0.11	0.15	<0.11	15
Manganese (ug/L)	61.3	97.7	181	101	43/50**
Magnesium (ug/L)	2,560	4,410	6,430	2,810	-
Nickel (ug/L)	2.1	4.5	2.7j	2.5j	39
Potassium (ug/L)	3,350	4,200	2,770	2,390	-
Selenium (ug/L)	0.88j	0.76j	<0.46	0.46j	10
Sodium (ug/L)	10,800	8,470	6,320	8,490	-
Zinc (ug/L)	11.7j	20.7	20.8	13.8j	600

Notes:
1. Mg/L = milligrams per liter.
2. ug/L = micrograms per liter.
3. *EPA MCL = Environmental Protection Agency, Maximum Contaminant Level permissible in public water systems
3. ** Indicates Secondary Standard, non-enforceable for aesthetic effects (i.e. taste, odor).
4. j = Estimated concentration detected above reporting limit but below method detection limit.
5. Green highlighted results exceed DNREC Screening Levels or EPA Drinking Water Standard.

APPENDIX 10

PREDEVELOPMENT STORMWATER PLAN

PRE-DEVELOPMENT SUMMARY		
DRAINAGE AREA	POA	AREA (ACRES)
DAE-1	POA-1	41.866
DAE-2	POA-2	4.195
DAE-3	POA-3	19.592
DAE-4	POA-4	15.695
DAE-5	POA-5	9.898
DAC-1	POA-1	16.496


DAE-5
DRAINAGE AREA 5
9.898 ± AC.
CN = 30
DAE-1
DRAINAGE AREA 1
41.886 ± AC.
CN = 55
DAE-2
DRAINAGE AREA 2
4.195 ± AC.
CN = 81
DAE-3
DRAINAGE AREA 3
19.592 ± AC.
CN = 46
DAE-4
DRAINAGE AREA 4
15.695 ± AC.
CN = 56
DAC-1
CONTRIBUTING DRAINAGE AREA 1
16.496± AC.
CN = 67
POA 1
POA 2
POA 3
POA 4
POA 5
100 LF SHEET FLOW, WOODS (N=0.400) @ 0.0489 FT/FT
110 LF SHALLOW CONC. FLOW, WOODS @ 0.0489 FT/FT
652 LF SHALLOW CONC. FLOW, WOODS @ 0.0015 FT/FT
117 LF SHALLOW CONC. FLOW, WOODS @ 0.0170 FT/FT
65 LF SHEET FLOW, LIGHT WOODS (N = 0.400) @ 0.0998 FT/FT
35 LF SHEET FLOW, SMOOTH SURFACES (N=0.011) @ 0.0998 FT/FT
89 LF SHALLOW CONC. FLOW, UNPAVED @ 0.0112 FT/FT
100 LF SHALLOW CONC. FLOW, UNPAVED @ 0.0200 FT/FT
109 LF SHALLOW CONC. FLOW, WOODS @ 0.0092 FT/FT
148 LF SHALLOW CONC. FLOW, UNPAVED @ 0.0067 FT/FT
133 LF SHALLOW CONC. FLOW, WOODS @ 0.0075 FT/FT
247 LF SHALLOW CONC. FLOW, WOODS @ 0.0061 FT/FT
100 LF SHEET FLOW, WOODS (N=0.400) @ 0.0094 FT/FT
197 LF SHALLOW CONC. FLOW, WOODS @ 0.0094 FT/FT
507 LF SHALLOW CONC. FLOW, WOODS @ 0.0039 FT/FT
827 LF SHALLOW CONC. FLOW, WOODS @ 0.0023 FT/FT
112 LF SHALLOW CONC. FLOW, PAVED @ 0.0089 FT/FT
1250 LF SHALLOW CONC. FLOW, UNPAVED @ 0.0001 FT/FT
100 LF SHEET FLOW, SHORT GRASS (N = 0.150) @ 0.0071 FT/FT
94 LF SHALLOW CONC. FLOW, PAVED @ 0.0071 FT/FT
37 LF SHALLOW CONC. FLOW, UNPAVED @ 0.0268 FT/FT
740 LF SHALLOW CONC. FLOW, UNPAVED @ 0.0014 FT/FT
100 LF SHEET FLOW, SHORT GRASS (N = 0.150) @ 0.0083 FT/FT
42 LF SHALLOW CONC. FLOW, UNPAVED @ 0.0083 FT/FT
369 LF SHALLOW CONC. FLOW, UNPAVED @ 0.0017 FT/FT
229 LF SHALLOW CONC. FLOW, WOODS @ 0.0017 FT/FT
46 LF SHALLOW CONC. FLOW, UNPAVED @ 0.0437 FT/FT
432 LF SHALLOW CONC. FLOW, WOODS @ 0.0011 FT/FT
310 LF SHALLOW CONC. FLOW, WOODS @ 0.0032 FT/FT
ENVIRO WAY
(50' WIDE PRIVATE ACCESS EASEMENT)
SEAFORD ROAD
ONEALS ROAD
EXISTING WETLANDS BOUNDARY (TYP.)
PERDUE AGRIBUSINESS, LLC.
T.P. 132-6.00-95.00
SEAFORD RD.
DR. 2454-163
POND
GRAVEL
ASPHALT
ASPHALT DRIVEWAY
CONCRETE PAD
BUILDING 1
BUILDING 2
BUILDING 3
BUILDING 4
PUMP HOUSE
EXISTING COMPOST PILE CURING AREA
EXISTING STORM WATER MANAGEMENT SETTLING BASIN
FLOATING AERATOR
ABOVE GROUND PIPELINE
20' BUILDING SETBACK (TYP.)
TIE LINES ALONG GUM BRANCH TAX DITCH
PROJECT 1 GUM BRANCH TAX DITCH
SUB 2 - PROJ 1 GUM BRANCH TAX DITCH
GUM BRANCH TAX DITCH
N 89°01'22" W
N 76°01'50" E
N 68°58'54" E
N 68°58'54" W
N 42°13'25" W
N 42°13'25" E
S 77°50'34" W
S 76°42'51" W
S 76°41'46" W
S 24°24'19" W
S 80°13'57" W
S 07°07'57" E
S 07°07'57" W
S 07°07'57" E
S 07°07'57" W
S 07°07'57" E
S 07°07

APPENDIX 11

EXPLORATORY STORMWATER MANAGEMENT REPORT

EXPLORATORY STORMWATER REPORT
AND STORMWATER ASSESSMENT STUDY
FOR
BIOENERGY DEVELOPMENT
CITY OF SEAFORD
SUSSEX COUNTY, DELAWARE

TAX PARCEL NUMBERS: 132-6.00-95.00, 132-6.00-88.01, 132-11.00-41.00, and 132-11.00-41.02

April 2020

Prepared for:

Bioenergy Development Group, LLC
6751 Columbia Gateway Drive, Suite 300
Columbia, MD 21046

Prepared by:

Duffield Associates, Inc.
5400 Limestone Road
Wilmington, Delaware 19808

4/10/2020

Stephen J. Gorski, P.E.
Senior Project Manager

Project No. 12393.CF

DUFFIELD ASSOCIATES
Soil, Water & the Environment

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E.	EROSION AND SEDIMENT CONTROL	5

EXHIBITS

Exhibit 1: DelDOT Drainage Correspondence
Exhibit 2: Existing Drainage Area Map
Exhibit 3: Stormwater Assessment Study Mapping
Exhibit 4: Stream Stats Map with Downstream Analysis
Exhibit 5: Web Soil Survey Report
Exhibit 6: Pre-Development HydroCAD Computations
Exhibit 7: Adjacent Well and Septic Location Data

Office Use Only

Date Received:_____ Reviewer:_____

Meeting date/time:_____ DelDOT Attendance Required Y/N:_____

Stormwater Assessment Study (SAS) Checklist

Project Name: Bioenergy Development

Owner/Developer Name: Bioenergy Development Group, LLC.

Contact Person: Peter Ettinger

e-mail: pettinger@bioenergydevco.com Phone:_____

Consultant Company: Duffield Associates, Inc.

Contact Person: Stephen J. Gorski

e-mail: sgorski@duffnet.com Phone: 410-399-9777

Check all items that apply; leave check box blank if N/A.

A. Documents

Items should be arranged in the following order:

- ☐ This completed Stormwater Assessment Study (SAS) Checklist
- ☐ Brief narrative to include the following:
  - Project type/description
  - Description of soil limitations and how they relate to BMP selection
  - Applicable criteria if the site is in an area served by Watershed Master Plan
  - Impacts to tax ditch watershed or ROW
  - Description of existing site conditions and proposed conditions including information on downstream conveyance and Points of Analysis (POAs)
  - Identify and describe existing drainage structures and features
  - Provide photographs of structures / channels / outfalls / POAs
- ☐ Feedback from DelDOT Maintenance regarding drainage concerns **(if relevant)**.

  Consultant to contact DelDOT to determine if there are any known drainage problems. Provide Parcel ID number and a description of the project location, from the nearest intersection. DelDOT will respond with any known drainage and flooding problems.
  - *New Castle County – (302) 326-4523*
  - *Kent County – (302) 760-2424*
  - *Sussex County – (302) 853-1340*

B. Existing Hydrology Mapping

Submit an existing drainage features map based on **field-run topo or current LIDAR data**:

- ☐ On-site subareas
- ☐ Off-site subareas
- ☐ Site points of analysis

C. Stormwater Assessment Study GIS Mapping

Provide maps from the following SAS GIS Web application link:
https://firstmap.delaware.gov/sasgis
(Layers to be overlaid on the most recent aerial imagery basemap)

- ☒ Site location
- ☒ Parcel Boundary showing parcel and ID
- ☒ NHD rivers, streams and water features
- ☒ Contours
- ☒ Tax Ditch Mapping (watershed boundaries, channel locations, rights-of-way)
- ☒ Wellhead protection
- ☒ Aquifer recharge areas
- ☒ Land Use / Land Cover (LULC)
- ☒ Soils
- ☒ State Wetland Mapping Project (SWMP)
- N/A ☐ Head of Tide Mapping
- ☒ Potential Contamination Sources
  - N/A ☐ SIRB Sites
  - N/A ☐ Leaking Tanks
  - ☒ Above Ground Storage Tank Facility
  - N/A ☐ Underground Storage Tanks
  - N/A ☐ Solid and Hazardous Waste Site
- N/A ☐ Flood Data (BFE and FEMA Flood Map)
- ☒ Depth to Water WET

D. Supplemental Information

- ☒ StreamStats Map and Basin Characteristics Report showing limit of downstream analysis. (The downstream analysis point will be located at the point in the watershed where the site area comprises less than 10% of the watershed area. Alternative downstream limit points may be shown for discussion.)
  StreamStats link: https://streamstats.usgs.gov/ss
- ☒ NRCS Web Soil Survey Soils Report
- ☒ Adjacent well locational data
  Well permit data can be searched by tax parcel ID from the Delaware OpenData portal: https://data.delaware.gov/Energy-and-Environment/Well-Permits/2655-qn8j
  - ☒ Public wells within 150' of parcel boundary
  - ☒ Domestic wells within 100' of parcel boundary
- ☒ Adjacent septic system data
  - N/A ☐ Drainfields within 50' of parcel boundary
  - ☒ System components within 25' of parcel boundary

This checklist is for guidance only. The Delegated Agency reserves the right to request additional information during the review process as it deems necessary. Compliance with the checklist in no way is meant to relieve the design professional of his/her professional responsibilities.

I. PURPOSE

This report addresses certain requirements identified in the State of Delaware, Department of Natural Resources and Environmental Control's (DNREC) Stormwater Assessment Study Checklist. The Checklist references the State of Delaware codes and regulations for stormwater management and sediment control. Information is provided in this report discussing the proposed development of the property and the impacts regarding stormwater drainage and management.

The final Stormwater Management Report and the final Erosion & Sediment Control Plans, to be submitted with the Record Plan Stage submission, will demonstrate how the proposed land use action is in accordance with DNREC Sediment and Stormwater Regulations (DSSR), as adopted January 1, 2014, and revised February 11, 2019.

II. NARRATIVE

This report has been prepared in support of the proposed tank farm expansion to the existing site on Enviro Way, east of its intersection with Seaford Road, also known as Sussex County Tax Parcel Nos132-6.00-95.00, 132-6.00-88.01, 132-11.00-41.00, & 132-11.00-41.02. The site is currently mostly developed with an existing bioenergy facility and associated parking, railroads, and stormwater management areas. Existing site cover consists primarily of gravel, buildings, woods, and grass.

The purpose of the project is to develop the property with the addition of a tank farm to the existing site with associated infrastructure. The expansion will be generally focused west of the existing site. Proposed stormwater management facilities will be situated at locations to be determined during the design development stage.

A. LOCATION

The project site is located on the western side of Enviro Way south of the City of Seaford, Sussex County, Delaware. The property is zoned as AR-1 (Environmentally Sensitive Development District Overlay Zone, ESDDOZ).

The property boundaries are identified in the exhibits attached within this report. The project property is located within the Nanticoke River Watershed in the Chesapeake Bay Region. The total site area for the combined tax parcels is approximately 220.52 acres.

B. SITE INFORMATION

According to the NRCS Web Soil Survey for Sussex County, Delaware, Version 9, September 29, 2015, on-site soils and soils in the general vicinity of the project site are mapped as AsA- Askecksy loamy sand, 0-2 percent slope; Evd – Evesboro loamy sand 5-15 percent slope; Goa – Glassboro sandy loam, 0-2 percent slope; KpA – Keyport silt loam, 0-2 percent slope; KsA – Klej loamy sand, 0-2 percent slope; LO – Longmarsh and Indiantown soils, frequently flooded; MmA – Mullica mucky sandy loam, 0-2 percent slope; PpA – Pepperbox loamy sand, 0-2 percent slope; PrA – Pepperbox-Rockawalkin Complex, 0-2 percent slopes; PsA – Pepperbox-Rosedale Complex, 0-2 percent slope RkA – Rockawalkin loamy sand, 0-2 percent slope; RuB – Runclint loamy sand 0-2 percent slope; UdB – Udorthents 0-5 percent slope. The EvD, PpA, PrA, PsA, RkA and RuB soils are classified as Hydrologic Soil Group (HSG) A. The AsA, KsA, MmA and GoA soils are classified as HSG A/D but is assumed to be D type soils in our calculations. The LO soil is classified as HSG B/D but is assumed to be D type soils for our calculations. The UdB soil is classified as HSG C and the KpA soil is classified as HSG D. The EvD and RuB soils are excessively drained and the depths to the seasonal high water table are greater than 80 inches and 40 to 72 inches, respectively. The PpA, PrA RkA, UdB and KpA soils are moderately well drained and the depth to the seasonal high water table is 20 to 40 inches. The PsA soil is well drained and the depth to the seasonal high water table is 40 to 72 inches. The AsA soil is poorly drained and the depth to the seasonal high water table is 0 to 10 inches. The KsA and GoA soils are somewhat poorly drained and the depths to the seasonal high water table are 10 to 20 inches and 12 to 18 inches, respectively. The MmA and LoA soils are very poorly drained and the depth to the seasonal high water table is 0 to 10 inches.

The nearest blue line stream is Gum Branch located approximately 1,500 feet south of the site. Gum Branch drains to the Nanticoke River. The site generally drains west to the River and to a couple of ponds on site.

C. PRE-DEVELOPMENT STORMWATER ANALYSIS

The existing property in the study area consists of approximately 91.25 acres. There are presently four existing ponds on the site. There is some impervious surface on the site including an existing bioenergy facility and associated gravel and asphalt areas.

The pre-developed condition hydrology incorporates the topography based on 1-foot LIDAR contour lines. Hydrologic computations were completed for an analysis of pre-development conditions.

The site generally drains to five analysis points. About half of the site drains west towards existing pond on the property. The rest of the site drains west towards the edge of property. Three offsite drainage areas have also been identified. All three areas drain toward the existing on-site ponds and two points of analysis have been identified for offsite drainage.

Drainage Area #1 takes about half of the site and drains west towards existing ponds on the property. This discharge point will be known as Point of Analysis #1 (POA #1). Contributing Drainage Areas #1 and #3 also discharge to Point of Analysis #1. Contributing Drainage Areas #1 and #3 will be combined with Drainage Area #1 in all calculations.

POA #1

Drainage Area #2 is located east of the existing bioenergy facility on site and discharges towards an existing pond on site. This discharge point will be known as Point of Analysis #2 (POA #2). Contributing Drainage Area #2 also discharges to Point of Analysis #2. Contributing Drainage Area #2 will be combined with Drainage Area #2 in all calculations.

POA #2

Drainage Area #3 is located in the center portion of the site and discharges north towards as sump along Cedar Beach Road. This discharge point will be known as Point of Analysis #3 (POA #3).

POA #3

Drainage Area #4 is located in the western portion of the site and discharges west towards the edge of property. This discharge point will be known as Point of Analysis #4 (POA #4).

POA #4

Drainage Area #5 is located in the in the northern portion of the site and discharges west towards the edge of property. This discharge point will be known as Point of Analysis #5 (POA #5).

POA #5

D. POST-DEVELOPMENT STORMWATER GREEN TECHNOLOGY BEST MANAGEMENT PRACTICE IMPLEMENTATION

Proposed stormwater management facilities are planned within the proposed site layout in order to incorporate low impact drainage design.

The proposed drainage and stormwater management system will be configured to maintain existing site drainage patterns as much as possible. There are currently no foreseen erosion issues that would arise with the proposed development. Additionally, we have reached out to DelDOT about known drainage issues but have not yet heard back from them. Any response received from DelDOT will be added to the subsequent Stormwater Management report. A copy of our letter to DelDOT is included in Exhibit 1 to confirm this.

E. EROSION AND SEDIMENT CONTROL

Erosion and sediment control measures are designed to capture any sediment-laden runoff (prior to it leaving the site), and are in accordance with the DSSR and DNREC Erosion and Sediment Control Handbook. Perimeter controls, stabilized construction entrances, temporary seeding and mulching, and permanent vegetative cover are the key elements of the erosion and sedimentation control practices for this project.

EXHIBIT 1

DELDOT DRAINAGE CORRESPONDENCE

Justin Ohara

From: Justin Ohara
Sent: Friday, April 3, 2020 11:31 AM
To: 'Alastair.Probert@delaware.gov'
Subject: Stormwater Assessment Study Drainage Concerns
Attachments: SAS12393CF.pdf

Hi Alastair

I am currently putting together the Stormwater Assessment Study for four parcels along Enviro Way and at the intersection of Enviro Way and Seaford Road in Sussex County and in accordance with the Stormwater Assessment Study Checklist, I would like to confirm with DelDOT that there are no known concerns in regards to drainage and flooding on this property or the surrounding areas, including drainage along Enviro Way and Seaford Road. The tax parcel numbers are 132-6.00-95.00, 132-6.00-88.01, 132-11.00-41.00, and 132-11.00-41.02. I have included an aerial image and location map with the site marked out on both to help you identify the location. Please let me know if you have any questions.

Thanks,

Justin T. Ohara
Project Engineer

DUFFIELD ASSOCIATES
Soil, Water & the Environment

"Enhancing our community one project at a time."

Duffield Associates, Inc.
5400 Limestone Rd.
Wilmington, DE 19808
P **(302) 239.6634**
F (302) 239.8485
www.duffnet.com
DE - PA - MD - NJ
A Women-Owned Business Enterprise

EXHIBIT 2

EXISTING DRAINAGE AREA MAP

PRE-DEVELOPMENT SUMMARY		
DRAINAGE AREA	POA	AREA (ACRES)
DAE-1	POA-1	41.866
DAE-2	POA-2	4.195
DAE-3	POA-3	19.592
DAE-4	POA-4	15.695
DAE-5	POA-5	9.898
DAC-1	POA-1	16.496

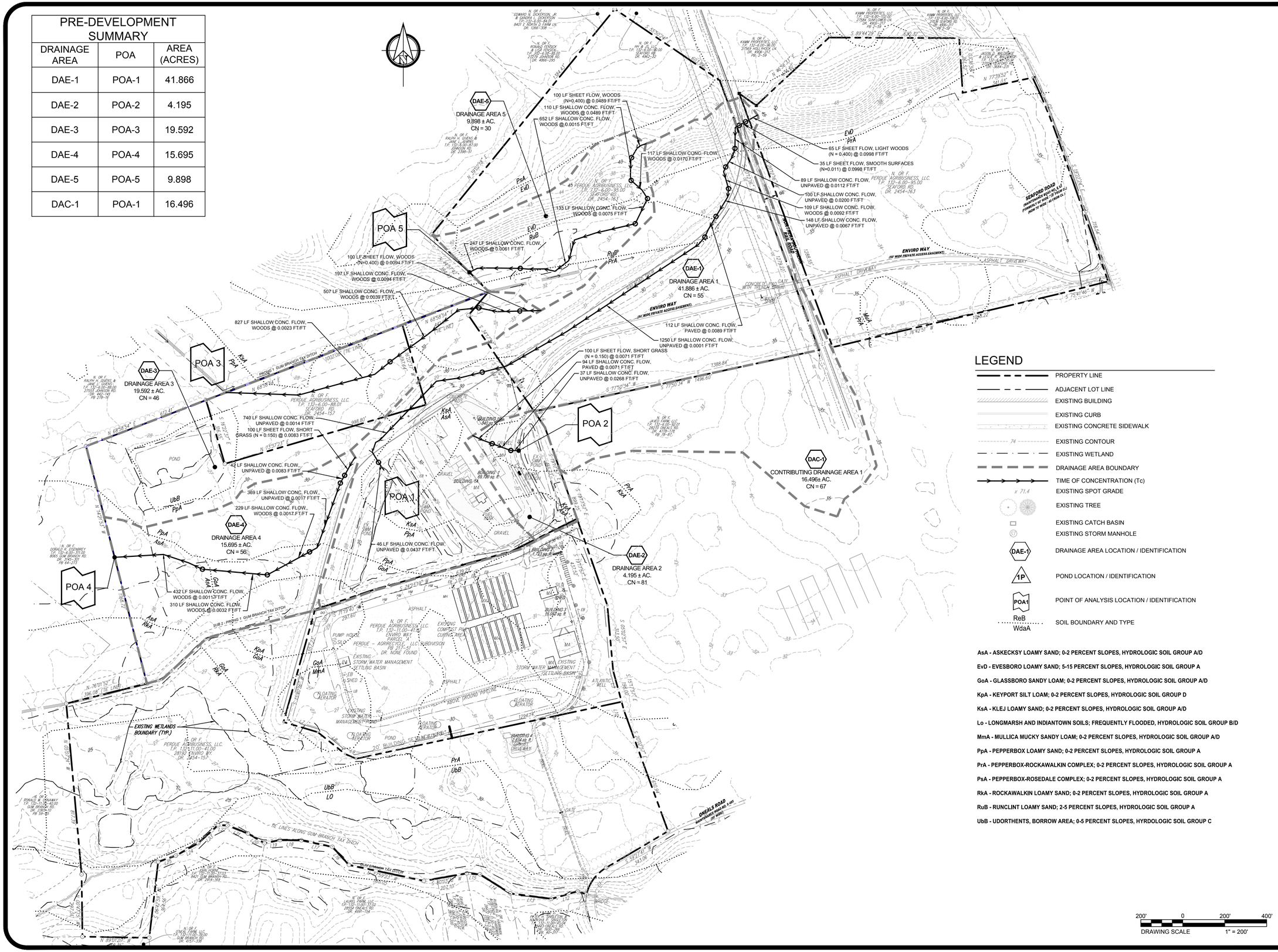

DAE-5
DRAINAGE AREA 5
9.898 ± AC.
CN = 30
DAE-1
DRAINAGE AREA 1
41.886 ± AC.
CN = 55
DAE-2
DRAINAGE AREA 2
4.195 ± AC.
CN = 81
DAE-3
DRAINAGE AREA 3
19.592 ± AC.
CN = 46
DAE-4
DRAINAGE AREA 4
15.695 ± AC.
CN = 56
DAC-1
CONTRIBUTING DRAINAGE AREA 1
16.496± AC.
CN = 67
POA 1
POA 2
POA 3
POA 4
POA 5
100 LF SHEET FLOW, WOODS (N=0.400) @ 0.0489 FT/FT
110 LF SHALLOW CONC. FLOW, WOODS @ 0.0489 FT/FT
652 LF SHALLOW CONC. FLOW, WOODS @ 0.0015 FT/FT
117 LF SHALLOW CONC. FLOW, WOODS @ 0.0170 FT/FT
65 LF SHEET FLOW, LIGHT WOODS (N = 0.400) @ 0.0998 FT/FT
35 LF SHEET FLOW, SMOOTH SURFACES (N=0.011) @ 0.0998 FT/FT
89 LF SHALLOW CONC. FLOW, UNPAVED @ 0.0112 FT/FT
100 LF SHALLOW CONC. FLOW, UNPAVED @ 0.0200 FT/FT
109 LF SHALLOW CONC. FLOW, WOODS @ 0.0092 FT/FT
148 LF SHALLOW CONC. FLOW, UNPAVED @ 0.0067 FT/FT
133 LF SHALLOW CONC. FLOW, WOODS @ 0.0075 FT/FT
247 LF SHALLOW CONC. FLOW, WOODS @ 0.0061 FT/FT
100 LF SHEET FLOW, WOODS (N=0.400) @ 0.0094 FT/FT
197 LF SHALLOW CONC. FLOW, WOODS @ 0.0094 FT/FT
507 LF SHALLOW CONC. FLOW, WOODS @ 0.0039 FT/FT
827 LF SHALLOW CONC. FLOW, WOODS @ 0.0023 FT/FT
112 LF SHALLOW CONC. FLOW, PAVED @ 0.0089 FT/FT
1250 LF SHALLOW CONC. FLOW, UNPAVED @ 0.0001 FT/FT
100 LF SHEET FLOW, SHORT GRASS (N = 0.150) @ 0.0071 FT/FT
94 LF SHALLOW CONC. FLOW, PAVED @ 0.0071 FT/FT
37 LF SHALLOW CONC. FLOW, UNPAVED @ 0.0268 FT/FT
740 LF SHALLOW CONC. FLOW, UNPAVED @ 0.0014 FT/FT
100 LF SHEET FLOW, SHORT GRASS (N = 0.150) @ 0.0083 FT/FT
42 LF SHALLOW CONC. FLOW, UNPAVED @ 0.0083 FT/FT
369 LF SHALLOW CONC. FLOW, UNPAVED @ 0.0017 FT/FT
229 LF SHALLOW CONC. FLOW, WOODS @ 0.0017 FT/FT
46 LF SHALLOW CONC. FLOW, UNPAVED @ 0.0437 FT/FT
432 LF SHALLOW CONC. FLOW, WOODS @ 0.0011 FT/FT
310 LF SHALLOW CONC. FLOW, WOODS @ 0.0032 FT/FT
ENVIRO WAY
(50' WIDE PRIVATE ACCESS EASEMENT)
SEAFORD ROAD
ONEALS ROAD
EXISTING WETLANDS BOUNDARY (TYP.)
PERDUE AGRIBUSINESS, LLC.
T.P. 132-6.00-95.00
SEAFORD RD.
DR. 2454-163
POND
GRAVEL
ASPHALT
ASPHALT DRIVEWAY
CONCRETE PAD
BUILDING 1
BUILDING 2
BUILDING 3
BUILDING 4
PUMP HOUSE
EXISTING COMPOST PILE CURING AREA
EXISTING STORM WATER MANAGEMENT SETTLING BASIN
FLOATING AERATOR
ABOVE GROUND PIPELINE
20' BUILDING SETBACK (TYP.)
TIE LINES ALONG GUM BRANCH TAX DITCH
PROJECT 1 GUM BRANCH TAX DITCH
SUB 2 - PROJ 1 GUM BRANCH TAX DITCH
GUM BRANCH TAX DITCH
N 89°01'22" W
N 76°01'50" E
N 68°58'54" E
N 68°58'54" W
N 42°13'25" W
N 42°13'25" E
S 77°50'34" W
S 76°42'51" W
S 76°41'46" W
S 24°24'19" W
S 80°13'57" W
S 07°07'57" E
S 07°07'57" W
S 07°07'57" E
S 07°07'57" W
S 07°07'57" E
S 07°07

EXHIBIT 3

STORMWATER ASSESSMENT STUDY MAPPING

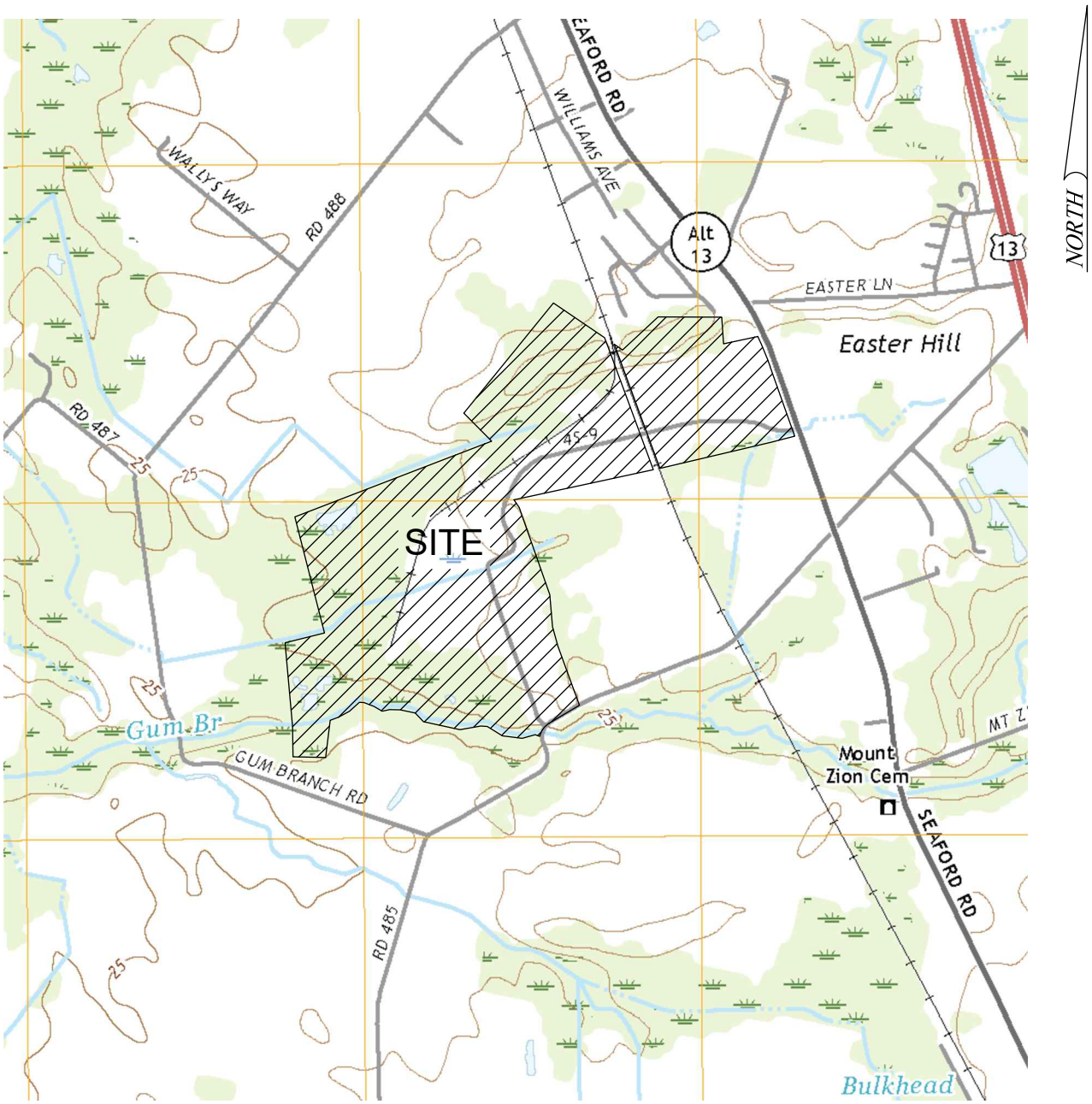
NORTH

NOTE:
THIS LOCATION SKETCH IS ADAPTED FROM THE DEMAC DELAWARE AERIAL PHOTOGRAPHY, 2012.

1600' 0 1600' 3200'

DRAWING SCALE 1" = 1600'

DATE: 3 APRIL 2020	AERIAL IMAGE	DESIGNED BY: JTO	DUFFIELD ASSOCIATES Soil, Water & the Environment
SCALE: 1' = 1600'	STORMWATER REPORT	DRAWN BY: JTO	5400 LIMESTONE ROAD WILMINGTON, DE 19808-1232 TEL. 302.239.6634 FAX 302.239.8485
PROJECT. NO. 12393.CF	**BIOENERGY DEVELOPMENT GROUP**	CHECKED BY: SJG	OFFICES IN DELAWARE, MARYLAND PENNSYLVANIA AND NEW JERSEY
SHEET: EXHIBIT 3A	CITY OF SEAFORD ~SUSSEX COUNTY ~ DELAWARE	FILE: SAS12393CF	E-MAIL: DUFFIELD@DUFFNET.COM

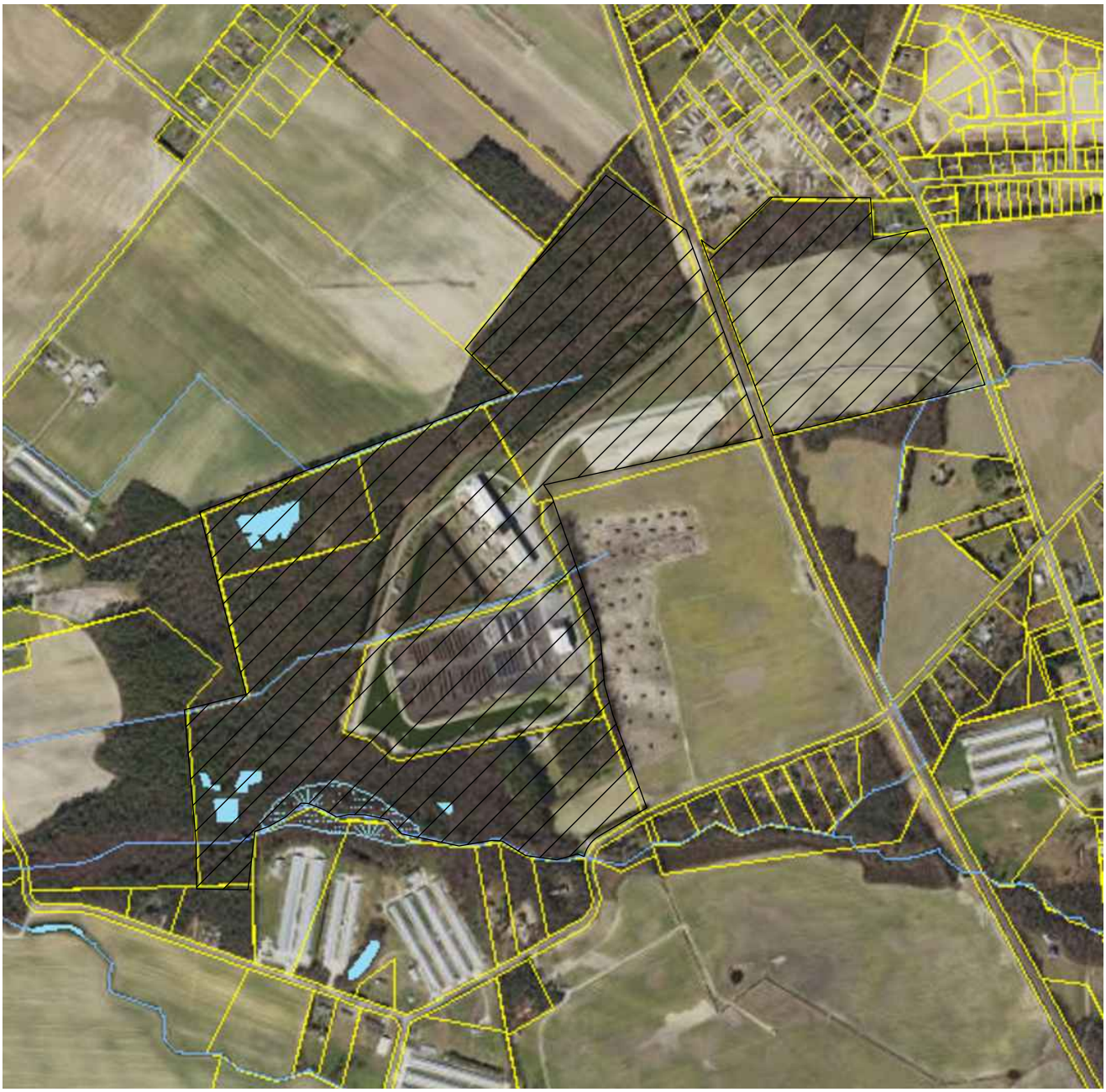


NOTE:
THIS LOCATION SKETCH IS ADAPTED FROM THE U.S.G.S TOPOGRAPHIC MAP, 7.5 MINUTE SERIES, FOR LAUREL QUADRANGLE, 2019

1600' 0 1600' 3200'

DRAWING SCALE 1" = 1600'

DATE: 3 APRIL 2020	USGS IMAGE	**DESIGNED BY: JTO**	DUFFIELD ASSOCIATES Soil, Water & the Environment
SCALE: 1' = 1600'	STORMWATER REPORT	**DRAWN BY: JTO**	5400 LIMESTONE ROAD WILMINGTON, DE 19808-1232 TEL. 302.239.6634 FAX 302.239.8485
PROJECT. NO. 12393.CF	**BIOENERGY DEVELOPMENT GROUP**	**CHECKED BY: SJG**	OFFICES IN DELAWARE, MARYLAND PENNSYLVANIA AND NEW JERSEY
SHEET: EXHIBIT 3B	CITY OF SEAFORD ~SUSSEX COUNTY ~ DELAWARE	**FILE: SAS12393CF**	E-MAIL: DUFFIELD@DUFFNET.COM



NORTH

FlowLine

WaterPolys

Water

Marsh

Parcels

NOTE:
THIS EXHIBIT IS ADAPTED FROM THE DNREC STORMWATER ASSESSMENT STUDY GIS MAP, 2016

1000' 0 1000' 2000'

DRAWING SCALE 1" = 1000'

DATE: 3 APRIL 2020	STORMWATER ASSESMENT STUDY GIS MAPPING	**DESIGNED BY: JTO**	DUFFIELD ASSOCIATES Soil, Water & the Environment
SCALE: 1' = 1000'	PARCEL BOUNDARY SHOWING NHD STREAMS AND WATER FEATURES	**DRAWN BY: JTO**	5400 LIMESTONE ROAD WILMINGTON, DE 19808-1232 TEL. 302.239.6634 FAX 302.239.8485
PROJECT. NO. 12393.CF	**BIOENERGY DEVELOPMENT GROUP**	**CHECKED BY: SJG**	OFFICES IN DELAWARE, MARYLAND PENNSYLVANIA AND NEW JERSEY
SHEET: EXHIBIT 3C	**CITY OF SEAFORD ~ SUSSEX COUNTY ~ DELAWARE**	**FILE: SAS12393CF**	E-MAIL: DUFFIELD@DUFFNET.COM

NORTH

Sussex_Co
- Depression Index
- Depression Intermediate
- Normal Index
- Normal Intermediate

NOTE:
THIS EXHIBIT IS ADAPTED FROM THE DNREC STORMWATER ASSESSMENT STUDY GIS MAP, 2016

1000' 0 1000' 2000'

DRAWING SCALE 1" = 1000'

DATE: 3 APRIL 2020	STORMWATER ASSESMENT STUDY GIS MAPPING	DESIGNED BY: JTO	DUFFIELD ASSOCIATES Soil, Water & the Environment
SCALE: 1' = 1000'	EXISTING 2' CONTOURS	DRAWN BY: JTO	5400 LIMESTONE ROAD WILMINGTON, DE 19808-1232 TEL. 302.239.6634 FAX 302.239.8485
PROJECT. NO. 12393.CF	**BIOENERGY DEVELOPMENT GROUP**	CHECKED BY: SJG	OFFICES IN DELAWARE, MARYLAND PENNSYLVANIA AND NEW JERSEY
SHEET: EXHIBIT 3D	CITY OF SEAFORD ~ SUSSEX COUNTY ~ DELAWARE	FILE: SAS12393CF	E-MAIL: DUFFIELD@DUFFNET.COM

Approx. Watershed Boundary

Tax Ditch Channel

Extent of Right-of-Way

NOTE:
THIS EXHIBIT IS ADAPTED FROM THE DNREC STORMWATER ASSESSMENT STUDY GIS MAP, 2016

1000' 0 1000' 2000'

DRAWING SCALE 1" = 1000'

DATE: 1 MARCH2019	STORMWATER ASSESMENT STUDY GIS MAPPING	**DESIGNED BY:** JTO	DUFFIELD ASSOCIATES Soil, Water & the Environment
SCALE: 1' = 1000'	TAX DITCH MAPPING	**DRAWN BY:** JTO	5400 LIMESTONE ROAD WILMINGTON, DE 19808-1232 TEL. 302.239.6634 FAX 302.239.8485
PROJECT. NO. 12393.CF	**BIOENERGY DEVELOPMENT GROUP**	**CHECKED BY:** SJG	OFFICES IN DELAWARE, MARYLAND PENNSYLVANIA AND NEW JERSEY
SHEET: EXHIBIT 3E	CITY OF SEAFORD ~ SUSSEX COUNTY ~ DELAWARE	**FILE:** SAS12393CF	E-MAIL: DUFFIELD@DUFFNET.COM

NORTH

Well Head Protection Areas

NOTE:
THIS EXHIBIT IS ADAPTED FROM THE DNREC STORMWATER ASSESSMENT STUDY GIS MAP, 2016

1000' 0 1000' 2000'

DRAWING SCALE 1" = 1000'

DATE: 3 APRIL 2020	STORMWATER ASSESMENT STUDY GIS MAPPING	**DESIGNED BY: JTO**	DUFFIELD ASSOCIATES Soil, Water & the Environment
SCALE: 1' = 1000'	WELL HEAD PROTECTION AREAS	**DRAWN BY: JTO**	5400 LIMESTONE ROAD WILMINGTON, DE 19808-1232 TEL. 302.239.6634 FAX 302.239.8485
PROJECT. NO. 12393.CF	**BIOENERGY DEVELOPMENT GROUP**	**CHECKED BY: SJG**	OFFICES IN DELAWARE, MARYLAND PENNSYLVANIA AND NEW JERSEY
SHEET: EXHIBIT 3F	**CITY OF SEAFORD ~ SUSSEX COUNTY ~ DELAWARE**	**FILE: SAS12393CF**	E-MAIL: DUFFIELD@DUFFNET.COM

NORTH

Aquifer Recharge Areas

Excellent Recharge Area

Good Recharge Area

NOTE:
THIS EXHIBIT IS ADAPTED FROM THE DNREC STORMWATER ASSESSMENT STUDY GIS MAP, 2016

1000' 0 1000' 2000'

DRAWING SCALE 1" = 1000'

DATE: 3 APRIL 2020	STORMWATER ASSESMENT STUDY GIS MAPPING	**DESIGNED BY:** JTO	DUFFIELD ASSOCIATES Soil, Water & the Environment
SCALE: 1' = 1000'	AQUIFER RECHARGE AREAS	**DRAWN BY:** JTO	5400 LIMESTONE ROAD WILMINGTON, DE 19808-1232 TEL. 302.239.6634 FAX 302.239.8485
PROJECT. NO. 12393.CF	**BIOENERGY DEVELOPMENT GROUP**	**CHECKED BY:** SJG	OFFICES IN DELAWARE, MARYLAND PENNSYLVANIA AND NEW JERSEY
SHEET: EXHIBIT 3G	CITY OF SEAFORD ~ SUSSEX COUNTY ~ DELAWARE	**FILE:** SAS12393CF	E-MAIL: DUFFIELD@DUFFNET.COM

Soils - Sussex County

- D
- A
- B/D
- A/D
- C

NOTE:
THIS EXHIBIT IS ADAPTED FROM THE DNREC STORMWATER ASSESSMENT STUDY GIS MAP, 2016

1000' 0 1000' 2000'

DRAWING SCALE 1" = 1000'

DATE: 1 MARCH2019	STORMWATER ASSESMENT STUDY GIS MAPPING SOILS	DESIGNED BY: JTO	DUFFIELD ASSOCIATES Soil, Water & the Environment
SCALE: 1' = 1000'	**BIOENERGY DEVELOPMENT GROUP**	DRAWN BY: JTO	5400 LIMESTONE ROAD WILMINGTON, DE 19808-1232 TEL. 302.239.6634 FAX 302.239.8485
PROJECT. NO. 12393.CF		CHECKED BY: SJG	OFFICES IN DELAWARE, MARYLAND PENNSYLVANIA AND NEW JERSEY
SHEET: EXHIBIT 3H	CITY OF SEAFORD ~ SUSSEX COUNTY ~ DELAWARE	FILE: SAS12393.CF	E-MAIL: DUFFIELD@DUFFNET.COM

NORTH

State Wetlands Mapping Project

- PALUSTRINE FORESTED DECIDUOUS
- PALUSTRINE SCRUB/SHRUB
- PALUSTRINE OPEN WATER/FLATS
- PALUSTRINE FORESTED EVERGREEN
- PALUSTRINE EMERGENT

NOTE:
THIS EXHIBIT IS ADAPTED FROM THE DNREC STORMWATER ASSESSMENT STUDY GIS MAP, 2016

1000' 0 1000' 2000'

DRAWING SCALE 1" = 1000'

DATE: 1 MARCH2019	STORMWATER ASSESMENT STUDY GIS MAPPING	**DESIGNED BY:** JTO	DUFFIELD ASSOCIATES Soil, Water & the Environment
SCALE: 1' = 1000'	STATE WETLAND MAPPING PROJECT	**DRAWN BY:** JTO	5400 LIMESTONE ROAD WILMINGTON, DE 19808-1232 TEL. 302.239.6634 FAX 302.239.8485
PROJECT. NO. 12393.CF	**BIOENERGY DEVELOPMENT GROUP**	**CHECKED BY:** SJG	OFFICES IN DELAWARE, MARYLAND PENNSYLVANIA AND NEW JERSEY
SHEET: EXHIBIT 3I	CITY OF SEAFORD ~ SUSSEX COUNTY ~ DELAWARE	**FILE:** SAS12393.CF	E-MAIL: DUFFIELD@DUFFNET.COM

Leaking Tanks

Above Ground Storage Tank Facility

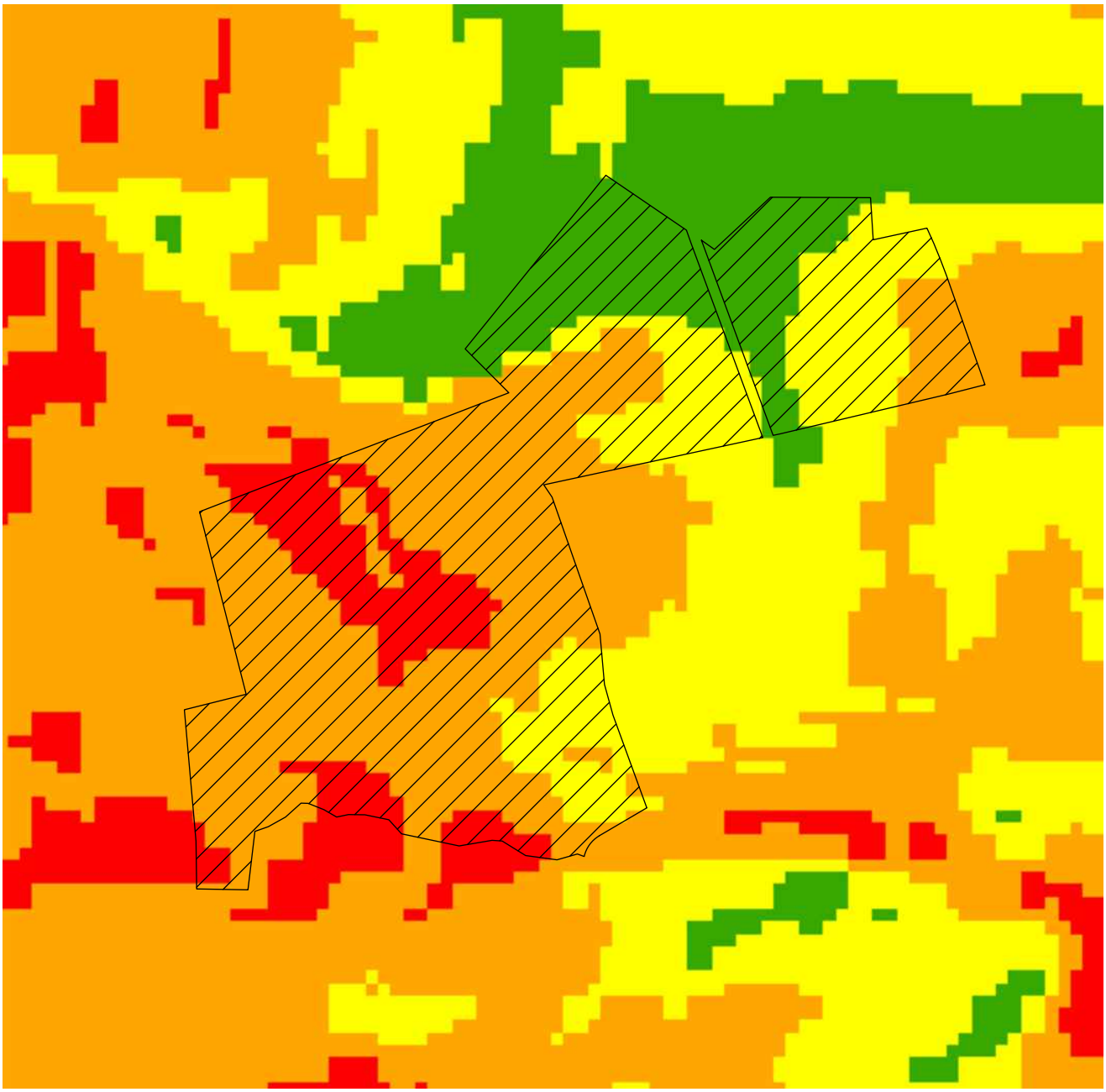
Underground Storage Tanks

NOTE:
THIS EXHIBIT IS ADAPTED FROM THE DNREC STORMWATER ASSESSMENT STUDY GIS MAP, 2016

1000' 0 1000' 2000'

DRAWING SCALE 1" = 1000'

DATE: 1 MARCH2019	STORMWATER ASSESMENT STUDY GIS MAPPING	DESIGNED BY: JTO	DUFFIELD ASSOCIATES Soil, Water & the Environment
SCALE: 1' = 1000'	POTENTIAL CONTAMINATION SOURCES	DRAWN BY: JTO	5400 LIMESTONE ROAD WILMINGTON, DE 19808-1232 TEL. 302.239.6634 FAX 302.239.8485
PROJECT. NO. 12393.CF	**BIOENERGY DEVELOPMENT GROUP**	CHECKED BY: SJG	OFFICES IN DELAWARE, MARYLAND PENNSYLVANIA AND NEW JERSEY
SHEET: EXHIBIT 3J	CITY OF SEAFORD ~ SUSSEX COUNTY ~ DELAWARE	FILE: SAS12393.CF	E-MAIL: DUFFIELD@DUFFNET.COM



0 - 3
3 - 6
6 - 9
9 - 16
16 - 20
> 20

NOTE:
THIS EXHIBIT IS ADAPTED FROM THE DNREC STORMWATER ASSESSMENT STUDY GIS MAP, 2016

1000' 0 1000' 2000'

DRAWING SCALE 1" = 1000'

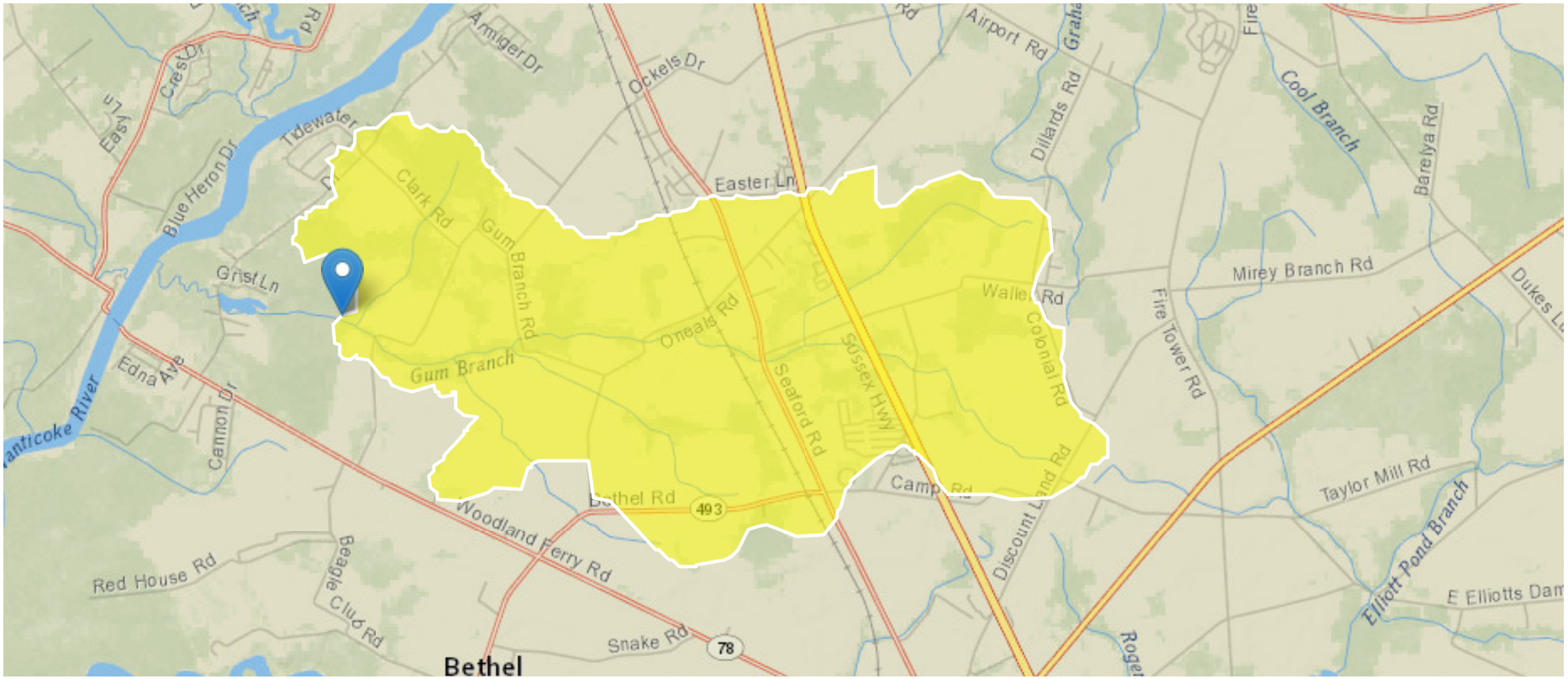
DATE: 1 MARCH2019	STORMWATER ASSESMENT STUDY GIS MAPPING	DESIGNED BY: JTO	DUFFIELD ASSOCIATES Soil, Water & the Environment
SCALE: 1' = 1000'	DEPTH TO WATER WET	DRAWN BY: JTO	5400 LIMESTONE ROAD WILMINGTON, DE 19808-1232 TEL. 302.239.6634 FAX 302.239.8485
PROJECT. NO. 12393.CF	**BIOENERGY DEVELOPMENT GROUP**	CHECKED BY: SJG	OFFICES IN DELAWARE, MARYLAND PENNSYLVANIA AND NEW JERSEY
SHEET: EXHIBIT 3K	CITY OF SEAFORD ~ SUSSEX COUNTY ~ DELAWARE	FILE: SAS12393.CF	E-MAIL: DUFFIELD@DUFFNET.COM

EXHIBIT 4

STREAM STATS MAP WITH
DOWNSTREAM ANALYSIS

StreamStats Report

Region ID: DE
Workspace ID: DE20200401193315053000
Clicked Point (Latitude, Longitude): 38.59968, -75.63338
Time: 2020-04-01 15:33:50 -0400



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	6.66	square miles
BSLDEM10M	Mean basin slope computed from 10 m DEM	0.68	percent
SOILA	Percentage of area of Hydrologic Soil Type A	41.2013	percent
FOREST	Percentage of area covered by forest	11.4341	percent
IMPNLCD01	Percentage of impervious area determined from NLCD 2001 impervious dataset	1.353	percent
LC11DEV	Percentage of developed (urban) land from NLCD 2011 classes 21-24	11.2	percent
LC11IMP	Average percentage of impervious area determined from NLCD 2011 impervious dataset	3.06	percent
STORNHD	Percent storage (wetlands and waterbodies) determined from 1:24K NHD	1.9038	percent

Peak-Flow Statistics Parameters[Coastal Plain Region]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	6.66	square miles	0.51	117
BSLDEM10M	Mean Basin Slope from 10m DEM	0.68	percent	0.3	3.69
SOILA	Percent Hydrologic Soil Type A	41.2013	percent	0.53	60

Peak-Flow Statistics Flow Report[Coastal Plain Region]

PIl: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PIl	PIu	SE	SEp	Equiv. Yrs.
2 Year Peak Flood	103	ft^3/s	37.1	285	67.4	67.4	0.8
5 Year Peak Flood	169	ft^3/s	67	426	60.1	60.1	1.6

Statistic	Value	Unit	PIl	PIu	SE	SEp	Equiv. Yrs.
10 Year Peak Flood	221	ft^3/s	89.4	545	58.5	58.5	2.4
25 Year Peak Flood	296	ft^3/s	92.3	948	59	59	3.5
50 Year Peak Flood	356	ft^3/s	107	1190	60.8	60.8	4.2
100 Year Peak Flood	423	ft^3/s	120	1490	63.4	63.4	4.8
200 Year Peak Flood	494	ft^3/s	132	1850	66.9	66.9	5.2
500 Year Peak Flood	595	ft^3/s	145	2450	72.3	72.3	5.6

Peak-Flow Statistics Citations

Ries, K.G., III, and Dillow, J.J.A.,2006, Magnitude and frequency of floods in Delaware: Scientific Investigations Report 2006-5146, 59 p. (http://pubs.usgs.gov/sir/2006/5146/)

USGS Data Disclaimer: Unless otherwise stated, all data, metadata and related materials are considered to satisfy the quality standards relative to the purpose for which the data were collected. Although these data and associated metadata have been reviewed for accuracy and completeness and approved for release by the U.S. Geological Survey (USGS), no warranty expressed or implied is made regarding the display or utility of the data for other purposes, nor on all computer systems, nor shall the act of distribution constitute any such warranty.

USGS Software Disclaimer: This software has been approved for release by the U.S. Geological Survey (USGS). Although the software has been subjected to rigorous review, the USGS reserves the right to update the software as needed pursuant to further analysis and review. No warranty, expressed or implied, is made by the USGS or the U.S. Government as to the functionality of the software and related material nor shall the fact of release constitute any such warranty. Furthermore, the software is released on condition that neither the USGS nor the U.S. Government shall be held liable for any damages resulting from its authorized or unauthorized use.

USGS Product Names Disclaimer: Any use of trade, firm, or product names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

Application Version: 4.3.11

EXHIBIT 5

WEB SOIL SURVEY REPORT

United States Department of Agriculture

NRCS

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

Sussex County, Delaware

April 1, 2020

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

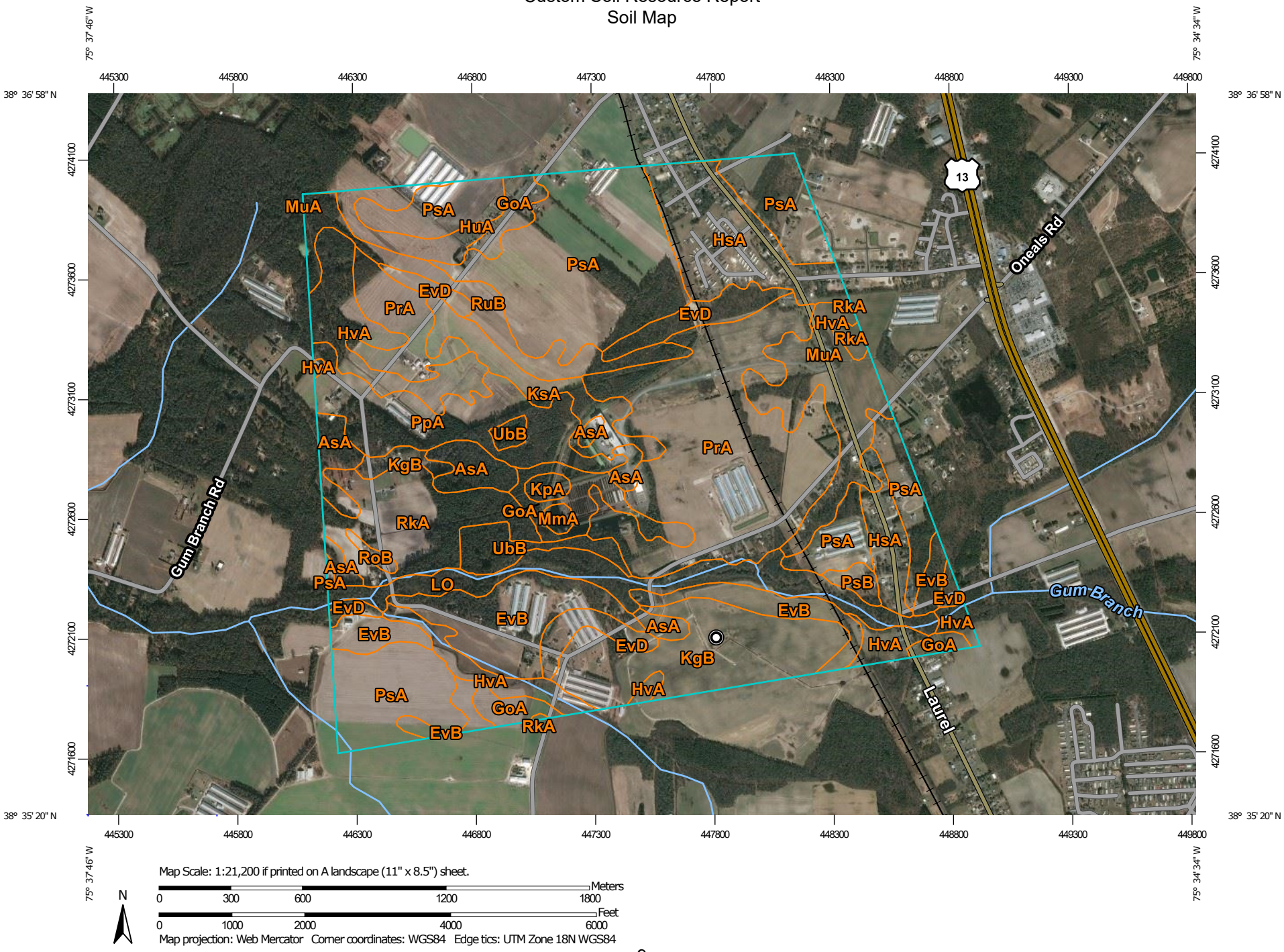
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

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

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

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

Soil Survey Area: Sussex County, Delaware
Survey Area Data: Version 20, Sep 13, 2019

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Nov 21, 2018—Mar 12, 2019

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

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
AsA	Askecksy loamy sand, 0 to 2 percent slopes	40.4	3.0%
EvB	Evesboro loamy sand, 0 to 5 percent slopes	98.7	7.4%
EvD	Evesboro loamy sand, 5 to 15 percent slopes	43.6	3.3%
GoA	Glassboro sandy loam, 0 to 2 percent slopes	46.6	3.5%
HsA	Henlopen-Rosedale-Urban land complex, 0 to 2 percent slopes	83.4	6.3%
HuA	Hurlock loamy sand, 0 to 2 percent slopes	19.6	1.5%
HvA	Hurlock sandy loam, 0 to 2 percent slopes	80.1	6.0%
KgB	Klej-Galloway complex, 0 to 5 percent slopes	87.2	6.6%
KpA	Keyport silt loam, 0 to 2 percent slopes	4.4	0.3%
KsA	Klej loamy sand, 0 to 2 percent slopes	31.8	2.4%
LO	Longmarsh and Indiantown soils, frequently flooded	59.0	4.4%
MmA	Mullica mucky sandy loam, 0 to 2 percent slopes	3.1	0.2%
MuA	Mullica-Berryland complex, 0 to 2 percent slopes	54.6	4.1%
PpA	Pepperbox loamy sand, 0 to 2 percent slopes	67.5	5.1%
PrA	Pepperbox-Rockawalkin complex, 0 to 2 percent slopes	211.2	15.9%
PsA	Pepperbox-Rosedale complex, 0 to 2 percent slopes	261.8	19.7%
PsB	Pepperbox-Rosedale complex, 2 to 5 percent slopes	5.7	0.4%
RkA	Rockawalkin loamy sand, 0 to 2 percent slopes	66.9	5.0%
RoB	Rosedale loamy sand, 2 to 5 percent slopes	2.9	0.2%
RuB	Runclint loamy sand, 2 to 5 percent slopes	40.4	3.0%
UbB	Udorthents, borrow area, 0 to 5 percent slopes	21.0	1.6%
Totals for Area of Interest		**1,329.8**	**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.

Sussex County, Delaware

AsA—Askecksy loamy sand, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 1qtfg
Elevation: 0 to 100 feet
Mean annual precipitation: 42 to 48 inches
Mean annual air temperature: 52 to 58 degrees F
Frost-free period: 180 to 220 days
Farmland classification: Not prime farmland

Map Unit Composition

Askecksy, undrained, and similar soils: 45 percent
Askecksy, drained, and similar soils: 30 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Askecksy, Undrained

Setting

Landform: Depressions, swales, flats, drainageways
Landform position (three-dimensional): Talf
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Parent material: Sandy eolian deposits and/or fluviomarine sediments

Typical profile

Oe - 0 to 3 inches: moderately decomposed plant material
A - 3 to 8 inches: loamy sand
Bg - 8 to 21 inches: loamy sand
Cg1 - 21 to 29 inches: sand
Cg2 - 29 to 80 inches: sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 99.90 in/hr)
Depth to water table: About 0 to 10 inches
Frequency of flooding: None
Frequency of ponding: Occasional
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 3.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: A/D
Hydric soil rating: Yes

Description of Askecksy, Drained

Setting

Landform: Flats, swales, depressions
Landform position (three-dimensional): Talf
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Parent material: Sandy eolian deposits and/or fluviomarine sediments

Typical profile

Ap - 0 to 8 inches: loamy sand
Bg - 8 to 21 inches: loamy sand
Cg1 - 21 to 29 inches: sand
Cg2 - 29 to 80 inches: sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.38 to 99.90 in/hr)
Depth to water table: About 10 to 20 inches
Frequency of flooding: None
Frequency of ponding: Rare
Available water storage in profile: Very low (about 2.5 inches)

Interpretive groups

Land capability classification (irrigated): 3w
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: A/D
Hydric soil rating: Yes

Minor Components

Hurlock, undrained

Percent of map unit: 10 percent
Landform: Depressions, swales, flats
Landform position (three-dimensional): Dip
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Hydric soil rating: Yes

Mullica, undrained

Percent of map unit: 5 percent
Landform: Depressions, swales, flats, drainageways
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: Yes

Galloway

Percent of map unit: 5 percent
Landform: Depressions, flats
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Hydric soil rating: No

Klej

Percent of map unit: 5 percent
Landform: Flats, depressions
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Hydric soil rating: No

EvB—Evesboro loamy sand, 0 to 5 percent slopes

Map Unit Setting

National map unit symbol: 1qtg9
Elevation: 0 to 200 feet
Mean annual precipitation: 42 to 48 inches
Mean annual air temperature: 52 to 58 degrees F
Frost-free period: 180 to 220 days
Farmland classification: Not prime farmland

Map Unit Composition

Evesboro and similar soils: 75 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Evesboro

Setting

Landform: Knolls, flats, dunes, fluviomarine terraces
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Parent material: Sandy eolian deposits and/or fluviomarine sediments

Typical profile

Ap - 0 to 4 inches: loamy sand
E - 4 to 16 inches: loamy sand
Bw - 16 to 39 inches: loamy sand
C - 39 to 80 inches: sand

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.9 inches)

Interpretive groups

Land capability classification (irrigated): 3s
Land capability classification (nonirrigated): 4s
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Runclint

Percent of map unit: 10 percent
Landform: Fluviomarine terraces, knolls, flats, dunes
Landform position (three-dimensional): Rise
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Hydric soil rating: No

Galloway

Percent of map unit: 5 percent
Landform: Flats, depressions
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Hydric soil rating: No

Cedartown

Percent of map unit: 5 percent
Landform: Dunes, flats, knolls
Landform position (three-dimensional): Rise, talf
Down-slope shape: Convex, linear
Across-slope shape: Linear, convex
Hydric soil rating: No

Fort mott

Percent of map unit: 5 percent
Landform: Flats, fluviomarine terraces, knolls
Landform position (three-dimensional): Rise
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Hydric soil rating: No

EvD—Evesboro loamy sand, 5 to 15 percent slopes

Map Unit Setting

National map unit symbol: 1qtgc
Elevation: 0 to 200 feet
Mean annual precipitation: 42 to 48 inches
Mean annual air temperature: 52 to 58 degrees F
Frost-free period: 180 to 220 days
Farmland classification: Not prime farmland

Map Unit Composition

Evesboro and similar soils: 75 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Evesboro

Setting

Landform: Flats, dunes, knolls, fluviomarine terraces
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Parent material: Sandy eolian deposits and/or fluviomarine sediments

Typical profile

Ap - 0 to 4 inches: loamy sand
E - 4 to 16 inches: loamy sand
Bw - 16 to 39 inches: loamy sand
C - 39 to 80 inches: sand

Properties and qualities

Slope: 5 to 15 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.9 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Runclint

Percent of map unit: 10 percent
Landform: Knolls, flats, dunes, fluviomarine terraces
Landform position (three-dimensional): Rise
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Hydric soil rating: No

Cedartown

Percent of map unit: 5 percent
Landform: Dunes, flats, knolls
Landform position (three-dimensional): Rise, talf
Down-slope shape: Convex, linear
Across-slope shape: Linear, convex
Hydric soil rating: No

Galloway

Percent of map unit: 5 percent

Landform: Flats, depressions
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Hydric soil rating: No

Fort mott

Percent of map unit: 5 percent
Landform: Fluviomarine terraces, flats, knolls
Landform position (three-dimensional): Rise
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Hydric soil rating: No

GoA—Glassboro sandy loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 1qtgs
Elevation: 0 to 140 feet
Mean annual precipitation: 42 to 48 inches
Mean annual air temperature: 52 to 58 degrees F
Frost-free period: 180 to 220 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Glassboro and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Glassboro

Setting

Landform: Drainageways, flats
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy fluviomarine deposits

Typical profile

Ap - 0 to 11 inches: sandy loam
Bt1 - 11 to 16 inches: sandy loam
Bt2 - 16 to 21 inches: coarse sandy loam
Btg - 21 to 26 inches: coarse sandy loam
Cg - 26 to 40 inches: loamy coarse sand
C1 - 40 to 56 inches: coarse sand
C2 - 56 to 80 inches: coarse sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly drained
Runoff class: Negligible

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: About 12 to 18 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.2 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: A/D
Hydric soil rating: No

Minor Components

Klej
Percent of map unit: 5 percent

Hurlock
Percent of map unit: 5 percent

Hammonton
Percent of map unit: 5 percent

Askecksy
Percent of map unit: 3 percent

Galloway
Percent of map unit: 2 percent

HsA—Henlopen-Rosedale-Urban land complex, 0 to 2 percent slopes

Map Unit Setting
National map unit symbol: 1qth7
Elevation: 0 to 130 feet
Mean annual precipitation: 42 to 48 inches
Mean annual air temperature: 52 to 58 degrees F
Frost-free period: 180 to 220 days
Farmland classification: Not prime farmland

Map Unit Composition
Henlopen and similar soils: 40 percent
Rosedale and similar soils: 30 percent
Urban land: 20 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Henlopen

Setting
Landform: Dunes, marine terraces
Down-slope shape: Convex, linear

Across-slope shape: Linear
Parent material: Sandy eolian deposits and loamy fluviomarine sediments

Typical profile

Ap - 0 to 10 inches: loamy sand
E - 10 to 46 inches: loamy sand
Bt - 46 to 62 inches: sandy loam
C - 62 to 80 inches: sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Runoff class: Negligible
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 storage in profile: Low (about 5.9 inches)

Interpretive groups

Land capability classification (irrigated): 2s
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: A
Hydric soil rating: No

Description of Rosedale

Setting

Landform: Flats
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy eolian deposits over fluviomarine sediments

Typical profile

A - 0 to 9 inches: loamy sand
E - 9 to 25 inches: loamy sand
Bt - 25 to 38 inches: sandy loam
C - 38 to 68 inches: loamy sand
2Cg - 68 to 80 inches: sandy clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 5.95 in/hr)
Depth to water table: About 40 to 72 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.3 inches)

Interpretive groups

Land capability classification (irrigated): 2s
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: A

Hydric soil rating: No

Description of Urban Land

Setting

Landform: Flats
Down-slope shape: Linear
Across-slope shape: Linear

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydric soil rating: Unranked

Minor Components

Runclint

Percent of map unit: 5 percent

Fort mott

Percent of map unit: 5 percent

HuA—Hurlock loamy sand, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 1qth8
Elevation: 0 to 140 feet
Mean annual precipitation: 42 to 48 inches
Mean annual air temperature: 52 to 58 degrees F
Frost-free period: 180 to 220 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Hurlock, undrained, and similar soils: 40 percent
Hurlock, drained, and similar soils: 40 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hurlock, Undrained

Setting

Landform: Depressions, flats, swales
Landform position (three-dimensional): Dip
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Parent material: Loamy fluviomarine sediments

Typical profile

Oe - 0 to 3 inches: moderately decomposed plant material

A - 3 to 6 inches: loamy sand
Eg - 6 to 13 inches: sandy loam
Btg - 13 to 25 inches: sandy loam
Cg - 25 to 63 inches: loamy sand
2Cg - 63 to 80 inches: silt loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 5.95 in/hr)
Depth to water table: About 0 to 10 inches
Frequency of flooding: None
Frequency of ponding: Occasional
Available water storage in profile: Moderate (about 7.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: A/D
Hydric soil rating: Yes

Description of Hurlock, Drained

Setting

Landform: Flats, swales, depressions
Landform position (three-dimensional): Dip
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Parent material: Loamy fluviomarine sediments

Typical profile

Ap - 0 to 10 inches: loamy sand
Eg - 10 to 13 inches: sandy loam
Btg - 13 to 25 inches: sandy loam
Cg - 25 to 63 inches: loamy sand
2Cg - 63 to 80 inches: silt loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 5.95 in/hr)
Depth to water table: About 10 to 20 inches
Frequency of flooding: None
Frequency of ponding: Rare
Available water storage in profile: Moderate (about 6.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: A/D
Hydric soil rating: Yes

Minor Components

Klej

Percent of map unit: 5 percent
Landform: Depressions, flats
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Hydric soil rating: No

Hammonton

Percent of map unit: 5 percent
Landform: Flats, drainageways, depressions
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Hydric soil rating: No

Glassboro

Percent of map unit: 5 percent
Landform: Drainageways, flats
Down-slope shape: Concave, linear
Across-slope shape: Linear
Hydric soil rating: No

Galloway

Percent of map unit: 5 percent
Landform: Flats, depressions
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Hydric soil rating: No

HvA—Hurlock sandy loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 1qth9
Elevation: 0 to 120 feet
Mean annual precipitation: 42 to 48 inches
Mean annual air temperature: 52 to 58 degrees F
Frost-free period: 180 to 220 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Hurlock, drained, and similar soils: 42 percent
Hurlock, undrained, and similar soils: 38 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hurlock, Drained

Setting

Landform: Swales, flats, depressions
Down-slope shape: Concave, linear
Across-slope shape: Linear, concave
Parent material: Loamy fluviomarine sediments fluviomarine deposits

Typical profile

Ap - 0 to 10 inches: sandy loam
Eg - 10 to 13 inches: sandy loam
Btg - 13 to 25 inches: sandy loam
Cg - 25 to 63 inches: loamy sand
2Cg - 63 to 80 inches: silt loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 5.95 in/hr)
Depth to water table: About 10 to 20 inches
Frequency of flooding: None
Frequency of ponding: Rare
Available water storage in profile: Moderate (about 6.7 inches)

Interpretive groups

Land capability classification (irrigated): 3w
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: A/D
Hydric soil rating: Yes

Description of Hurlock, Undrained

Setting

Landform: Depressions, swales, flats, drainageways
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Parent material: Loamy fluviomarine sediments fluviomarine deposits

Typical profile

Oe - 0 to 2 inches: moderately decomposed plant material
A - 2 to 4 inches: sandy loam
Eg - 4 to 13 inches: sandy loam
Btg - 13 to 25 inches: sandy loam
Cg - 25 to 63 inches: loamy sand
2Cg - 63 to 80 inches: silt loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 5.95 in/hr)
Depth to water table: About 0 to 10 inches

Frequency of flooding: None
Frequency of ponding: Occasional
Available water storage in profile: Moderate (about 7.4 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: A/D
Hydric soil rating: Yes

Minor Components

Hammonton
Percent of map unit: 5 percent
Landform: Drainageways, flats
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Woodstown
Percent of map unit: 5 percent
Landform: Broad interstream divides, flats, fluviomarine terraces
Landform position (three-dimensional): Tread, rise
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Mullica, drained
Percent of map unit: 5 percent
Landform: Drainageways, depressions, swales, flats
Landform position (three-dimensional): Dip
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Hydric soil rating: Yes

Klej
Percent of map unit: 5 percent
Landform: Flats
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

KgB—Klej-Galloway complex, 0 to 5 percent slopes

Map Unit Setting
National map unit symbol: 1qthr
Elevation: 0 to 200 feet
Mean annual precipitation: 42 to 48 inches
Mean annual air temperature: 52 to 58 degrees F

Frost-free period: 180 to 220 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Klej and similar soils: 45 percent
Galloway and similar soils: 35 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Klej

Setting

Landform: Flats, depressions
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Parent material: Sandy eolian deposits and/or fluviomarine sediments

Typical profile

A - 0 to 7 inches: loamy sand
E - 7 to 14 inches: loamy sand
Bw - 14 to 20 inches: loamy sand
C - 20 to 62 inches: loamy sand
Cg - 62 to 80 inches: sand

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (0.57 to 19.98 in/hr)
Depth to water table: About 10 to 20 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.4 inches)

Interpretive groups

Land capability classification (irrigated): 3w
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: A/D
Hydric soil rating: No

Description of Galloway

Setting

Landform: Flats, depressions
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Parent material: Sandy eolian deposits and/or fluviomarine sediments

Typical profile

Ap - 0 to 12 inches: loamy sand
Bw - 12 to 15 inches: loamy sand
C1 - 15 to 30 inches: loamy sand
C2 - 30 to 80 inches: sand

Properties and qualities

Slope: 0 to 5 percent

Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.38 to 99.90 in/hr)
Depth to water table: About 20 to 40 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.9 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Runclint

Percent of map unit: 5 percent
Landform: Fluviomarine terraces, flats
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Askecksy, drained

Percent of map unit: 5 percent
Landform: Swales, flats, depressions
Landform position (three-dimensional): Talf
Down-slope shape: Concave, linear
Across-slope shape: Linear, concave
Hydric soil rating: Yes

Hurlock, drained

Percent of map unit: 5 percent
Landform: Flats, depressions, swales
Landform position (three-dimensional): Dip
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Hydric soil rating: Yes

Berryland, drained

Percent of map unit: 5 percent
Landform: Depressions, swales, flats
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: Yes

KpA—Keyport silt loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 1qtht
Elevation: 0 to 210 feet
Mean annual precipitation: 42 to 48 inches
Mean annual air temperature: 52 to 58 degrees F
Frost-free period: 180 to 220 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Keyport and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Keyport

Setting

Landform: Depressions, flats, fluviomarine terraces
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Parent material: Silty and clayey eolian deposits over fluviomarine sediments

Typical profile

Ap - 0 to 10 inches: silt loam
Bt - 10 to 48 inches: silty clay loam
2Cg - 48 to 80 inches: stratified silt loam to sandy loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Runoff class: Low
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 20 to 40 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 10.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Mattapex

Percent of map unit: 10 percent
Landform: Swales, flats, depressions
Down-slope shape: Concave, linear
Across-slope shape: Linear, concave
Hydric soil rating: No

Crosiadore

Percent of map unit: 5 percent
Landform: Flats, depressions
Landform position (three-dimensional): Talf
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Hydric soil rating: No

Lenni, drained

Percent of map unit: 5 percent
Landform: Flats, depressions, swales
Landform position (three-dimensional): Dip
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Hydric soil rating: Yes

KsA—Klej loamy sand, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 1qthw
Elevation: 0 to 200 feet
Mean annual precipitation: 42 to 48 inches
Mean annual air temperature: 52 to 58 degrees F
Frost-free period: 180 to 220 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Klej and similar soils: 70 percent
Minor components: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Klej

Setting

Landform: Flats, depressions
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Parent material: Sandy eolian deposits and/or fluviomarine sediments

Typical profile

A - 0 to 7 inches: loamy sand

E - 7 to 14 inches: loamy sand
Bw - 14 to 20 inches: loamy sand
C - 20 to 62 inches: loamy sand
Cg - 62 to 80 inches: sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (0.57 to 19.98 in/hr)
Depth to water table: About 10 to 20 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.4 inches)

Interpretive groups

Land capability classification (irrigated): 3w
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: A/D
Hydric soil rating: No

Minor Components

Galloway

Percent of map unit: 10 percent
Landform: Flats, depressions
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Hydric soil rating: No

Berryland, drained

Percent of map unit: 5 percent
Landform: Flats, depressions, swales
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: Yes

Hurlock, drained

Percent of map unit: 5 percent
Landform: Swales, flats, depressions
Landform position (three-dimensional): Dip
Down-slope shape: Concave, linear
Across-slope shape: Linear, concave
Hydric soil rating: Yes

Runclint

Percent of map unit: 5 percent
Landform: Knolls, flats, dunes, fluviomarine terraces
Landform position (three-dimensional): Rise
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Hydric soil rating: No

Hammonton

Percent of map unit: 5 percent

Landform: Flats, drainageways, depressions
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Hydric soil rating: No

LO—Longmarsh and Indiantown soils, frequently flooded

Map Unit Setting

National map unit symbol: 1qtj1
Elevation: 0 to 120 feet
Mean annual precipitation: 42 to 48 inches
Mean annual air temperature: 52 to 58 degrees F
Frost-free period: 180 to 220 days
Farmland classification: Not prime farmland

Map Unit Composition

Longmarsh and similar soils: 43 percent
Indiantown and similar soils: 37 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Longmarsh

Setting

Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy alluvium

Typical profile

Oe - 0 to 2 inches: moderately decomposed plant material
A - 2 to 19 inches: mucky loam
Cg1 - 19 to 34 inches: sandy loam
Cg2 - 34 to 80 inches: loamy sand

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Very poorly drained
Runoff class: Negligible
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: About 0 to 10 inches
Frequency of flooding: Frequent
Frequency of ponding: Frequent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 8.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B/D
Hydric soil rating: Yes

Description of Indiantown

Setting

Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy alluvium

Typical profile

Oe - 0 to 2 inches: moderately decomposed plant material
A - 2 to 25 inches: mucky silt loam
Cg - 25 to 80 inches: loamy sand

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Very poorly drained
Runoff class: Negligible
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 10 inches
Frequency of flooding: Frequent
Frequency of ponding: Frequent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: High (about 11.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B/D
Hydric soil rating: Yes

Minor Components

Zekiah

Percent of map unit: 10 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: Yes

Klej

Percent of map unit: 5 percent
Landform: Flats
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Manahawkin

Percent of map unit: 5 percent
Landform: Swamps, flood plains
Down-slope shape: Linear

Across-slope shape: Linear
Hydric soil rating: Yes

MmA—Mullica mucky sandy loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 1qtj7
Elevation: 30 to 230 feet
Mean annual precipitation: 42 to 48 inches
Mean annual air temperature: 52 to 58 degrees F
Frost-free period: 180 to 220 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Mullica, drained, and similar soils: 50 percent
Mullica, undrained, and similar soils: 30 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Mullica, Drained

Setting

Landform: Flats, drainageways, depressions, swales
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave

Typical profile

Ap - 0 to 10 inches: mucky sandy loam
A - 10 to 14 inches: mucky sandy loam
Bg - 14 to 24 inches: sandy loam
Cg - 24 to 65 inches: sand
2Ab - 65 to 80 inches: silt loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 5.95 in/hr)
Depth to water table: About 0 to 10 inches
Frequency of flooding: None
Frequency of ponding: Rare
Available water storage in profile: Low (about 4.9 inches)

Interpretive groups

Land capability classification (irrigated): 2w
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: A/D
Hydric soil rating: Yes

Description of Mullica, Undrained

Setting

Landform: Flats, drainageways, swales, depressions
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Parent material: Sandy and loamy fluviomarine sediments

Typical profile

Oe - 0 to 3 inches: moderately decomposed plant material
A - 3 to 10 inches: mucky sandy loam
Eg - 10 to 14 inches: sandy loam
Bg - 14 to 24 inches: sandy loam
Cg - 24 to 65 inches: sand
2Ab - 65 to 80 inches: silt loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 5.95 in/hr)
Depth to water table: About 0 to 10 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Available water storage in profile: Moderate (about 6.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: A/D
Hydric soil rating: Yes

Minor Components

Berryland

Percent of map unit: 10 percent
Landform: Depressions, flats, swales
Hydric soil rating: Yes

Hurlock

Percent of map unit: 10 percent
Landform: Flats
Hydric soil rating: Yes

MuA—Mullica-Berryland complex, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 1qtjb

Elevation: 0 to 100 feet
Mean annual precipitation: 42 to 48 inches
Mean annual air temperature: 52 to 58 degrees F
Frost-free period: 180 to 220 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Mullica, drained, and similar soils: 25 percent
Berryland, drained, and similar soils: 25 percent
Berryland, undrained, and similar soils: 15 percent
Mullica, undrained, and similar soils: 15 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Mullica, Drained

Setting

Landform: Flats, swales, depressions
Down-slope shape: Linear
Across-slope shape: Linear

Typical profile

Ap - 0 to 10 inches: mucky sandy loam
A - 10 to 14 inches: mucky sandy loam
Bg - 14 to 24 inches: sandy loam
Cg - 24 to 65 inches: sand
2Ab - 65 to 80 inches: silt loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 5.95 in/hr)
Depth to water table: About 0 to 10 inches
Frequency of flooding: None
Frequency of ponding: Rare
Available water storage in profile: Low (about 4.9 inches)

Interpretive groups

Land capability classification (irrigated): 2w
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: A/D
Hydric soil rating: Yes

Description of Berryland, Drained

Setting

Landform: Depressions, flats, swales
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy eolian deposits and/or fluviomarine sediments

Typical profile

Ap - 0 to 10 inches: mucky loamy sand
A - 10 to 17 inches: loamy sand

Bh - 17 to 24 inches: loamy sand
C - 24 to 70 inches: sand
2Ab - 70 to 80 inches: silt loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Very poorly drained
Runoff class: Negligible
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 10 inches
Frequency of flooding: None
Frequency of ponding: Rare
Available water storage in profile: Low (about 4.4 inches)

Interpretive groups

Land capability classification (irrigated): 2w
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: A/D
Hydric soil rating: Yes

Description of Berryland, Undrained

Setting

Landform: Depressions, flats, drainageways, swales
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy eolian deposits and/or fluviomarine sediments

Typical profile

Oe - 0 to 2 inches: moderately decomposed plant material
A1 - 2 to 14 inches: mucky loamy sand
A2 - 14 to 17 inches: loamy sand
Bh - 17 to 24 inches: loamy sand
C - 24 to 70 inches: sand
2Ab - 70 to 80 inches: silt loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Very poorly drained
Runoff class: Negligible
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 10 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Available water storage in profile: Low (about 5.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: A/D
Hydric soil rating: Yes

Description of Mullica, Undrained

Setting

Landform: Flats, drainageways, swales, depressions
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy and loamy fluviomarine sediments

Typical profile

Oe - 0 to 3 inches: moderately decomposed plant material
A - 3 to 10 inches: mucky sandy loam
Eg - 10 to 14 inches: sandy loam
Bg - 14 to 24 inches: sandy loam
Cg - 24 to 65 inches: sand
2Ab - 65 to 80 inches: silt loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 5.95 in/hr)
Depth to water table: About 0 to 10 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Available water storage in profile: Moderate (about 6.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: A/D
Hydric soil rating: Yes

Minor Components

Klej

Percent of map unit: 10 percent
Landform: Flats, depressions
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Hydric soil rating: No

Askecksy, drained

Percent of map unit: 5 percent
Landform: Depressions, swales, flats
Landform position (three-dimensional): Talf
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Hydric soil rating: Yes

Galloway

Percent of map unit: 5 percent
Landform: Depressions, flats
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Hydric soil rating: No

PpA—Pepperbox loamy sand, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 1qtjj
Elevation: 0 to 70 feet
Mean annual precipitation: 42 to 48 inches
Mean annual air temperature: 52 to 58 degrees F
Frost-free period: 180 to 220 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Pepperbox and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Pepperbox

Setting

Landform: Depressions, flats
Landform position (three-dimensional): Dip
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy eolian deposits over fluvial marine sediments

Typical profile

A - 0 to 10 inches: loamy sand
E - 10 to 25 inches: loamy sand
Bt - 25 to 37 inches: sandy loam
2Btg - 37 to 65 inches: sandy clay loam
2Cg - 65 to 80 inches: sandy clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 1.98 in/hr)
Depth to water table: About 20 to 40 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 8.2 inches)

Interpretive groups

Land capability classification (irrigated): 2w
Land capability classification (nonirrigated): 2w

Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Rosedale
Percent of map unit: 10 percent
Landform: Flats
Hydric soil rating: No

Fort mott
Percent of map unit: 5 percent
Landform: Flats, knolls
Landform position (three-dimensional): Rise
Hydric soil rating: No

Rockawalkin
Percent of map unit: 5 percent
Landform: Flats
Hydric soil rating: No

PrA—Pepperbox-Rockawalkin complex, 0 to 2 percent slopes

Map Unit Setting
National map unit symbol: 1qtjl
Elevation: 10 to 100 feet
Mean annual precipitation: 42 to 48 inches
Mean annual air temperature: 52 to 58 degrees F
Frost-free period: 180 to 220 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition
Pepperbox and similar soils: 50 percent
Rockawalkin and similar soils: 30 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Pepperbox

Setting
Landform: Depressions, flats
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Parent material: Sandy eolian deposits over fluviomarine sediments

Typical profile
A - 0 to 10 inches: loamy sand
E - 10 to 25 inches: loamy sand
Bt - 25 to 37 inches: sandy loam
2Btg - 37 to 65 inches: sandy clay loam
2Cg - 65 to 80 inches: sandy clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 1.98 in/hr)
Depth to water table: About 20 to 40 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 8.2 inches)

Interpretive groups

Land capability classification (irrigated): 2w
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: A
Hydric soil rating: No

Description of Rockawalkin

Setting

Landform: Depressions, flats
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Parent material: Sandy eolian deposits over fluviomarine sediments

Typical profile

Ap - 0 to 10 inches: loamy sand
E - 10 to 27 inches: loamy sand
Bt - 27 to 43 inches: sandy loam
BC - 43 to 70 inches: loamy sand
C - 70 to 80 inches: sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Runoff class: Negligible
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: About 20 to 40 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.0 inches)

Interpretive groups

Land capability classification (irrigated): 2w
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Rosedale

Percent of map unit: 10 percent
Landform: Flats
Hydric soil rating: No

Keyport

Percent of map unit: 5 percent
Landform: Flats, swales, depressions
Hydric soil rating: No

Fort mott

Percent of map unit: 5 percent
Landform: Flats, knolls
Landform position (three-dimensional): Rise
Hydric soil rating: No

PsA—Pepperbox-Rosedale complex, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 1qtjn
Elevation: 0 to 70 feet
Mean annual precipitation: 42 to 48 inches
Mean annual air temperature: 52 to 58 degrees F
Frost-free period: 180 to 220 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Rosedale and similar soils: 45 percent
Pepperbox and similar soils: 45 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Rosedale

Setting

Landform: Flats
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy eolian deposits over fluviomarine sediments

Typical profile

A - 0 to 9 inches: loamy sand
E - 9 to 25 inches: loamy sand
Bt - 25 to 38 inches: sandy loam
C - 38 to 68 inches: loamy sand
2Cg - 68 to 80 inches: sandy clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 5.95 in/hr)

Depth to water table: About 40 to 72 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.3 inches)

Interpretive groups
Land capability classification (irrigated): 2s
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: A
Hydric soil rating: No

Description of Pepperbox

Setting
Landform: Depressions, flats
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Parent material: Sandy eolian deposits over fluviomarine sediments

Typical profile
A - 0 to 10 inches: loamy sand
E - 10 to 25 inches: loamy sand
Bt - 25 to 37 inches: sandy loam
2Btg - 37 to 65 inches: sandy clay loam
2Cg - 65 to 80 inches: sandy clay loam

Properties and qualities
Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 1.98 in/hr)
Depth to water table: About 20 to 40 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 8.2 inches)

Interpretive groups
Land capability classification (irrigated): 2w
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Rockawalkin
Percent of map unit: 5 percent
Landform: Flats
Hydric soil rating: No

Fort mott
Percent of map unit: 5 percent
Landform: Knolls, flats
Landform position (three-dimensional): Rise
Hydric soil rating: No

PsB—Pepperbox-Rosedale complex, 2 to 5 percent slopes

Map Unit Setting

National map unit symbol: 1qtjp
Elevation: 0 to 70 feet
Mean annual precipitation: 42 to 48 inches
Mean annual air temperature: 52 to 58 degrees F
Frost-free period: 180 to 220 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Pepperbox and similar soils: 45 percent
Rosedale and similar soils: 45 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Pepperbox

Setting

Landform: Flats, depressions
Landform position (three-dimensional): Dip
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Parent material: Sandy eolian deposits over fluvial marine sediments

Typical profile

A - 0 to 10 inches: loamy sand
E - 10 to 25 inches: loamy sand
Bt - 25 to 37 inches: sandy loam
2Btg - 37 to 65 inches: sandy clay loam
2Cg - 65 to 80 inches: sandy clay loam

Properties and qualities

Slope: 2 to 5 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 1.98 in/hr)
Depth to water table: About 20 to 40 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 8.2 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: A
Hydric soil rating: No

Description of Rosedale

Setting

Landform: Flats
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy eolian deposits over fluviomarine sediments

Typical profile

A - 0 to 9 inches: loamy sand
E - 9 to 25 inches: loamy sand
Bt - 25 to 38 inches: sandy loam
C - 38 to 68 inches: loamy sand
2Cg - 68 to 80 inches: sandy clay loam

Properties and qualities

Slope: 2 to 5 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 5.95 in/hr)
Depth to water table: About 40 to 72 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.3 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Rockawalkin

Percent of map unit: 5 percent
Landform: Flats
Hydric soil rating: No

Fort mott

Percent of map unit: 5 percent
Landform: Knolls, flats
Landform position (three-dimensional): Rise
Hydric soil rating: No

RkA—Rockawalkin loamy sand, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 1qtjv

Elevation: 10 to 100 feet
Mean annual precipitation: 42 to 48 inches
Mean annual air temperature: 52 to 58 degrees F
Frost-free period: 180 to 220 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Rockawalkin and similar soils: 75 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Rockawalkin

Setting

Landform: Flats, depressions
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Parent material: Sandy eolian deposits over fluviomarine sediments

Typical profile

Ap - 0 to 10 inches: loamy sand
E - 10 to 27 inches: loamy sand
Bt - 27 to 43 inches: sandy loam
BC - 43 to 70 inches: loamy sand
C - 70 to 80 inches: sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Runoff class: Negligible
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: About 20 to 40 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.0 inches)

Interpretive groups

Land capability classification (irrigated): 2w
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Pepperbox

Percent of map unit: 10 percent
Landform: Flats, swales, depressions
Hydric soil rating: No

Woodstown

Percent of map unit: 5 percent
Landform: Flats, swales, depressions
Hydric soil rating: No

Klej

Percent of map unit: 5 percent

Landform: Swales, depressions, flats
Hydric soil rating: No

Runclint

Percent of map unit: 5 percent
Landform: Flats, knolls, dunes
Landform position (three-dimensional): Rise
Hydric soil rating: No

RoB—Rosedale loamy sand, 2 to 5 percent slopes

Map Unit Setting

National map unit symbol: 1qtjy
Elevation: 0 to 120 feet
Mean annual precipitation: 42 to 48 inches
Mean annual air temperature: 52 to 58 degrees F
Frost-free period: 180 to 220 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Rosedale and similar soils: 75 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Rosedale

Setting

Landform: Flats
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy eolian deposits over fluviomarine sediments

Typical profile

A - 0 to 9 inches: loamy sand
E - 9 to 25 inches: loamy sand
Bt - 25 to 38 inches: sandy loam
C - 38 to 68 inches: loamy sand
2Cg - 68 to 80 inches: sandy clay loam

Properties and qualities

Slope: 2 to 5 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 5.95 in/hr)
Depth to water table: About 40 to 72 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.3 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Evesboro

Percent of map unit: 10 percent
Landform: Flats
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Galloway

Percent of map unit: 5 percent
Landform: Flats, depressions
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Hydric soil rating: No

Klej

Percent of map unit: 5 percent
Landform: Flats, depressions
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Hydric soil rating: No

Hambrook

Percent of map unit: 5 percent
Landform: Flats, fluviomarine terraces, depressions
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Hydric soil rating: No

RuB—Runclint loamy sand, 2 to 5 percent slopes

Map Unit Setting

National map unit symbol: 1qtk1
Elevation: 0 to 120 feet
Mean annual precipitation: 42 to 48 inches
Mean annual air temperature: 52 to 58 degrees F
Frost-free period: 180 to 220 days
Farmland classification: Not prime farmland

Map Unit Composition

Runclint and similar soils: 75 percent
Minor components: 25 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Runclint

Setting

Landform: Fluviomarine terraces, knolls, flats, dunes
Landform position (three-dimensional): Rise
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Parent material: Sandy eolian deposits and/or fluviomarine sediments

Typical profile

Ap - 0 to 9 inches: loamy sand
E - 9 to 22 inches: sand
Bw - 22 to 39 inches: sand
BC - 39 to 59 inches: sand
2C - 59 to 80 inches: loamy coarse sand

Properties and qualities

Slope: 2 to 5 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (0.57 to 19.98 in/hr)
Depth to water table: About 40 to 72 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.5 inches)

Interpretive groups

Land capability classification (irrigated): 3s
Land capability classification (nonirrigated): 4s
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Evesboro

Percent of map unit: 10 percent
Landform: Flats
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Galloway

Percent of map unit: 5 percent
Landform: Flats, depressions
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Hydric soil rating: No

Klej

Percent of map unit: 5 percent
Landform: Flats, depressions
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave

Hydric soil rating: No

Hurlock, drained

Percent of map unit: 5 percent
Landform: Depressions, swales, flats
Landform position (three-dimensional): Dip
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Hydric soil rating: Yes

UbB—Udorthents, borrow area, 0 to 5 percent slopes

Map Unit Setting

National map unit symbol: 1qtkp
Elevation: 0 to 150 feet
Mean annual precipitation: 42 to 48 inches
Mean annual air temperature: 52 to 58 degrees F
Frost-free period: 180 to 220 days
Farmland classification: Not prime farmland

Map Unit Composition

Udorthents, borrow area, and similar soils: 75 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udorthents, Borrow Area

Setting

Landform: Knolls, flats
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Parent material: Fluviomarine sediments fluviomarine deposits

Typical profile

AC - 0 to 2 inches: loam
C - 2 to 80 inches: sandy loam

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to very high (0.06 to 19.98 in/hr)
Depth to water table: About 20 to 40 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 7.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Udorthents, loamy
Percent of map unit: 10 percent
Landform: Broad interstream divides
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Klej
Percent of map unit: 5 percent
Landform: Flats, depressions
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Hydric soil rating: No

Askecksy, drained
Percent of map unit: 5 percent
Landform: Flats, depressions, swales
Landform position (three-dimensional): Talf
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Hydric soil rating: Yes

Water
Percent of map unit: 5 percent
Hydric soil rating: No

Soil Information for All Uses

Suitabilities and Limitations for Use

The Suitabilities and Limitations for Use section includes various soil interpretations displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each interpretation.

Land Classifications

Land Classifications are specified land use and management groupings that are assigned to soil areas because combinations of soil have similar behavior for specified practices. Most are based on soil properties and other factors that directly influence the specific use of the soil. Example classifications include ecological site classification, farmland classification, irrigated and nonirrigated land capability classification, and hydric rating.

Hydric Rating by Map Unit

This rating indicates the percentage of map units that meets the criteria for hydric soils. Map units are composed of one or more map unit components or soil types, each of which is rated as hydric soil or not hydric. Map units that are made up dominantly of hydric soils may have small areas of minor nonhydric components in the higher positions on the landform, and map units that are made up dominantly of nonhydric soils may have small areas of minor hydric components in the lower positions on the landform. Each map unit is rated based on its respective components and the percentage of each component within the map unit.

The thematic map is color coded based on the composition of hydric components. The five color classes are separated as 100 percent hydric components, 66 to 99 percent hydric components, 33 to 65 percent hydric components, 1 to 32 percent hydric components, and less than one percent hydric components.

In Web Soil Survey, the Summary by Map Unit table that is displayed below the map pane contains a column named 'Rating'. In this column the percentage of each map unit that is classified as hydric is displayed.

Hydric soils are defined by the National Technical Committee for Hydric Soils (NTCHS) as soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part (Federal Register, 1994). Under natural conditions, these soils are either saturated or inundated long enough during the growing season to support the growth and reproduction of hydrophytic vegetation.

The NTCHS definition identifies general soil properties that are associated with wetness. In order to determine whether a specific soil is a hydric soil or nonhydric soil, however, more specific information, such as information about the depth and duration of the water table, is needed. Thus, criteria that identify those estimated soil properties unique to hydric soils have been established (Federal Register, 2002). These criteria are used to identify map unit components that normally are associated with wetlands. The criteria used are selected estimated soil properties that are described in "Soil Taxonomy" (Soil Survey Staff, 1999) and "Keys to Soil Taxonomy" (Soil Survey Staff, 2006) and in the "Soil Survey Manual" (Soil Survey Division Staff, 1993).

If soils are wet enough for a long enough period of time to be considered hydric, they should exhibit certain properties that can be easily observed in the field. These visible properties are indicators of hydric soils. The indicators used to make onsite determinations of hydric soils are specified in "Field Indicators of Hydric Soils in the United States" (Hurt and Vasilas, 2006).

References:

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

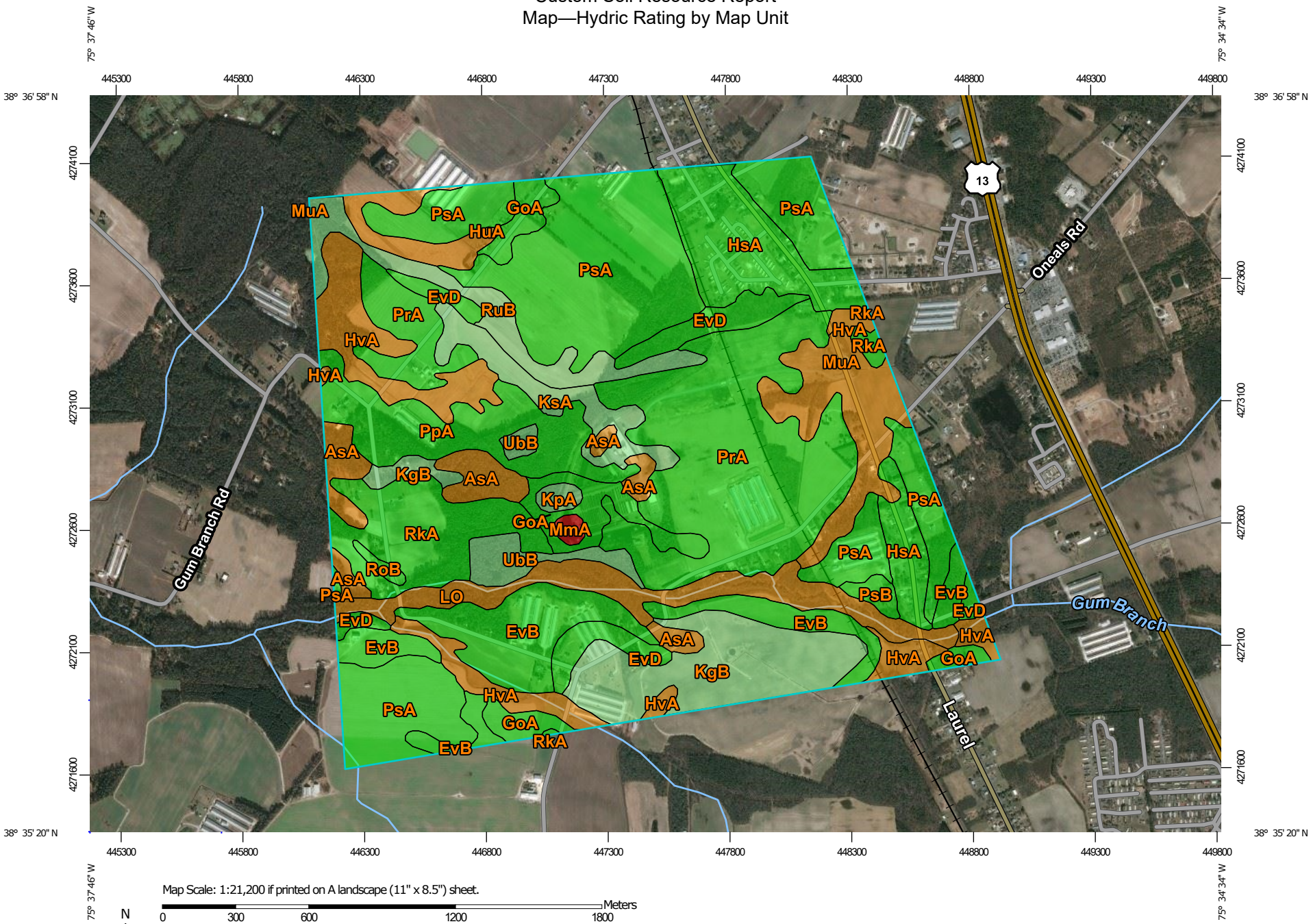
Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18.

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service. U.S. Department of Agriculture Handbook 436.

Soil Survey Staff. 2006. Keys to soil taxonomy. 10th edition. U.S. Department of Agriculture, Natural Resources Conservation Service.

Custom Soil Resource Report
Map—Hydric Rating by Map Unit



Map Scale: 1:21,200 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 300 600 1200 1800

Feet: 0 1000 2000 4000 6000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

Hydric (100%)

Hydric (66 to 99%)

Hydric (33 to 65%)

Hydric (1 to 32%)

Not Hydric (0%)

Not rated or not available

Soil Rating Lines

Hydric (100%)

Hydric (66 to 99%)

Hydric (33 to 65%)

Hydric (1 to 32%)

Not Hydric (0%)

Not rated or not available

Soil Rating Points

Hydric (100%)

Hydric (66 to 99%)

Hydric (33 to 65%)

Hydric (1 to 32%)

Not Hydric (0%)

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

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

Soil Survey Area: Sussex County, Delaware
Survey Area Data: Version 20, Sep 13, 2019

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Nov 21, 2018—Mar 12, 2019

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.

Table—Hydric Rating by Map Unit

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
AsA	Askecksy loamy sand, 0 to 2 percent slopes	90	40.4	3.0%
EvB	Evesboro loamy sand, 0 to 5 percent slopes	0	98.7	7.4%
EvD	Evesboro loamy sand, 5 to 15 percent slopes	0	43.6	3.3%
GoA	Glassboro sandy loam, 0 to 2 percent slopes	0	46.6	3.5%
HsA	Henlopen-Rosedale-Urban land complex, 0 to 2 percent slopes	0	83.4	6.3%
HuA	Hurlock loamy sand, 0 to 2 percent slopes	80	19.6	1.5%
HvA	Hurlock sandy loam, 0 to 2 percent slopes	85	80.1	6.0%
KgB	Klej-Galloway complex, 0 to 5 percent slopes	15	87.2	6.6%
KpA	Keyport silt loam, 0 to 2 percent slopes	5	4.4	0.3%
KsA	Klej loamy sand, 0 to 2 percent slopes	10	31.8	2.4%
LO	Longmarsh and Indiantown soils, frequently flooded	95	59.0	4.4%
MmA	Mullica mucky sandy loam, 0 to 2 percent slopes	100	3.1	0.2%
MuA	Mullica-Berryland complex, 0 to 2 percent slopes	85	54.6	4.1%
PpA	Pepperbox loamy sand, 0 to 2 percent slopes	0	67.5	5.1%
PrA	Pepperbox-Rockawalkin complex, 0 to 2 percent slopes	0	211.2	15.9%
PsA	Pepperbox-Rosedale complex, 0 to 2 percent slopes	0	261.8	19.7%
PsB	Pepperbox-Rosedale complex, 2 to 5 percent slopes	0	5.7	0.4%
RkA	Rockawalkin loamy sand, 0 to 2 percent slopes	0	66.9	5.0%
RoB	Rosedale loamy sand, 2 to 5 percent slopes	0	2.9	0.2%
RuB	Runclint loamy sand, 2 to 5 percent slopes	5	40.4	3.0%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
UbB	Udorthents, borrow area, 0 to 5 percent slopes	5	21.0	1.6%
Totals for Area of Interest			**1,329.8**	**100.0%**

Rating Options—Hydric Rating by Map Unit

Aggregation Method: Percent Present

Component Percent Cutoff: None Specified

Tie-break Rule: Lower

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

Hydrologic Soil Group

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

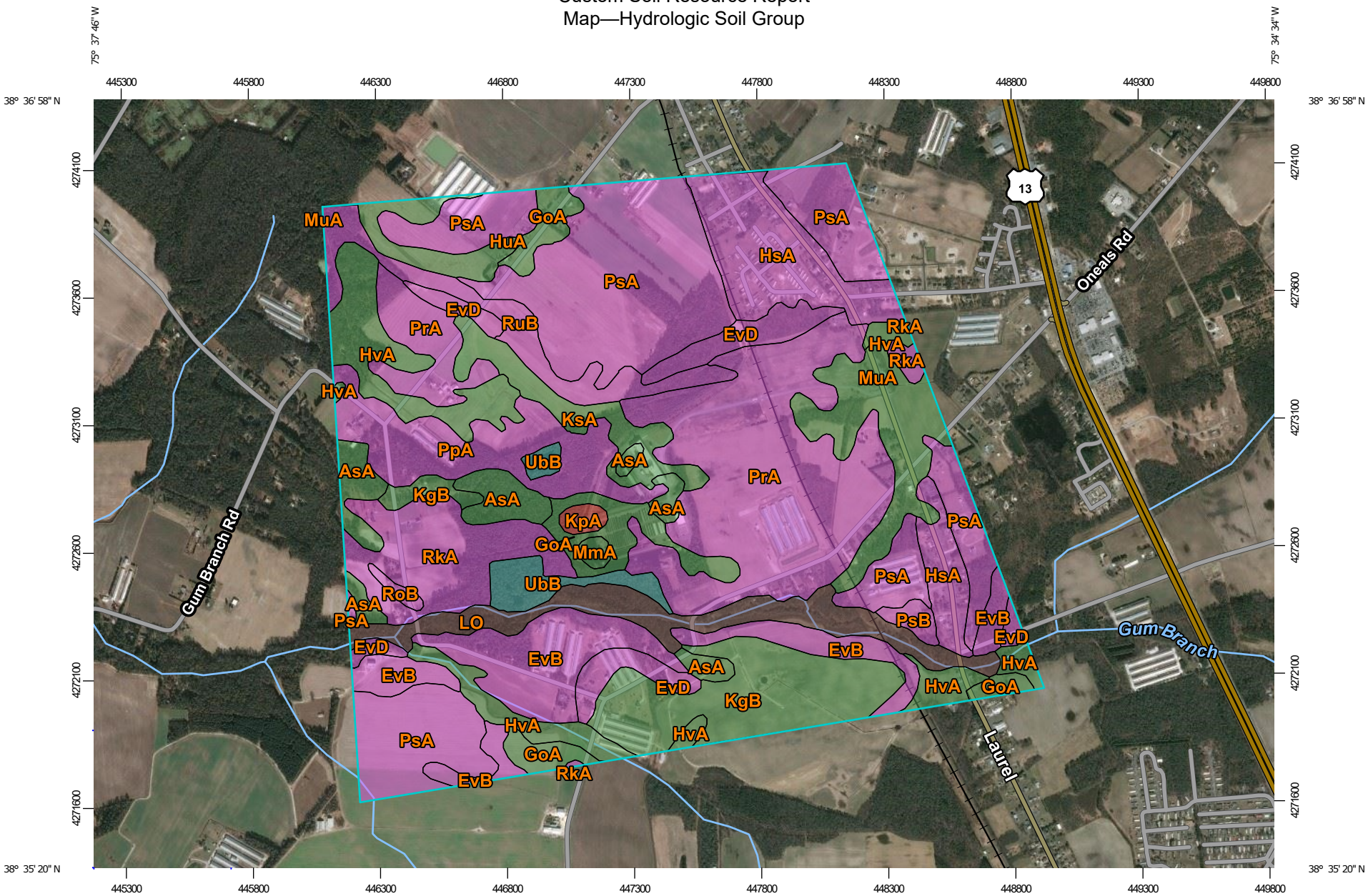
Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at

or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Map—Hydrologic Soil Group



Map Scale: 1:21,200 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 300 600 1200 1800

Feet: 0 1000 2000 4000 6000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

Streams and Canals

Transportation

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

Background

Aerial Photography

MAP INFORMATION

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

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

Soil Survey Area: Sussex County, Delaware
Survey Area Data: Version 20, Sep 13, 2019

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Nov 21, 2018—Mar 12, 2019

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.

Table—Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
AsA	Askecksy loamy sand, 0 to 2 percent slopes	A/D	40.4	3.0%
EvB	Evesboro loamy sand, 0 to 5 percent slopes	A	98.7	7.4%
EvD	Evesboro loamy sand, 5 to 15 percent slopes	A	43.6	3.3%
GoA	Glassboro sandy loam, 0 to 2 percent slopes	A/D	46.6	3.5%
HsA	Henlopen-Rosedale-Urban land complex, 0 to 2 percent slopes	A	83.4	6.3%
HuA	Hurlock loamy sand, 0 to 2 percent slopes	A/D	19.6	1.5%
HvA	Hurlock sandy loam, 0 to 2 percent slopes	A/D	80.1	6.0%
KgB	Klej-Galloway complex, 0 to 5 percent slopes	A/D	87.2	6.6%
KpA	Keyport silt loam, 0 to 2 percent slopes	D	4.4	0.3%
KsA	Klej loamy sand, 0 to 2 percent slopes	A/D	31.8	2.4%
LO	Longmarsh and Indiantown soils, frequently flooded	B/D	59.0	4.4%
MmA	Mullica mucky sandy loam, 0 to 2 percent slopes	A/D	3.1	0.2%
MuA	Mullica-Berryland complex, 0 to 2 percent slopes	A/D	54.6	4.1%
PpA	Pepperbox loamy sand, 0 to 2 percent slopes	A	67.5	5.1%
PrA	Pepperbox-Rockawalkin complex, 0 to 2 percent slopes	A	211.2	15.9%
PsA	Pepperbox-Rosedale complex, 0 to 2 percent slopes	A	261.8	19.7%
PsB	Pepperbox-Rosedale complex, 2 to 5 percent slopes	A	5.7	0.4%
RkA	Rockawalkin loamy sand, 0 to 2 percent slopes	A	66.9	5.0%
RoB	Rosedale loamy sand, 2 to 5 percent slopes	A	2.9	0.2%
RuB	Runclint loamy sand, 2 to 5 percent slopes	A	40.4	3.0%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
UbB	Udorthents, borrow area, 0 to 5 percent slopes	C	21.0	1.6%
Totals for Area of Interest			**1,329.8**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Water Features

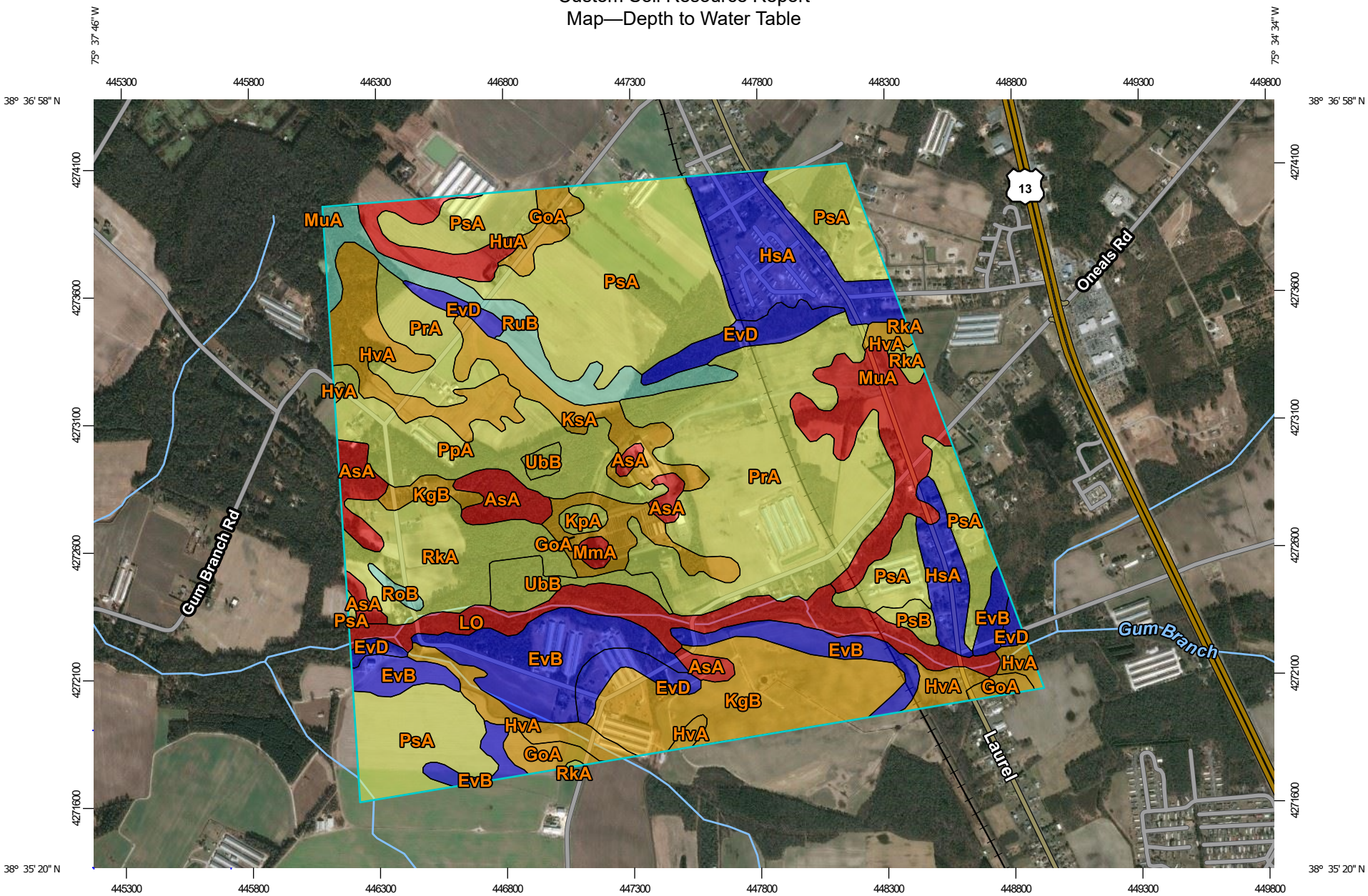
Water Features include ponding frequency, flooding frequency, and depth to water table.

Depth to Water Table

"Water table" refers to a saturated zone in the soil. It occurs during specified months. Estimates of the upper limit are based mainly on observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table.

This attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

Map—Depth to Water Table



Map Scale: 1:21,200 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 300 600 1200 1800

Feet: 0 1000 2000 4000 6000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Not rated or not available

Soil Rating Lines

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Not rated or not available

Soil Rating Points

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

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

Soil Survey Area: Sussex County, Delaware
Survey Area Data: Version 20, Sep 13, 2019

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Nov 21, 2018—Mar 12, 2019

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.

Table—Depth to Water Table

Map unit symbol	Map unit name	Rating (centimeters)	Acres in AOI	Percent of AOI
AsA	Askecksy loamy sand, 0 to 2 percent slopes	13	40.4	3.0%
EvB	Evesboro loamy sand, 0 to 5 percent slopes	>200	98.7	7.4%
EvD	Evesboro loamy sand, 5 to 15 percent slopes	>200	43.6	3.3%
GoA	Glassboro sandy loam, 0 to 2 percent slopes	30	46.6	3.5%
HsA	Henlopen-Rosedale-Urban land complex, 0 to 2 percent slopes	>200	83.4	6.3%
HuA	Hurlock loamy sand, 0 to 2 percent slopes	13	19.6	1.5%
HvA	Hurlock sandy loam, 0 to 2 percent slopes	36	80.1	6.0%
KgB	Klej-Galloway complex, 0 to 5 percent slopes	30	87.2	6.6%
KpA	Keyport silt loam, 0 to 2 percent slopes	61	4.4	0.3%
KsA	Klej loamy sand, 0 to 2 percent slopes	30	31.8	2.4%
LO	Longmarsh and Indiantown soils, frequently flooded	13	59.0	4.4%
MmA	Mullica mucky sandy loam, 0 to 2 percent slopes	13	3.1	0.2%
MuA	Mullica-Berryland complex, 0 to 2 percent slopes	13	54.6	4.1%
PpA	Pepperbox loamy sand, 0 to 2 percent slopes	61	67.5	5.1%
PrA	Pepperbox-Rockawalkin complex, 0 to 2 percent slopes	61	211.2	15.9%
PsA	Pepperbox-Rosedale complex, 0 to 2 percent slopes	61	261.8	19.7%
PsB	Pepperbox-Rosedale complex, 2 to 5 percent slopes	61	5.7	0.4%
RkA	Rockawalkin loamy sand, 0 to 2 percent slopes	61	66.9	5.0%
RoB	Rosedale loamy sand, 2 to 5 percent slopes	114	2.9	0.2%
RuB	Runclint loamy sand, 2 to 5 percent slopes	114	40.4	3.0%

Map unit symbol	Map unit name	Rating (centimeters)	Acres in AOI	Percent of AOI
UbB	Udorthents, borrow area, 0 to 5 percent slopes	61	21.0	1.6%
Totals for Area of Interest			**1,329.8**	**100.0%**

Rating Options—Depth to Water Table

Units of Measure: centimeters

Aggregation Method: Dominant Component

Component Percent Cutoff: None Specified

Tie-break Rule: Lower

Interpret Nulls as Zero: No

Beginning Month: January

Ending Month: December

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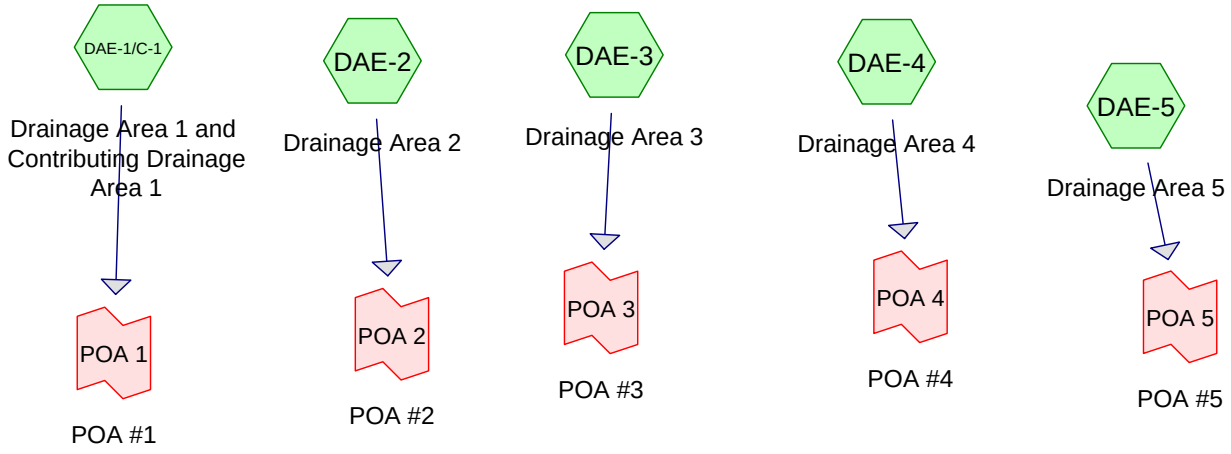
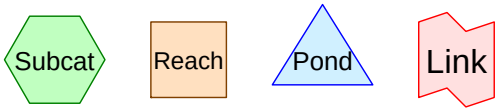
EXHIBIT 6

PRE-DEVELOPMENT HYDROCAD
COMPUTATIONS





Routing Diagram for 12393.CF-PRE-Rpv
Prepared by {enter your company name here}, Printed 4/9/2020
HydroCAD® 10.00-25 s/n 02614 © 2019 HydroCAD Software Solutions LLC

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
24.402	39	>75% Grass cover, Good, HSG A (DAE-1/C-1, DAE-2, DAE-3, DAE-4)
8.729	80	>75% Grass cover, Good, HSG D (DAE-1/C-1, DAE-2, DAE-3, DAE-4)
3.601	96	Gravel surface, HSG A (DAE-1/C-1, DAE-2, DAE-4)
2.881	96	Gravel surface, HSG D (DAE-1/C-1, DAE-2)
1.629	98	Roofs, HSG D (DAE-1/C-1, DAE-2)
14.353	67	Row crops, straight row, Good, HSG A (DAE-1/C-1)
0.099	98	Unconnected pavement, HSG A (DAE-1/C-1)
0.799	98	Unconnected pavement, HSG D (DAE-1/C-1, DAE-2)
0.770	98	Water Surface, HSG A (DAE-1/C-1, DAE-2)
1.362	98	Water Surface, HSG C (DAE-3)
1.015	98	Water Surface, HSG D (DAE-1/C-1, DAE-2, DAE-4)
35.401	30	Woods, Good, HSG A (DAE-1/C-1, DAE-2, DAE-3, DAE-4, DAE-5)
2.368	70	Woods, Good, HSG C (DAE-3)
10.333	77	Woods, Good, HSG D (DAE-1/C-1, DAE-2, DAE-3, DAE-4)
107.742	**54**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
78.626	HSG A	DAE-1/C-1, DAE-2, DAE-3, DAE-4, DAE-5
0.000	HSG B	
3.730	HSG C	DAE-3
25.386	HSG D	DAE-1/C-1, DAE-2, DAE-3, DAE-4
0.000	Other	
107.742		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
24.402	0.000	0.000	8.729	0.000	33.131	>75% Grass cover, Good	DAE-1/C-1, DAE-2, DAE-3, DAE-4
3.601	0.000	0.000	2.881	0.000	6.482	Gravel surface	DAE-1/C-1, DAE-2, DAE-4
0.000	0.000	0.000	1.629	0.000	1.629	Roofs	DAE-1/C-1, DAE-2
14.353	0.000	0.000	0.000	0.000	14.353	Row crops, straight row, Good	DAE-1/C-1
0.099	0.000	0.000	0.799	0.000	0.898	Unconnected pavement	DAE-1/C-1, DAE-2
0.770	0.000	1.362	1.015	0.000	3.147	Water Surface	DAE-1/C-1, DAE-2, DAE-3, DAE-4
35.401	0.000	2.368	10.333	0.000	48.102	Woods, Good	DAE-1/C-1, DAE-2, DAE-3, DAE-

Ground Covers (selected nodes) (continued)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
78.626	**0.000**	**3.730**	**25.386**	**0.000**	**107.742**	**TOTAL AREA**	

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment DAE-1/C-1: Drainage Area 1 Runoff Area=58.362 ac 5.75% Impervious Runoff Depth=0.57"
Flow Length=2,694' Tc=166.5 min CN=58 Runoff=4.35 cfs 2.775 af

Subcatchment DAE-2: Drainage Area 2 Runoff Area=4.195 ac 20.12% Impervious Runoff Depth=1.35"
Flow Length=231' Tc=15.5 min CN=81 Runoff=4.65 cfs 0.473 af

Subcatchment DAE-3: Drainage Area 3 Runoff Area=19.592 ac 6.95% Impervious Runoff Depth=0.32"
Flow Length=1,621' Tc=118.9 min CN=46 Runoff=0.98 cfs 0.526 af

Subcatchment DAE-4: Drainage Area 4 Runoff Area=15.695 ac 0.71% Impervious Runoff Depth=0.52"
Flow Length=1,482' Tc=103.5 min CN=56 Runoff=1.53 cfs 0.685 af

Subcatchment DAE-5: Drainage Area 5 Runoff Area=9.898 ac 0.00% Impervious Runoff Depth=0.09"
Flow Length=1,359' Tc=91.0 min CN=30 Runoff=0.13 cfs 0.078 af

Link POA 1: POA #1 Inflow=4.35 cfs 2.775 af
Primary=4.35 cfs 2.775 af

Link POA 2: POA #2 Inflow=4.65 cfs 0.473 af
Primary=4.65 cfs 0.473 af

Link POA 3: POA #3 Inflow=0.98 cfs 0.526 af
Primary=0.98 cfs 0.526 af

Link POA 4: POA #4 Inflow=1.53 cfs 0.685 af
Primary=1.53 cfs 0.685 af

Link POA 5: POA #5 Inflow=0.13 cfs 0.078 af
Primary=0.13 cfs 0.078 af

Total Runoff Area = 107.742 ac Runoff Volume = 4.537 af Average Runoff Depth = 0.51"
94.73% Pervious = 102.068 ac 5.27% Impervious = 5.674 ac

Summary for Subcatchment DAE-1/C-1: Drainage Area 1 and Contributing Drainage Area 1

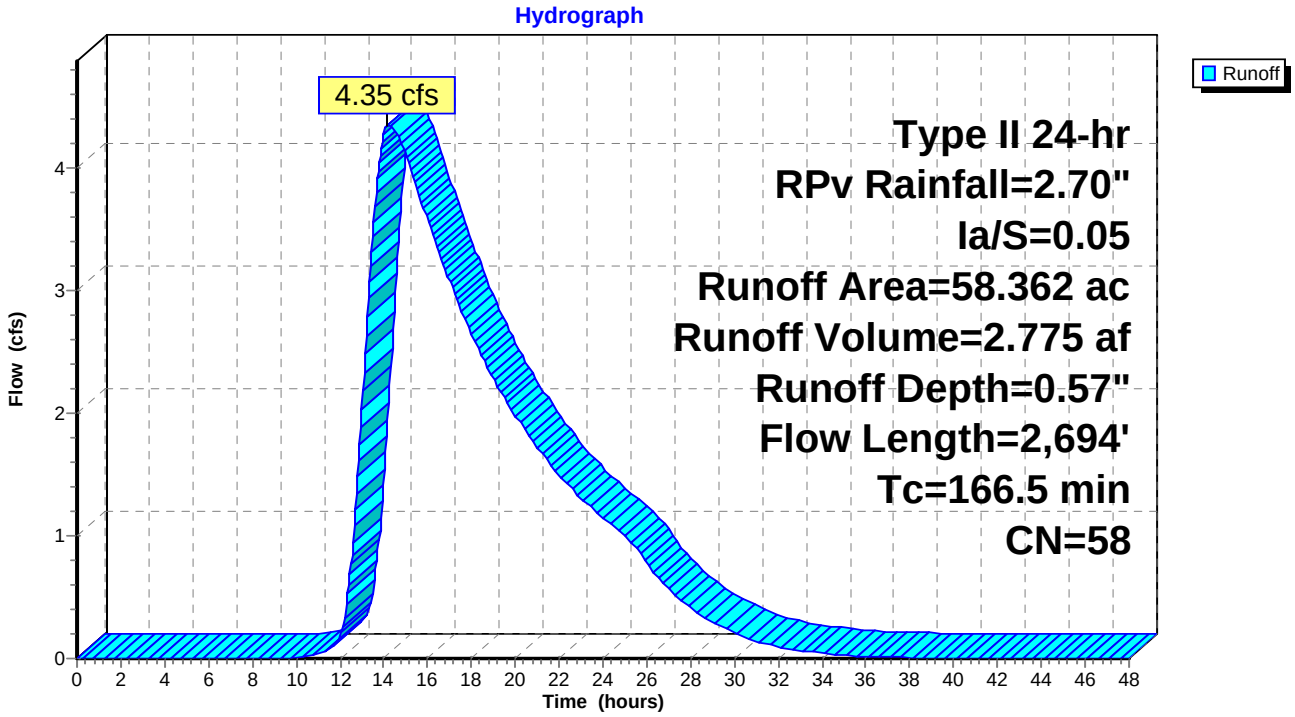
Runoff = 4.35 cfs @ 14.10 hrs, Volume= 2.775 af, Depth= 0.57"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr RPv Rainfall=2.70", Ia/S=0.05

	Area (ac)	CN	Description
	6.248	30	Woods, Good, HSG A
	22.384	39	>75% Grass cover, Good, HSG A
	14.353	67	Row crops, straight row, Good, HSG A
	2.991	96	Gravel surface, HSG A
	0.099	98	Unconnected pavement, HSG A
*	0.577	98	Water Surface, HSG A
	0.073	77	Woods, Good, HSG D
	6.967	80	>75% Grass cover, Good, HSG D
	1.990	96	Gravel surface, HSG D
	0.719	98	Unconnected pavement, HSG D
*	0.823	98	Water Surface, HSG D
	1.138	98	Roofs, HSG D
	58.362	58	Weighted Average
	55.006		94.25% Pervious Area
	3.356		5.75% Impervious Area
	0.818		24.37% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	65	0.0998	0.14		**Sheet Flow, Sheet Flow - Woods** Woods: Light underbrush n= 0.400 P2= 3.40"
0.3	35	0.0998	2.19		**Sheet Flow, Sheet Flow - Smooth Surface** Smooth surfaces n= 0.011 P2= 3.40"
0.9	89	0.0112	1.70		**Shallow Concentrated Flow, Shallow Conc - Unpaved** Unpaved Kv= 16.1 fps
0.7	100	0.0200	2.28		**Shallow Concentrated Flow, Shallow Conc - Unpaved** Unpaved Kv= 16.1 fps
3.8	109	0.0092	0.48		**Shallow Concentrated Flow, Shallow Conc - Woods** Woodland Kv= 5.0 fps
1.9	148	0.0067	1.32		**Shallow Concentrated Flow, Shallow Conc - Unpaved** Unpaved Kv= 16.1 fps
1.0	112	0.0089	1.92		**Shallow Concentrated Flow, Shallow Conc - Paved** Paved Kv= 20.3 fps
129.4	1,250	0.0001	0.16		**Shallow Concentrated Flow, Shallow Conc - Unpaved** Unpaved Kv= 16.1 fps
20.5	740	0.0014	0.60		**Shallow Concentrated Flow, Shallow Conc - Unpaved** Unpaved Kv= 16.1 fps
0.2	46	0.0437	3.37		**Shallow Concentrated Flow, Shallow Conc - Unpaved** Unpaved Kv= 16.1 fps
166.5	2,694	Total			

Subcatchment DAE-1/C-1: Drainage Area 1 and Contributing Drainage Area 1



Summary for Subcatchment DAE-2: Drainage Area 2

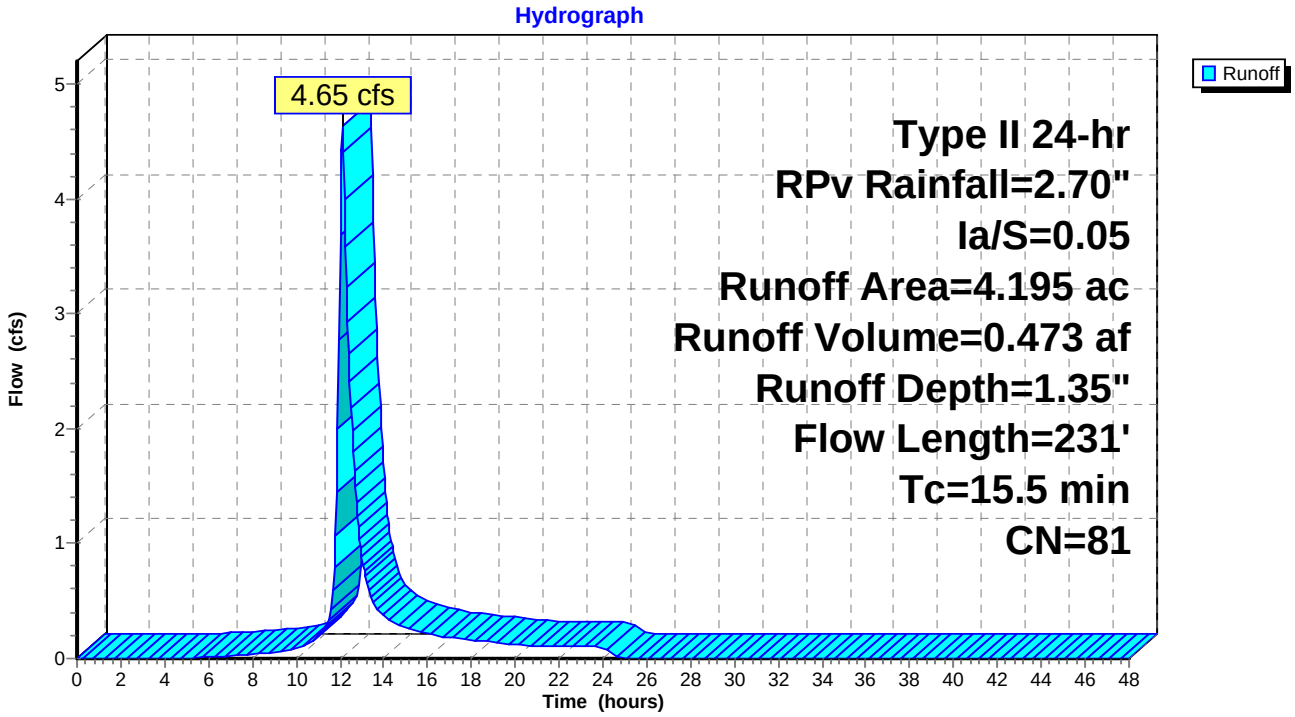
Runoff = 4.65 cfs @ 12.10 hrs, Volume= 0.473 af, Depth= 1.35"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr RPv Rainfall=2.70", Ia/S=0.05

	Area (ac)	CN	Description
	0.016	30	Woods, Good, HSG A
	0.783	39	>75% Grass cover, Good, HSG A
	0.484	96	Gravel surface, HSG A
*	0.193	98	Water Surface, HSG A
	0.432	77	Woods, Good, HSG D
	0.745	80	>75% Grass cover, Good, HSG D
	0.891	96	Gravel surface, HSG D
	0.080	98	Unconnected pavement, HSG D
*	0.080	98	Water Surface, HSG D
	0.491	98	Roofs, HSG D
	4.195	81	Weighted Average
	3.351		79.88% Pervious Area
	0.844		20.12% Impervious Area
	0.080		9.48% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.4	100	0.0071	0.12		**Sheet Flow, Sheet Flow - Grass** Grass: Short n= 0.150 P2= 3.40"
0.9	94	0.0071	1.71		**Shallow Concentrated Flow, Shallow Conc - Paved** Paved Kv= 20.3 fps
0.2	37	0.0268	2.64		**Shallow Concentrated Flow, Shallow Conc - Unpaved** Unpaved Kv= 16.1 fps
15.5	231	Total			

Subcatchment DAE-2: Drainage Area 2



Summary for Subcatchment DAE-3: Drainage Area 3

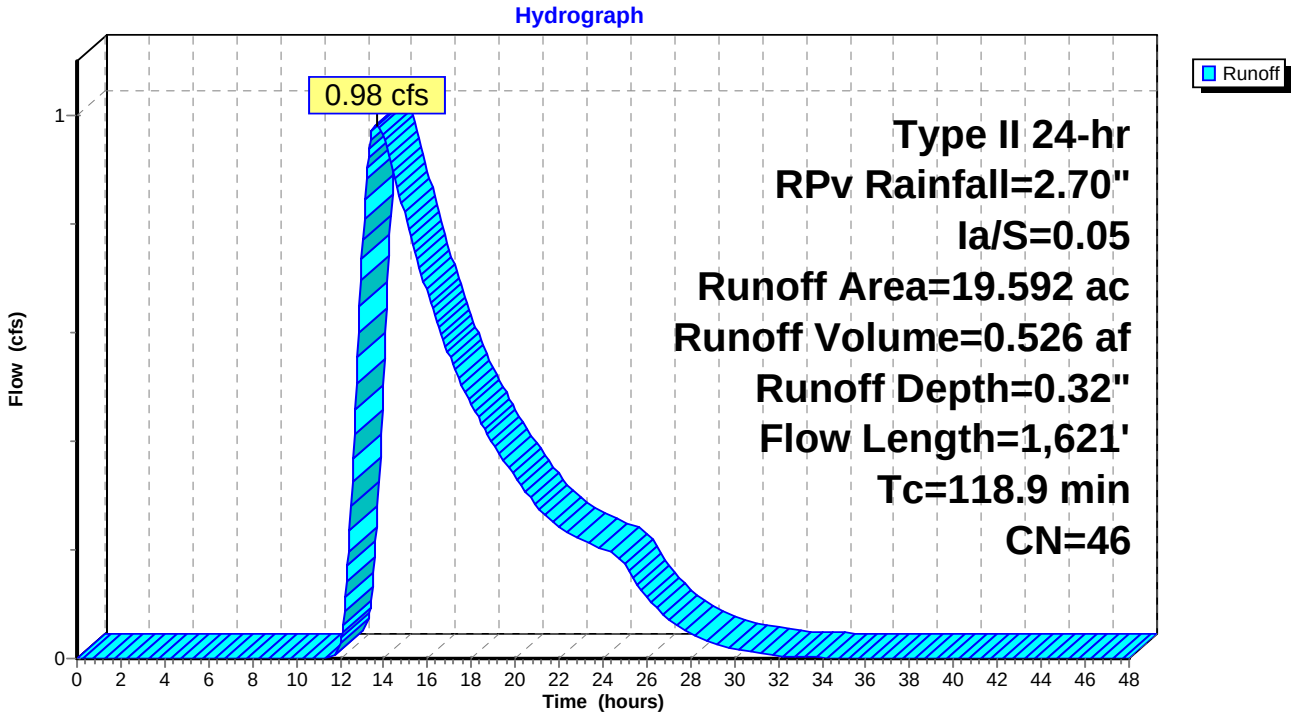
Runoff = 0.98 cfs @ 13.69 hrs, Volume= 0.526 af, Depth= 0.32"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr RPv Rainfall=2.70", Ia/S=0.05

	Area (ac)	CN	Description
	13.014	30	Woods, Good, HSG A
	0.264	39	>75% Grass cover, Good, HSG A
	2.368	70	Woods, Good, HSG C
*	1.362	98	Water Surface, HSG C
	2.442	77	Woods, Good, HSG D
	0.142	80	>75% Grass cover, Good, HSG D
	19.592	46	Weighted Average
	18.230		93.05% Pervious Area
	1.362		6.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
28.2	100	0.0094	0.06		**Sheet Flow, Sheet Flow - Woods** Woods: Light underbrush n= 0.400 P2= 3.40"
6.8	197	0.0094	0.48		**Shallow Concentrated Flow, Shallow Conc - Woods** Woodland Kv= 5.0 fps
27.1	507	0.0039	0.31		**Shallow Concentrated Flow, Shallow Conc - Woods** Woodland Kv= 5.0 fps
56.8	817	0.0023	0.24		**Shallow Concentrated Flow, Shallow Conc - Woods** Woodland Kv= 5.0 fps
118.9	1,621	Total			

Subcatchment DAE-3: Drainage Area 3



Summary for Subcatchment DAE-4: Drainage Area 4

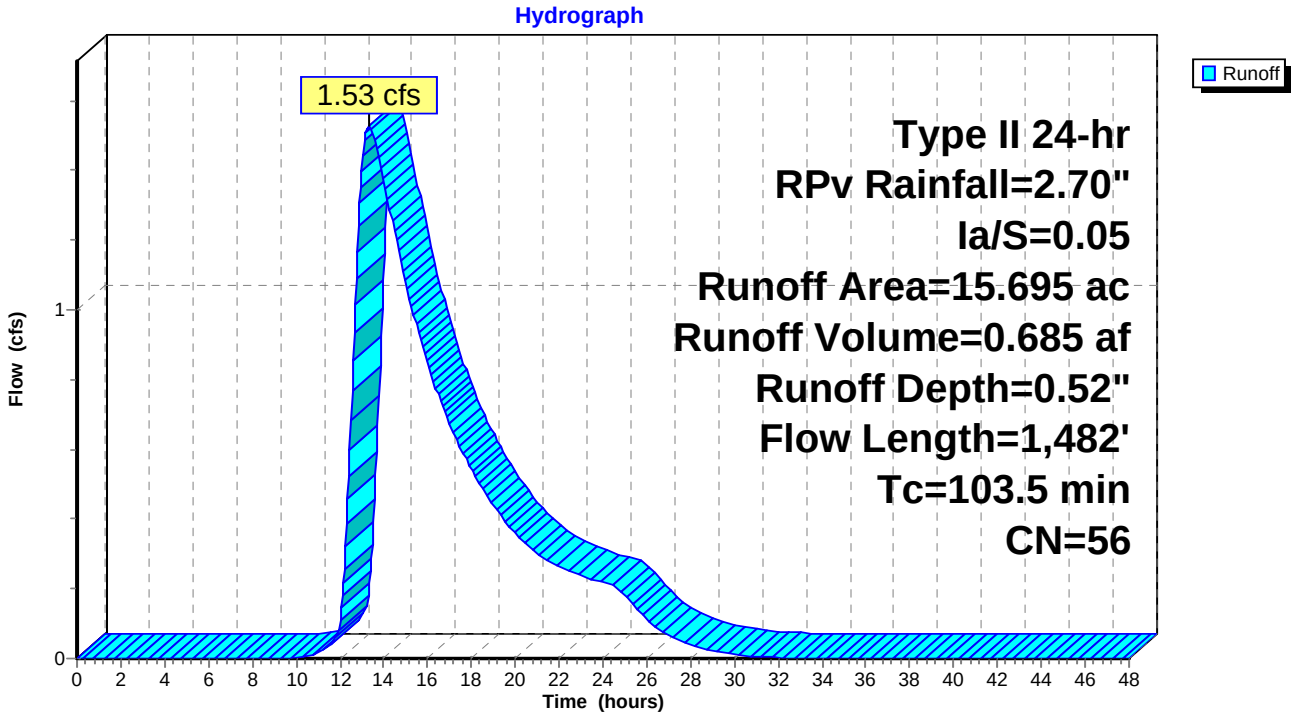
Runoff = 1.53 cfs @ 13.34 hrs, Volume= 0.685 af, Depth= 0.52"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr RPv Rainfall=2.70", Ia/S=0.05

	Area (ac)	CN	Description
	6.225	30	Woods, Good, HSG A
	0.971	39	>75% Grass cover, Good, HSG A
	0.126	96	Gravel surface, HSG A
	7.386	77	Woods, Good, HSG D
	0.875	80	>75% Grass cover, Good, HSG D
*	0.112	98	Water Surface, HSG D
	15.695	56	Weighted Average
	15.583		99.29% Pervious Area
	0.112		0.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.5	100	0.0083	0.12		**Sheet Flow, Sheet Flow - Grass** Grass: Short n= 0.150 P2= 3.40"
0.5	42	0.0083	1.47		**Shallow Concentrated Flow, Shallow Conc - Unpaved** Unpaved Kv= 16.1 fps
9.3	369	0.0017	0.66		**Shallow Concentrated Flow, Shallow Conc - Unpaved** Unpaved Kv= 16.1 fps
18.5	229	0.0017	0.21		**Shallow Concentrated Flow, Shallow Conc - Woods** Woodland Kv= 5.0 fps
18.3	310	0.0032	0.28		**Shallow Concentrated Flow, Shallow Conc - Woods** Woodland Kv= 5.0 fps
43.4	432	0.0011	0.17		**Shallow Concentrated Flow, Shallow Conc - Woods** Woodland Kv= 5.0 fps
103.5	1,482	Total			

Subcatchment DAE-4: Drainage Area 4



Summary for Subcatchment DAE-5: Drainage Area 5

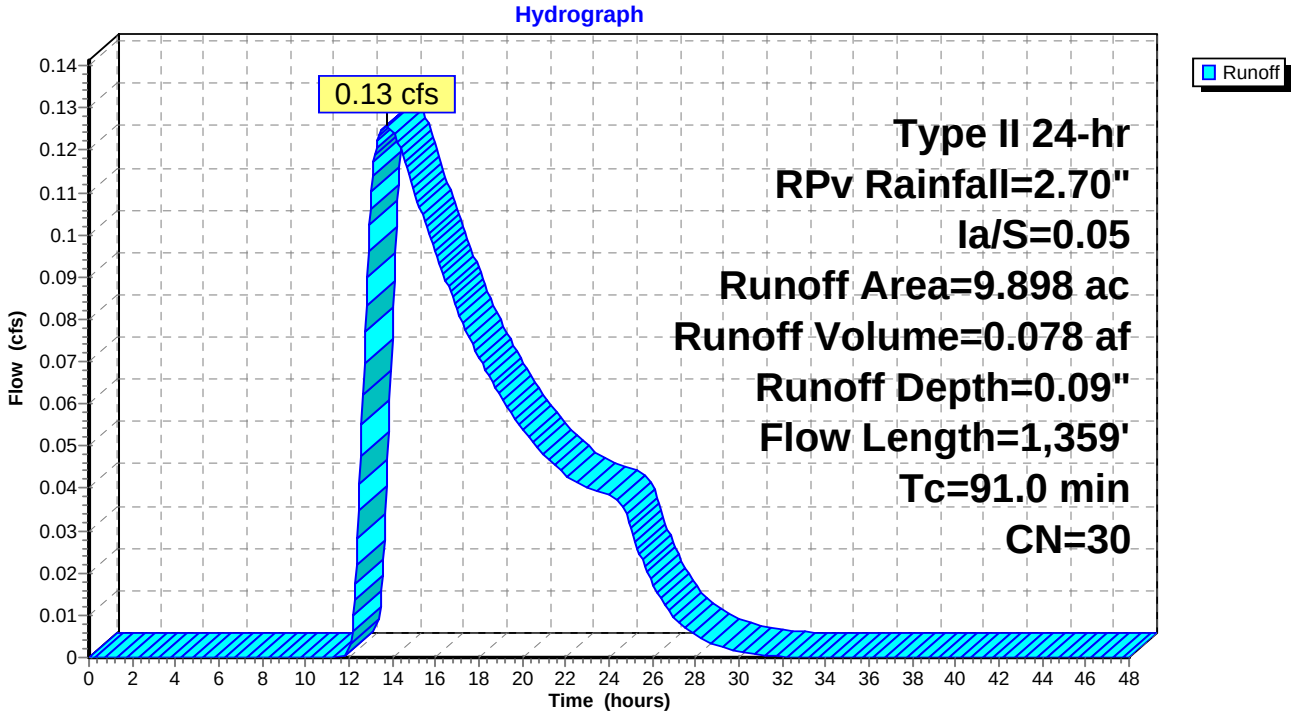
Runoff = 0.13 cfs @ 13.73 hrs, Volume= 0.078 af, Depth= 0.09"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr RPv Rainfall=2.70", Ia/S=0.05

Area (ac)	CN	Description
9.898	30	Woods, Good, HSG A
9.898		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.6	100	0.0489	0.11		**Sheet Flow, Sheet Flow - Woods** Woods: Light underbrush n= 0.400 P2= 3.40"
1.7	110	0.0489	1.11		**Shallow Concentrated Flow, Shallow Conc - Woods** Woodland Kv= 5.0 fps
3.0	117	0.0170	0.65		**Shallow Concentrated Flow, Shallow Conc - Woods** Woodland Kv= 5.0 fps
5.1	133	0.0075	0.43		**Shallow Concentrated Flow, Shallow Conc - Woods** Woodland Kv= 5.0 fps
56.1	652	0.0015	0.19		**Shallow Concentrated Flow, Shallow Conc - Woods** Woodland Kv= 5.0 fps
10.5	247	0.0061	0.39		**Shallow Concentrated Flow, Shallow Conc - Woods** Woodland Kv= 5.0 fps
91.0	1,359	Total			

Subcatchment DAE-5: Drainage Area 5

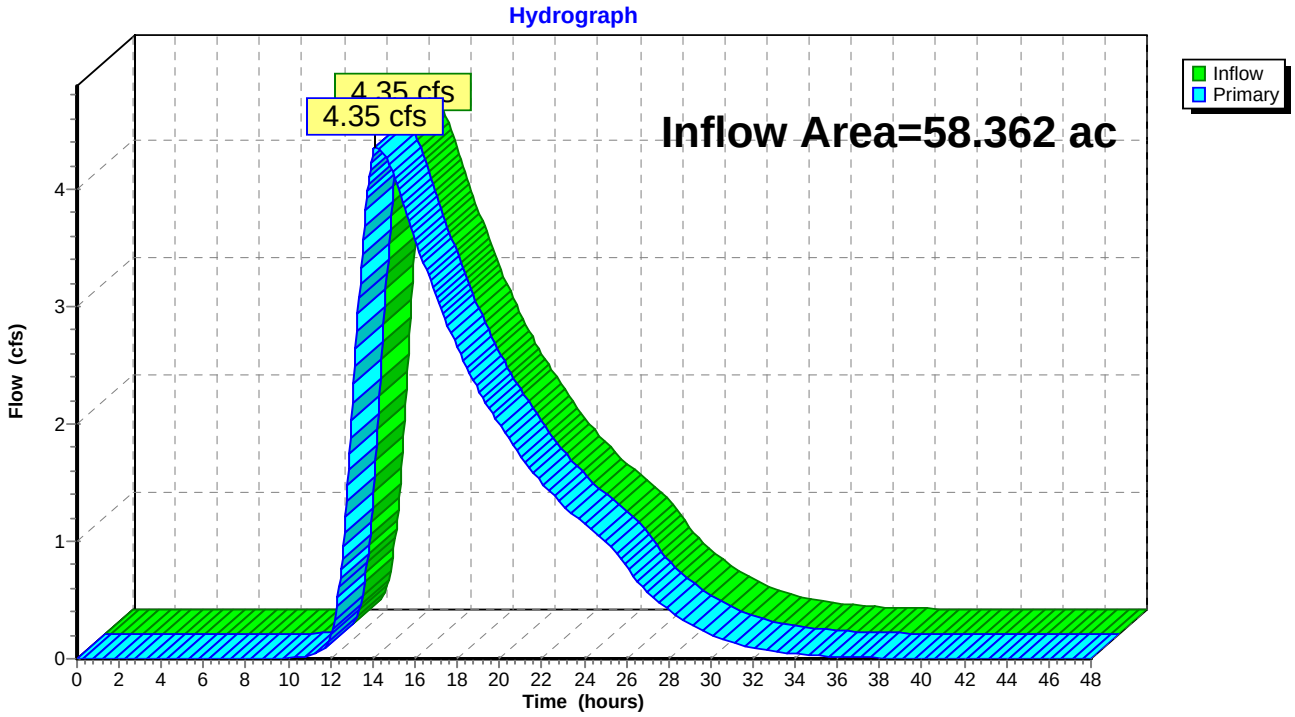


Summary for Link POA 1: POA #1

Inflow Area = 58.362 ac, 5.75% Impervious, Inflow Depth = 0.57" for RPv event
Inflow = 4.35 cfs @ 14.10 hrs, Volume= 2.775 af
Primary = 4.35 cfs @ 14.10 hrs, Volume= 2.775 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link POA 1: POA #1

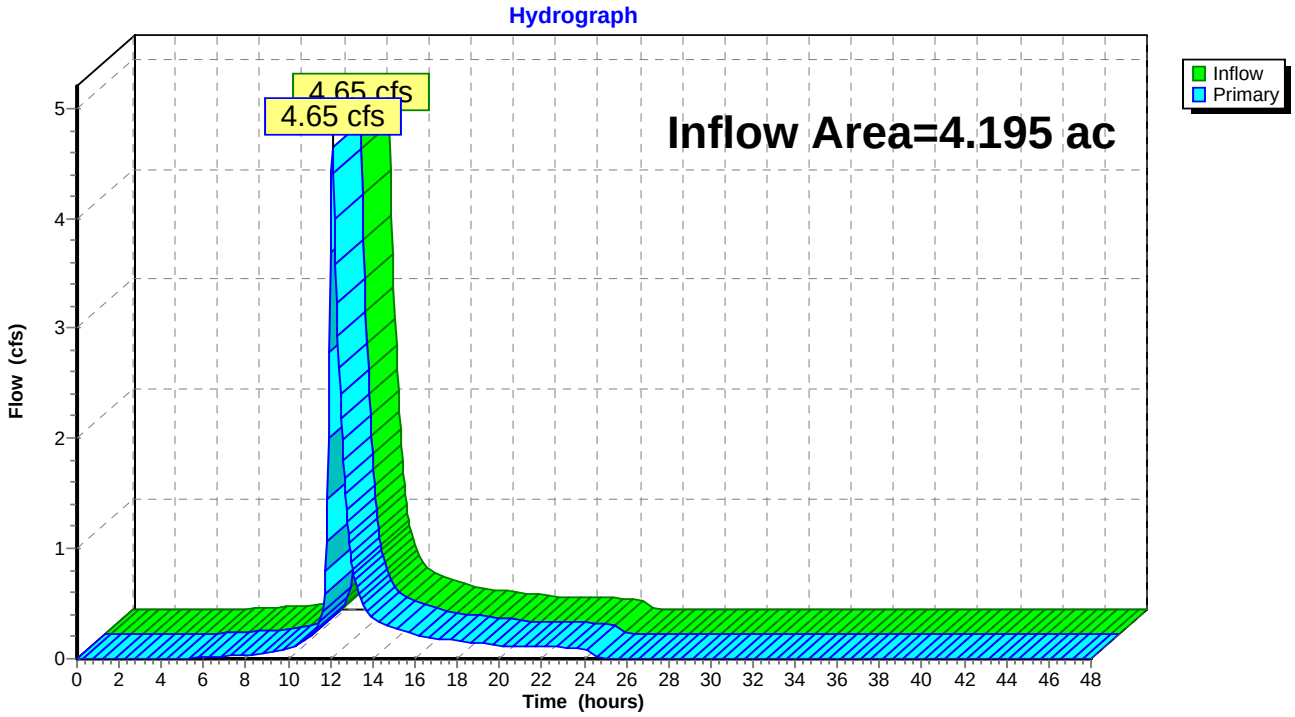


Summary for Link POA 2: POA #2

Inflow Area = 4.195 ac, 20.12% Impervious, Inflow Depth = 1.35" for RPv event
Inflow = 4.65 cfs @ 12.10 hrs, Volume= 0.473 af
Primary = 4.65 cfs @ 12.10 hrs, Volume= 0.473 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link POA 2: POA #2

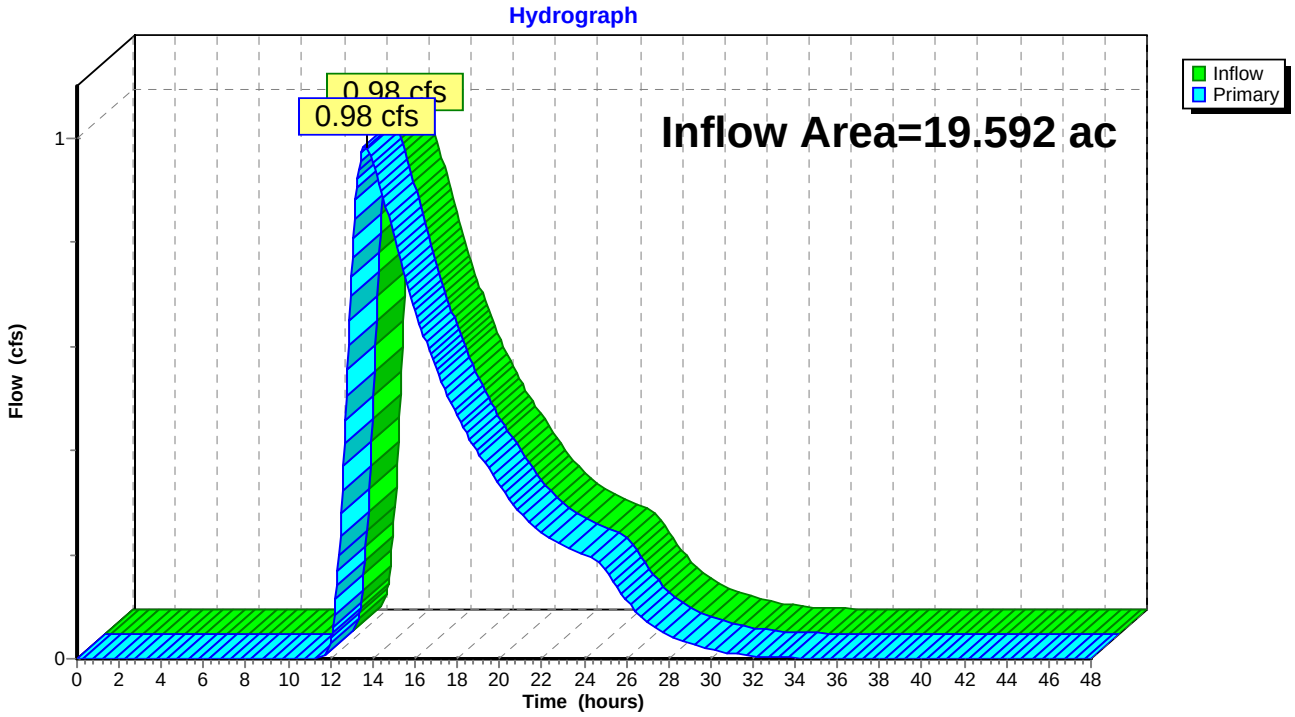


Summary for Link POA 3: POA #3

Inflow Area = 19.592 ac, 6.95% Impervious, Inflow Depth = 0.32" for RPv event
Inflow = 0.98 cfs @ 13.69 hrs, Volume= 0.526 af
Primary = 0.98 cfs @ 13.69 hrs, Volume= 0.526 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link POA 3: POA #3

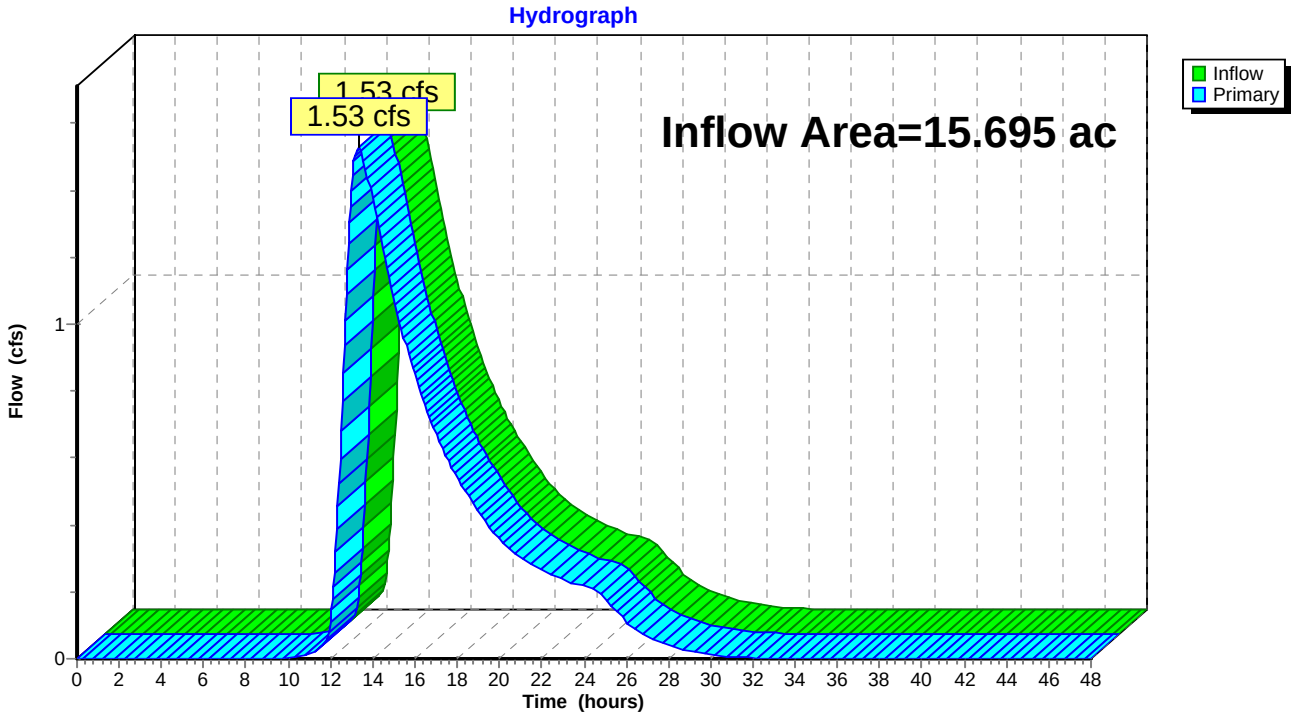


Summary for Link POA 4: POA #4

Inflow Area = 15.695 ac, 0.71% Impervious, Inflow Depth = 0.52" for RPv event
Inflow = 1.53 cfs @ 13.34 hrs, Volume= 0.685 af
Primary = 1.53 cfs @ 13.34 hrs, Volume= 0.685 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link POA 4: POA #4

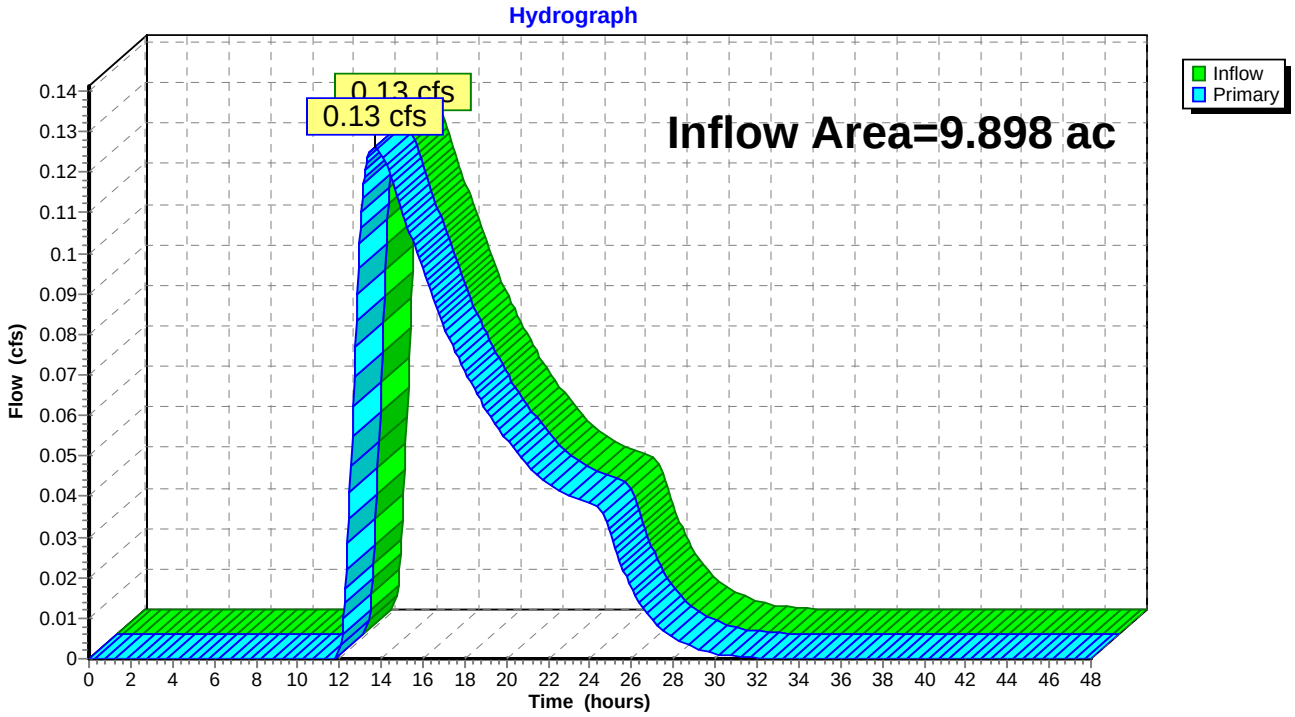


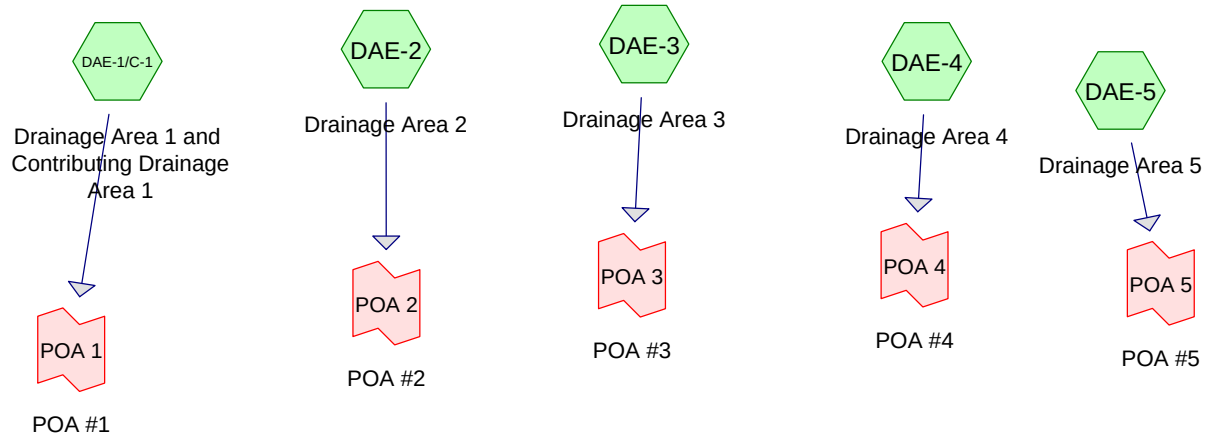
Summary for Link POA 5: POA #5

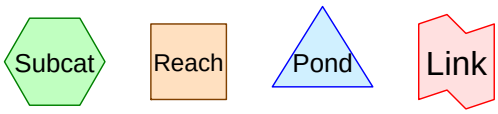
Inflow Area = 9.898 ac, 0.00% Impervious, Inflow Depth = 0.09" for RPv event
Inflow = 0.13 cfs @ 13.73 hrs, Volume= 0.078 af
Primary = 0.13 cfs @ 13.73 hrs, Volume= 0.078 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link POA 5: POA #5







Routing Diagram for 12393.CF-PRE-CvFv
Prepared by {enter your company name here}, Printed 4/9/2020
HydroCAD® 10.00-25 s/n 02614 © 2019 HydroCAD Software Solutions LLC

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
24.402	39	>75% Grass cover, Good, HSG A (DAE-1/C-1, DAE-2, DAE-3, DAE-4)
8.729	80	>75% Grass cover, Good, HSG D (DAE-1/C-1, DAE-2, DAE-3, DAE-4)
3.601	96	Gravel surface, HSG A (DAE-1/C-1, DAE-2, DAE-4)
2.881	96	Gravel surface, HSG D (DAE-1/C-1, DAE-2)
1.629	98	Roofs, HSG D (DAE-1/C-1, DAE-2)
14.353	67	Row crops, straight row, Good, HSG A (DAE-1/C-1)
0.099	98	Unconnected pavement, HSG A (DAE-1/C-1)
0.799	98	Unconnected pavement, HSG D (DAE-1/C-1, DAE-2)
0.770	98	Water Surface, HSG A (DAE-1/C-1, DAE-2)
1.362	98	Water Surface, HSG C (DAE-3)
1.015	98	Water Surface, HSG D (DAE-1/C-1, DAE-2, DAE-4)
35.401	30	Woods, Good, HSG A (DAE-1/C-1, DAE-2, DAE-3, DAE-4, DAE-5)
2.368	70	Woods, Good, HSG C (DAE-3)
10.333	77	Woods, Good, HSG D (DAE-1/C-1, DAE-2, DAE-3, DAE-4)
107.742	**54**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
78.626	HSG A	DAE-1/C-1, DAE-2, DAE-3, DAE-4, DAE-5
0.000	HSG B	
3.730	HSG C	DAE-3
25.386	HSG D	DAE-1/C-1, DAE-2, DAE-3, DAE-4
0.000	Other	
107.742		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
24.402	0.000	0.000	8.729	0.000	33.131	>75% Grass cover, Good	DAE-1/C-1, DAE-2, DAE-3, DAE-4
3.601	0.000	0.000	2.881	0.000	6.482	Gravel surface	DAE-1/C-1, DAE-2, DAE-4
0.000	0.000	0.000	1.629	0.000	1.629	Roofs	DAE-1/C-1, DAE-2
14.353	0.000	0.000	0.000	0.000	14.353	Row crops, straight row, Good	DAE-1/C-1
0.099	0.000	0.000	0.799	0.000	0.898	Unconnected pavement	DAE-1/C-1, DAE-2
0.770	0.000	1.362	1.015	0.000	3.147	Water Surface	DAE-1/C-1, DAE-2, DAE-3, DAE-4
35.401	0.000	2.368	10.333	0.000	48.102	Woods, Good	DAE-1/C-1, DAE-2, DAE-3, DAE-

Ground Covers (selected nodes) (continued)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
78.626	**0.000**	**3.730**	**25.386**	**0.000**	**107.742**	**TOTAL AREA**	

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment DAE-1/C-1: Drainage Area 1 Runoff Area=58.362 ac 5.75% Impervious Runoff Depth=1.34"
Flow Length=2,694' Tc=166.5 min CN=58 Runoff=9.64 cfs 6.504 af

Subcatchment DAE-2: Drainage Area 2 Runoff Area=4.195 ac 20.12% Impervious Runoff Depth=3.25"
Flow Length=231' Tc=15.5 min CN=81 Runoff=11.67 cfs 1.137 af

Subcatchment DAE-3: Drainage Area 3 Runoff Area=19.592 ac 6.95% Impervious Runoff Depth=0.59"
Flow Length=1,621' Tc=118.9 min CN=46 Runoff=1.39 cfs 0.969 af

Subcatchment DAE-4: Drainage Area 4 Runoff Area=15.695 ac 0.71% Impervious Runoff Depth=1.20"
Flow Length=1,482' Tc=103.5 min CN=56 Runoff=3.16 cfs 1.569 af

Subcatchment DAE-5: Drainage Area 5 Runoff Area=9.898 ac 0.00% Impervious Runoff Depth=0.02"
Flow Length=1,359' Tc=91.0 min CN=30 Runoff=0.03 cfs 0.014 af

Link POA 1: POA #1 Inflow=9.64 cfs 6.504 af
Primary=9.64 cfs 6.504 af

Link POA 2: POA #2 Inflow=11.67 cfs 1.137 af
Primary=11.67 cfs 1.137 af

Link POA 3: POA #3 Inflow=1.39 cfs 0.969 af
Primary=1.39 cfs 0.969 af

Link POA 4: POA #4 Inflow=3.16 cfs 1.569 af
Primary=3.16 cfs 1.569 af

Link POA 5: POA #5 Inflow=0.03 cfs 0.014 af
Primary=0.03 cfs 0.014 af

Total Runoff Area = 107.742 ac Runoff Volume = 10.193 af Average Runoff Depth = 1.14"
94.73% Pervious = 102.068 ac 5.27% Impervious = 5.674 ac

Summary for Subcatchment DAE-1/C-1: Drainage Area 1 and Contributing Drainage Area 1

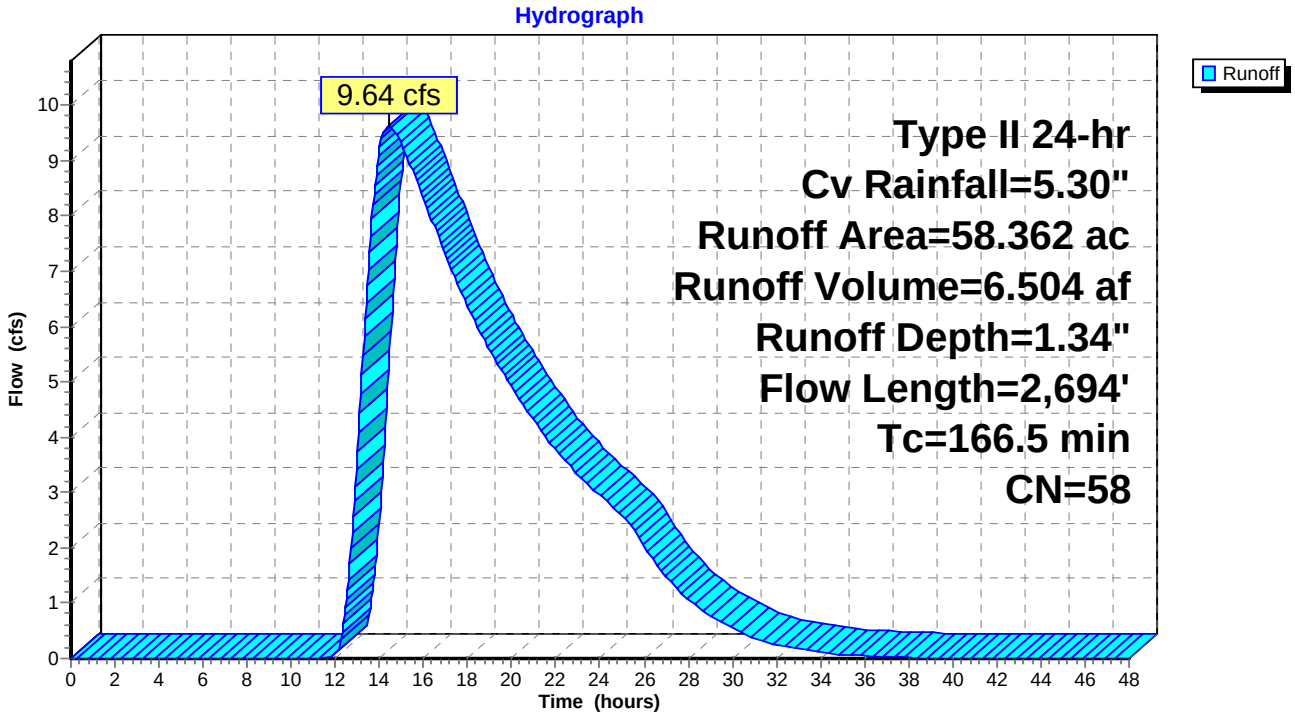
Runoff = 9.64 cfs @ 14.43 hrs, Volume= 6.504 af, Depth= 1.34"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr Cv Rainfall=5.30"

	Area (ac)	CN	Description
	6.248	30	Woods, Good, HSG A
	22.384	39	>75% Grass cover, Good, HSG A
	14.353	67	Row crops, straight row, Good, HSG A
	2.991	96	Gravel surface, HSG A
	0.099	98	Unconnected pavement, HSG A
*	0.577	98	Water Surface, HSG A
	0.073	77	Woods, Good, HSG D
	6.967	80	>75% Grass cover, Good, HSG D
	1.990	96	Gravel surface, HSG D
	0.719	98	Unconnected pavement, HSG D
*	0.823	98	Water Surface, HSG D
	1.138	98	Roofs, HSG D
	58.362	58	Weighted Average
	55.006		94.25% Pervious Area
	3.356		5.75% Impervious Area
	0.818		24.37% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	65	0.0998	0.14		**Sheet Flow, Sheet Flow - Woods** Woods: Light underbrush n= 0.400 P2= 3.40"
0.3	35	0.0998	2.19		**Sheet Flow, Sheet Flow - Smooth Surface** Smooth surfaces n= 0.011 P2= 3.40"
0.9	89	0.0112	1.70		**Shallow Concentrated Flow, Shallow Conc - Unpaved** Unpaved Kv= 16.1 fps
0.7	100	0.0200	2.28		**Shallow Concentrated Flow, Shallow Conc - Unpaved** Unpaved Kv= 16.1 fps
3.8	109	0.0092	0.48		**Shallow Concentrated Flow, Shallow Conc - Woods** Woodland Kv= 5.0 fps
1.9	148	0.0067	1.32		**Shallow Concentrated Flow, Shallow Conc - Unpaved** Unpaved Kv= 16.1 fps
1.0	112	0.0089	1.92		**Shallow Concentrated Flow, Shallow Conc - Paved** Paved Kv= 20.3 fps
129.4	1,250	0.0001	0.16		**Shallow Concentrated Flow, Shallow Conc - Unpaved** Unpaved Kv= 16.1 fps
20.5	740	0.0014	0.60		**Shallow Concentrated Flow, Shallow Conc - Unpaved** Unpaved Kv= 16.1 fps
0.2	46	0.0437	3.37		**Shallow Concentrated Flow, Shallow Conc - Unpaved** Unpaved Kv= 16.1 fps
166.5	2,694	Total			

Subcatchment DAE-1/C-1: Drainage Area 1 and Contributing Drainage Area 1



Summary for Subcatchment DAE-2: Drainage Area 2

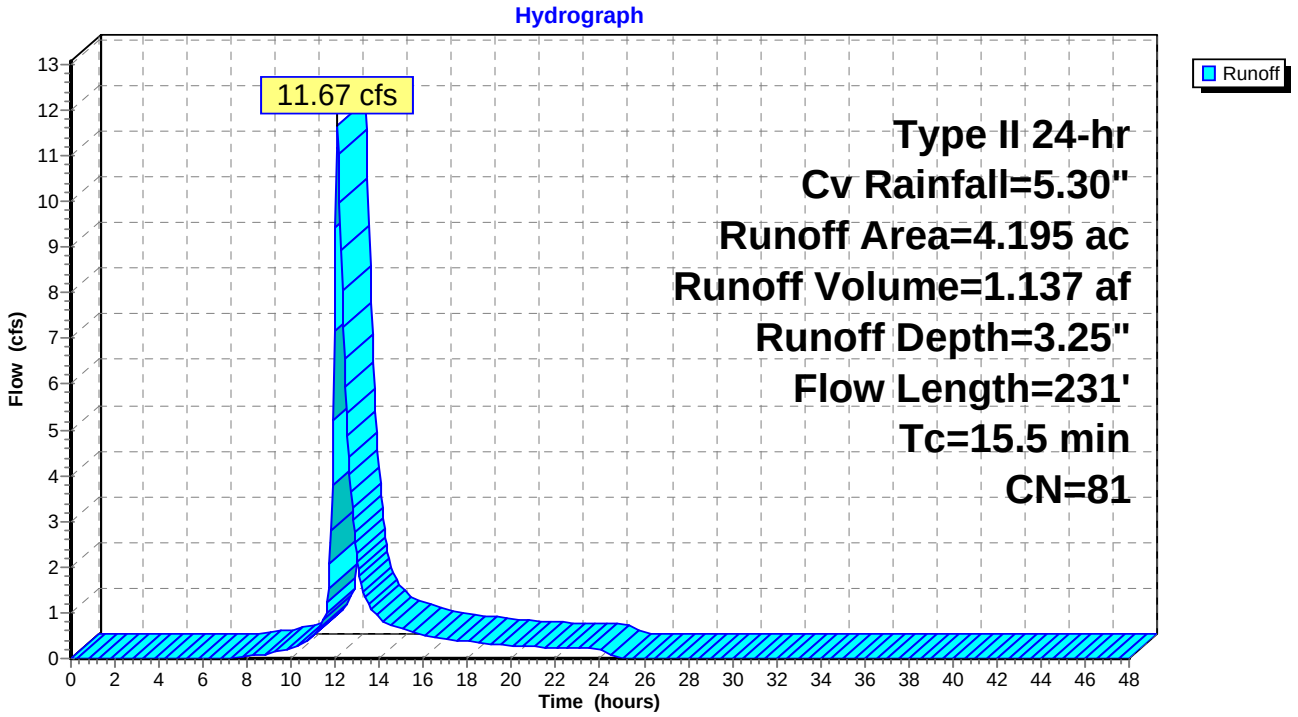
Runoff = 11.67 cfs @ 12.10 hrs, Volume= 1.137 af, Depth= 3.25"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr Cv Rainfall=5.30"

	Area (ac)	CN	Description
	0.016	30	Woods, Good, HSG A
	0.783	39	>75% Grass cover, Good, HSG A
	0.484	96	Gravel surface, HSG A
*	0.193	98	Water Surface, HSG A
	0.432	77	Woods, Good, HSG D
	0.745	80	>75% Grass cover, Good, HSG D
	0.891	96	Gravel surface, HSG D
	0.080	98	Unconnected pavement, HSG D
*	0.080	98	Water Surface, HSG D
	0.491	98	Roofs, HSG D
	4.195	81	Weighted Average
	3.351		79.88% Pervious Area
	0.844		20.12% Impervious Area
	0.080		9.48% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.4	100	0.0071	0.12		**Sheet Flow, Sheet Flow - Grass** Grass: Short n= 0.150 P2= 3.40"
0.9	94	0.0071	1.71		**Shallow Concentrated Flow, Shallow Conc - Paved** Paved Kv= 20.3 fps
0.2	37	0.0268	2.64		**Shallow Concentrated Flow, Shallow Conc - Unpaved** Unpaved Kv= 16.1 fps
15.5	231	Total			

Subcatchment DAE-2: Drainage Area 2



Summary for Subcatchment DAE-3: Drainage Area 3

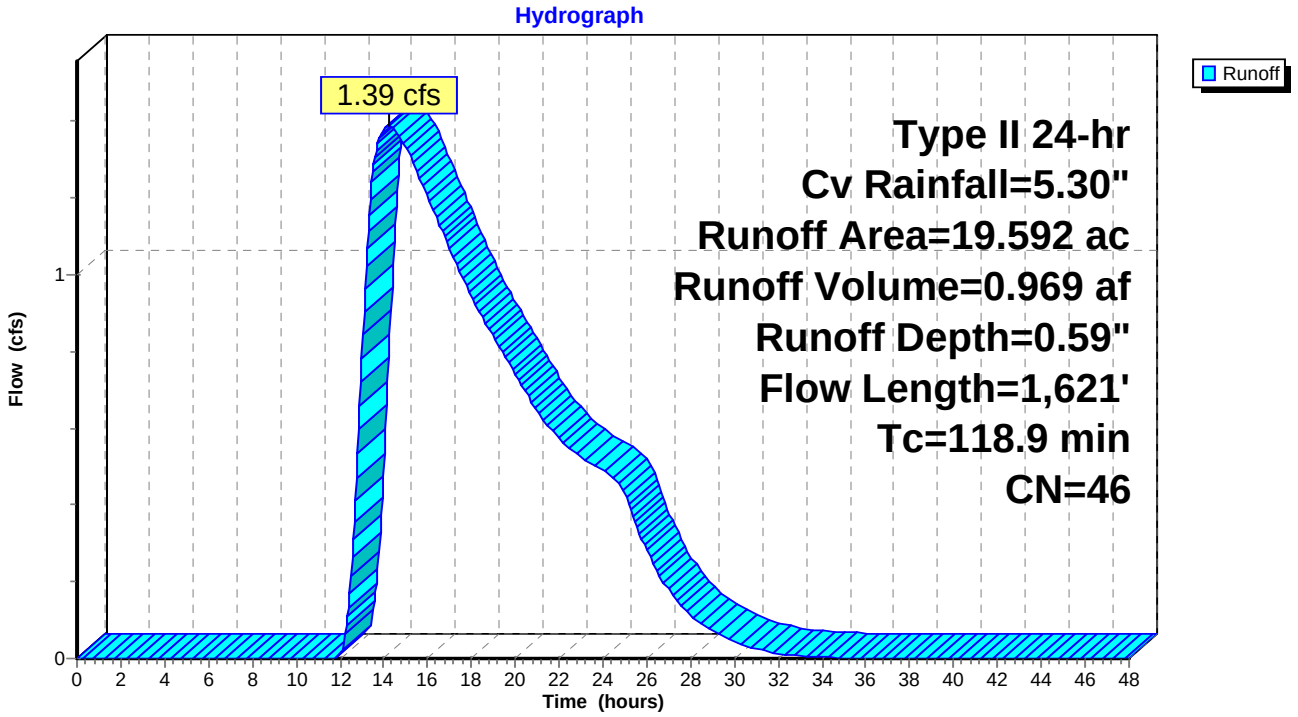
Runoff = 1.39 cfs @ 14.25 hrs, Volume= 0.969 af, Depth= 0.59"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr Cv Rainfall=5.30"

	Area (ac)	CN	Description
	13.014	30	Woods, Good, HSG A
	0.264	39	>75% Grass cover, Good, HSG A
	2.368	70	Woods, Good, HSG C
*	1.362	98	Water Surface, HSG C
	2.442	77	Woods, Good, HSG D
	0.142	80	>75% Grass cover, Good, HSG D
	19.592	46	Weighted Average
	18.230		93.05% Pervious Area
	1.362		6.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
28.2	100	0.0094	0.06		**Sheet Flow, Sheet Flow - Woods** Woods: Light underbrush n= 0.400 P2= 3.40"
6.8	197	0.0094	0.48		**Shallow Concentrated Flow, Shallow Conc - Woods** Woodland Kv= 5.0 fps
27.1	507	0.0039	0.31		**Shallow Concentrated Flow, Shallow Conc - Woods** Woodland Kv= 5.0 fps
56.8	817	0.0023	0.24		**Shallow Concentrated Flow, Shallow Conc - Woods** Woodland Kv= 5.0 fps
118.9	1,621	Total			

Subcatchment DAE-3: Drainage Area 3



Summary for Subcatchment DAE-4: Drainage Area 4

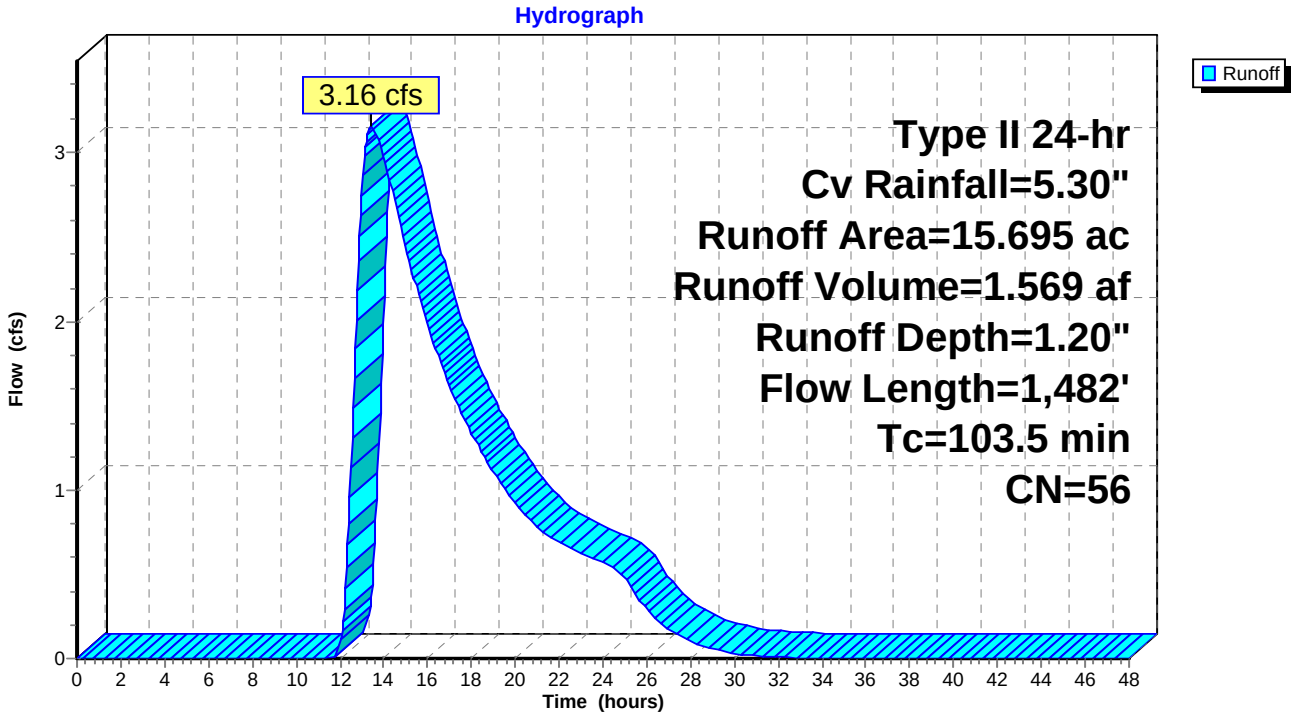
Runoff = 3.16 cfs @ 13.37 hrs, Volume= 1.569 af, Depth= 1.20"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr Cv Rainfall=5.30"

	Area (ac)	CN	Description
	6.225	30	Woods, Good, HSG A
	0.971	39	>75% Grass cover, Good, HSG A
	0.126	96	Gravel surface, HSG A
	7.386	77	Woods, Good, HSG D
	0.875	80	>75% Grass cover, Good, HSG D
*	0.112	98	Water Surface, HSG D
	15.695	56	Weighted Average
	15.583		99.29% Pervious Area
	0.112		0.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.5	100	0.0083	0.12		**Sheet Flow, Sheet Flow - Grass** Grass: Short n= 0.150 P2= 3.40"
0.5	42	0.0083	1.47		**Shallow Concentrated Flow, Shallow Conc - Unpaved** Unpaved Kv= 16.1 fps
9.3	369	0.0017	0.66		**Shallow Concentrated Flow, Shallow Conc - Unpaved** Unpaved Kv= 16.1 fps
18.5	229	0.0017	0.21		**Shallow Concentrated Flow, Shallow Conc - Woods** Woodland Kv= 5.0 fps
18.3	310	0.0032	0.28		**Shallow Concentrated Flow, Shallow Conc - Woods** Woodland Kv= 5.0 fps
43.4	432	0.0011	0.17		**Shallow Concentrated Flow, Shallow Conc - Woods** Woodland Kv= 5.0 fps
103.5	1,482	Total			

Subcatchment DAE-4: Drainage Area 4



Summary for Subcatchment DAE-5: Drainage Area 5

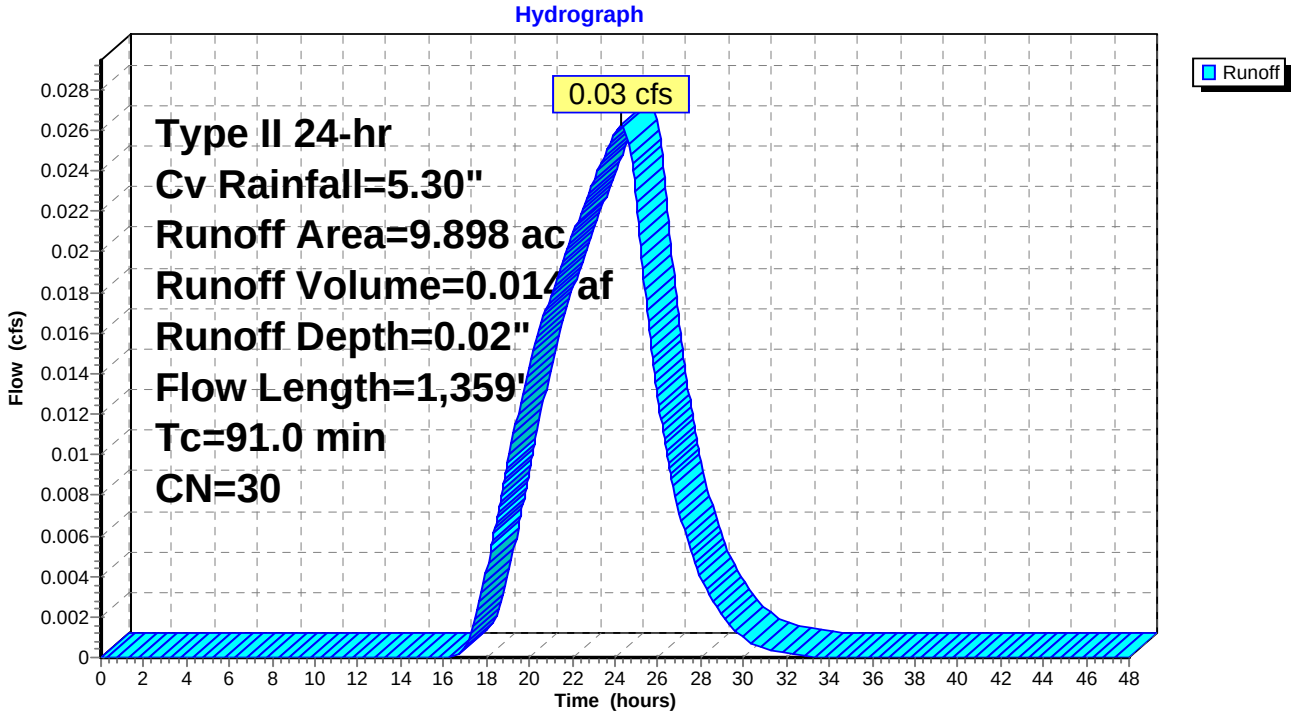
Runoff = 0.03 cfs @ 24.29 hrs, Volume= 0.014 af, Depth= 0.02"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr Cv Rainfall=5.30"

Area (ac)	CN	Description
9.898	30	Woods, Good, HSG A
9.898		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.6	100	0.0489	0.11		**Sheet Flow, Sheet Flow - Woods** Woods: Light underbrush n= 0.400 P2= 3.40"
1.7	110	0.0489	1.11		**Shallow Concentrated Flow, Shallow Conc - Woods** Woodland Kv= 5.0 fps
3.0	117	0.0170	0.65		**Shallow Concentrated Flow, Shallow Conc - Woods** Woodland Kv= 5.0 fps
5.1	133	0.0075	0.43		**Shallow Concentrated Flow, Shallow Conc - Woods** Woodland Kv= 5.0 fps
56.1	652	0.0015	0.19		**Shallow Concentrated Flow, Shallow Conc - Woods** Woodland Kv= 5.0 fps
10.5	247	0.0061	0.39		**Shallow Concentrated Flow, Shallow Conc - Woods** Woodland Kv= 5.0 fps
91.0	1,359	Total			

Subcatchment DAE-5: Drainage Area 5

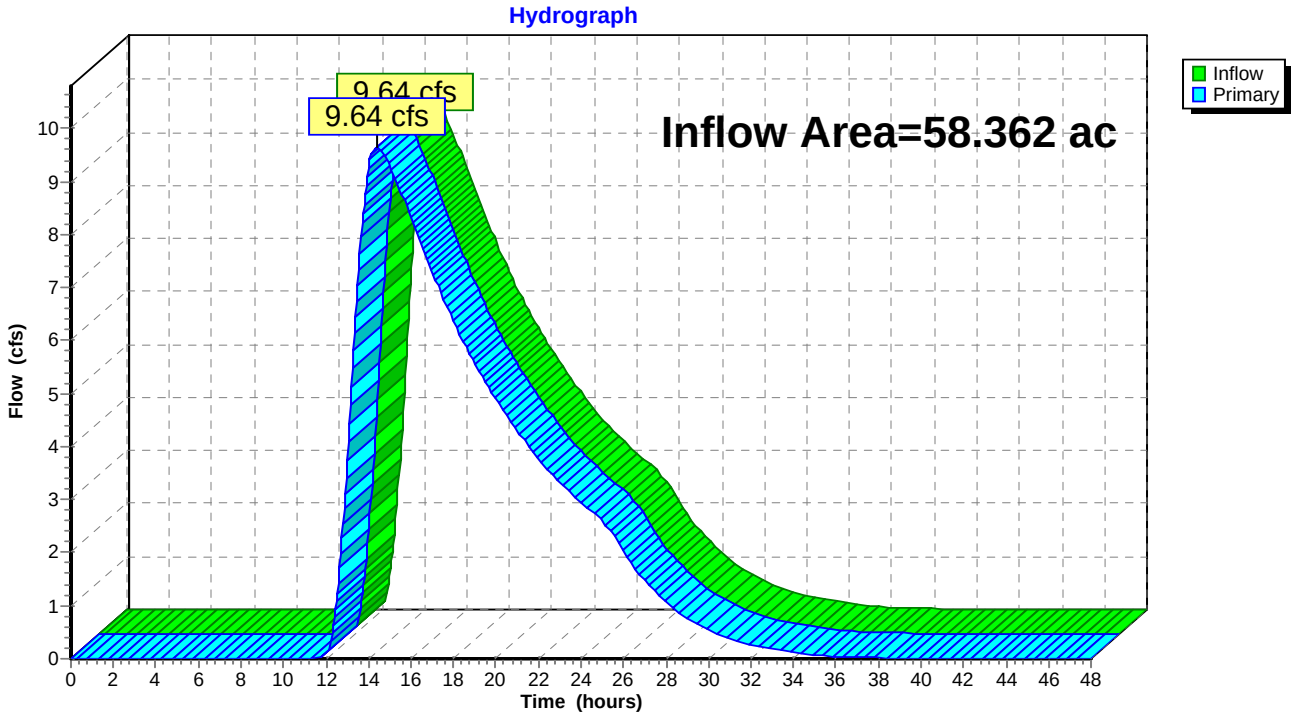


Summary for Link POA 1: POA #1

Inflow Area = 58.362 ac, 5.75% Impervious, Inflow Depth = 1.34" for Cv event
Inflow = 9.64 cfs @ 14.43 hrs, Volume= 6.504 af
Primary = 9.64 cfs @ 14.43 hrs, Volume= 6.504 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link POA 1: POA #1

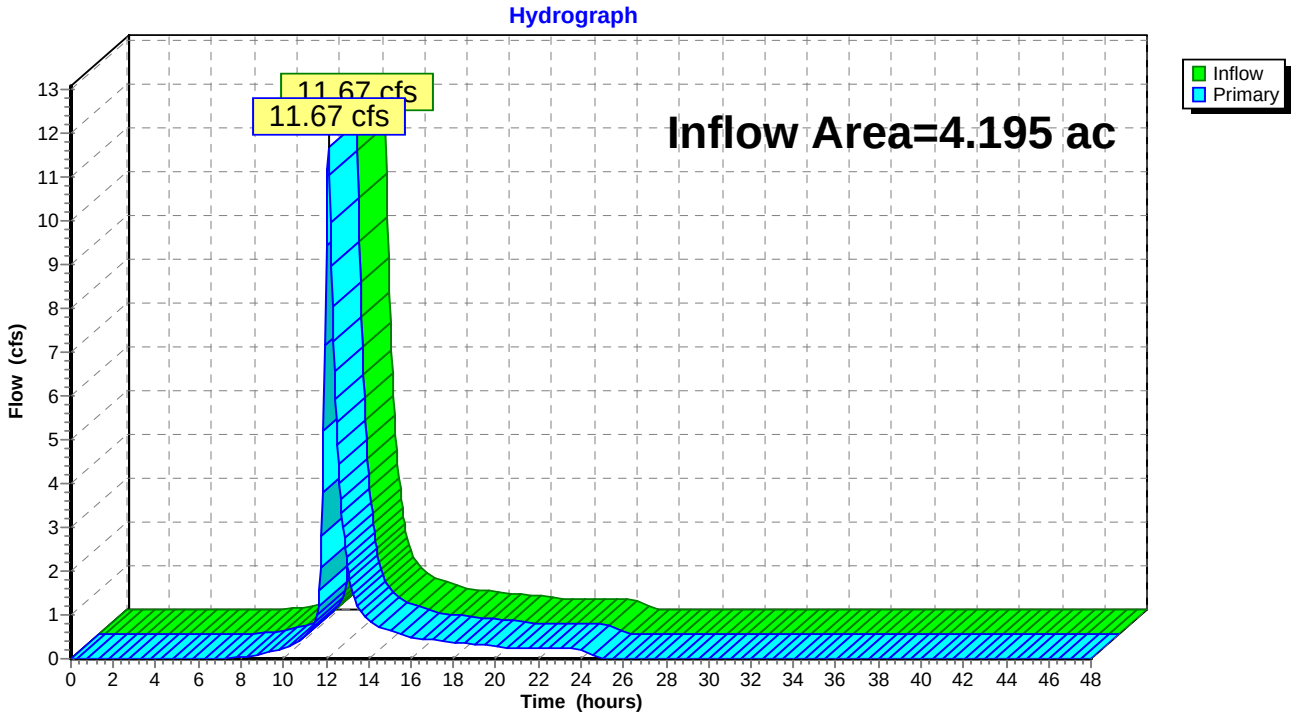


Summary for Link POA 2: POA #2

Inflow Area = 4.195 ac, 20.12% Impervious, Inflow Depth = 3.25" for Cv event
Inflow = 11.67 cfs @ 12.10 hrs, Volume= 1.137 af
Primary = 11.67 cfs @ 12.10 hrs, Volume= 1.137 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link POA 2: POA #2

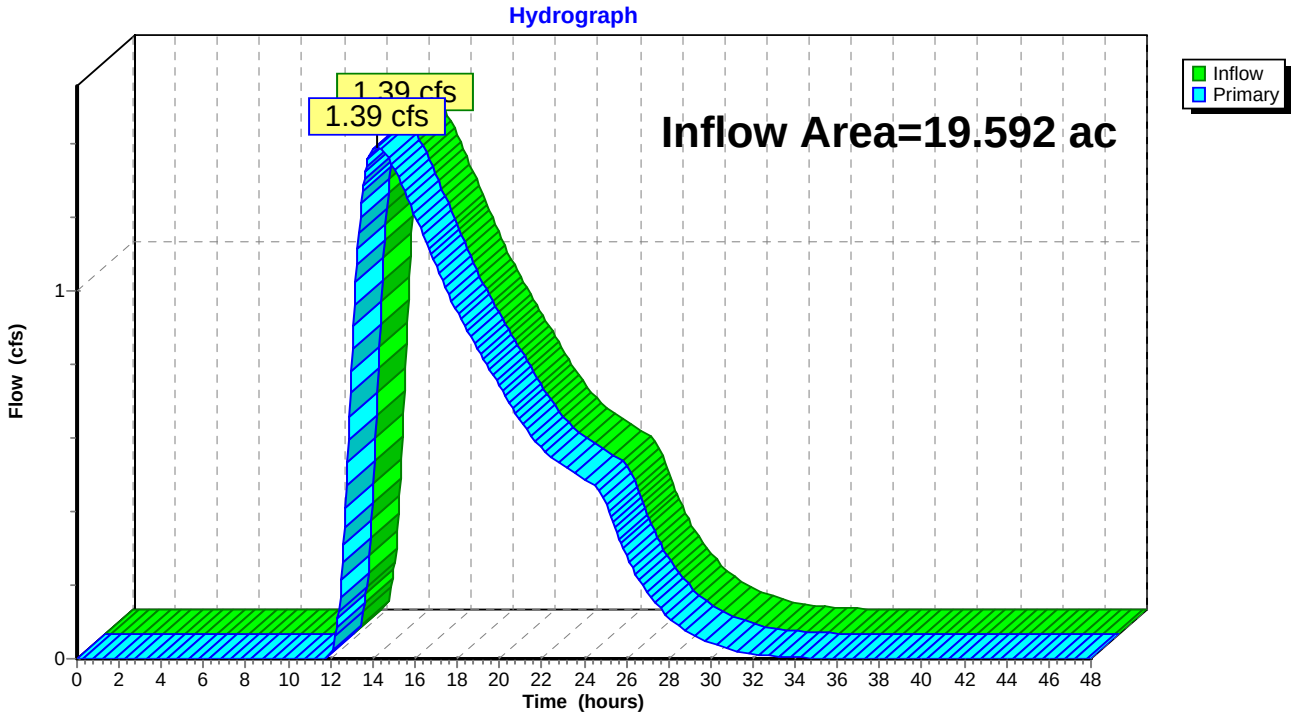


Summary for Link POA 3: POA #3

Inflow Area = 19.592 ac, 6.95% Impervious, Inflow Depth = 0.59" for Cv event
Inflow = 1.39 cfs @ 14.25 hrs, Volume= 0.969 af
Primary = 1.39 cfs @ 14.25 hrs, Volume= 0.969 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link POA 3: POA #3

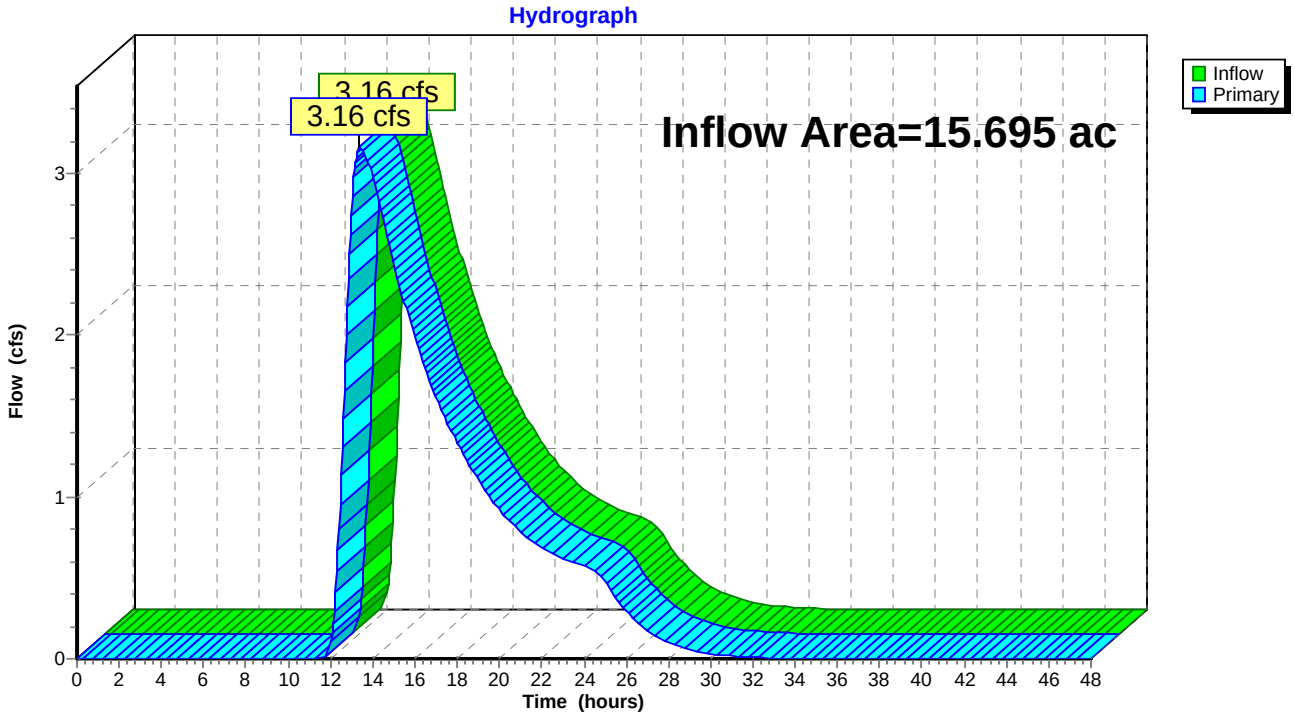


Summary for Link POA 4: POA #4

Inflow Area = 15.695 ac, 0.71% Impervious, Inflow Depth = 1.20" for Cv event
Inflow = 3.16 cfs @ 13.37 hrs, Volume= 1.569 af
Primary = 3.16 cfs @ 13.37 hrs, Volume= 1.569 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link POA 4: POA #4

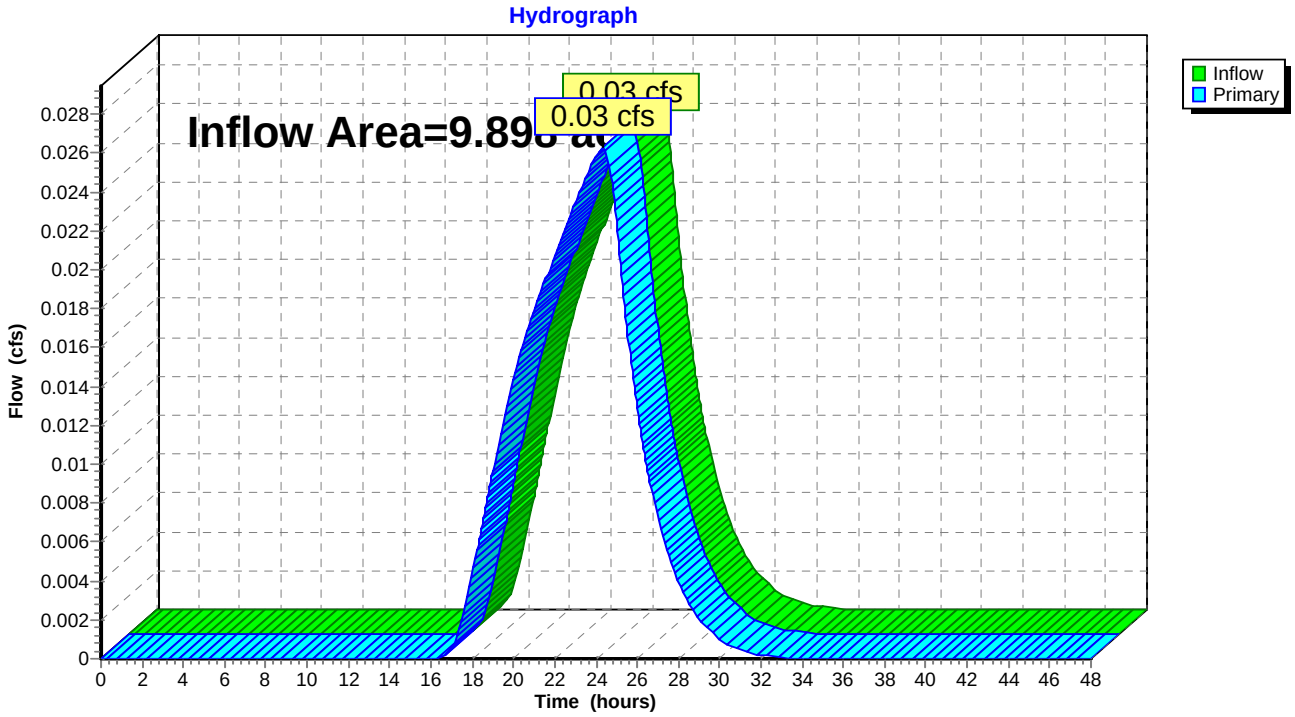


Summary for Link POA 5: POA #5

Inflow Area = 9.898 ac, 0.00% Impervious, Inflow Depth = 0.02" for Cv event
Inflow = 0.03 cfs @ 24.29 hrs, Volume= 0.014 af
Primary = 0.03 cfs @ 24.29 hrs, Volume= 0.014 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link POA 5: POA #5



Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment DAE-1/C-1: Drainage Area 1 Runoff Area=58.362 ac 5.75% Impervious Runoff Depth=4.01"
Flow Length=2,694' Tc=166.5 min CN=58 Runoff=32.60 cfs 19.492 af

Subcatchment DAE-2: Drainage Area 2 Runoff Area=4.195 ac 20.12% Impervious Runoff Depth=6.88"
Flow Length=231' Tc=15.5 min CN=81 Runoff=24.33 cfs 2.406 af

Subcatchment DAE-3: Drainage Area 3 Runoff Area=19.592 ac 6.95% Impervious Runoff Depth=2.53"
Flow Length=1,621' Tc=118.9 min CN=46 Runoff=7.98 cfs 4.123 af

Subcatchment DAE-4: Drainage Area 4 Runoff Area=15.695 ac 0.71% Impervious Runoff Depth=3.76"
Flow Length=1,482' Tc=103.5 min CN=56 Runoff=11.75 cfs 4.915 af

Subcatchment DAE-5: Drainage Area 5 Runoff Area=9.898 ac 0.00% Impervious Runoff Depth=0.74"
Flow Length=1,359' Tc=91.0 min CN=30 Runoff=0.89 cfs 0.608 af

Link POA 1: POA #1 Inflow=32.60 cfs 19.492 af
Primary=32.60 cfs 19.492 af

Link POA 2: POA #2 Inflow=24.33 cfs 2.406 af
Primary=24.33 cfs 2.406 af

Link POA 3: POA #3 Inflow=7.98 cfs 4.123 af
Primary=7.98 cfs 4.123 af

Link POA 4: POA #4 Inflow=11.75 cfs 4.915 af
Primary=11.75 cfs 4.915 af

Link POA 5: POA #5 Inflow=0.89 cfs 0.608 af
Primary=0.89 cfs 0.608 af

Total Runoff Area = 107.742 ac Runoff Volume = 31.544 af Average Runoff Depth = 3.51"
94.73% Pervious = 102.068 ac 5.27% Impervious = 5.674 ac

Summary for Subcatchment DAE-1/C-1: Drainage Area 1 and Contributing Drainage Area 1

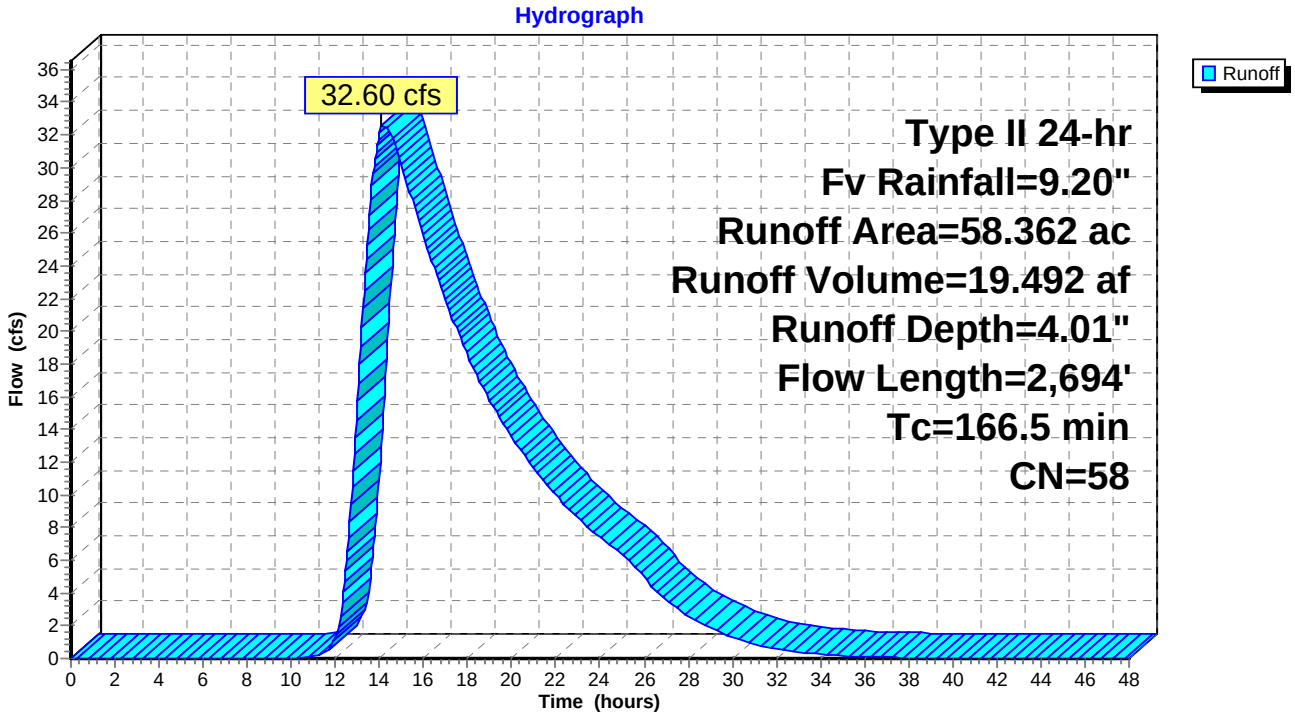
Runoff = 32.60 cfs @ 14.11 hrs, Volume= 19.492 af, Depth= 4.01"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr Fv Rainfall=9.20"

	Area (ac)	CN	Description
	6.248	30	Woods, Good, HSG A
	22.384	39	>75% Grass cover, Good, HSG A
	14.353	67	Row crops, straight row, Good, HSG A
	2.991	96	Gravel surface, HSG A
	0.099	98	Unconnected pavement, HSG A
*	0.577	98	Water Surface, HSG A
	0.073	77	Woods, Good, HSG D
	6.967	80	>75% Grass cover, Good, HSG D
	1.990	96	Gravel surface, HSG D
	0.719	98	Unconnected pavement, HSG D
*	0.823	98	Water Surface, HSG D
	1.138	98	Roofs, HSG D
	58.362	58	Weighted Average
	55.006		94.25% Pervious Area
	3.356		5.75% Impervious Area
	0.818		24.37% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	65	0.0998	0.14		**Sheet Flow, Sheet Flow - Woods** Woods: Light underbrush n= 0.400 P2= 3.40"
0.3	35	0.0998	2.19		**Sheet Flow, Sheet Flow - Smooth Surface** Smooth surfaces n= 0.011 P2= 3.40"
0.9	89	0.0112	1.70		**Shallow Concentrated Flow, Shallow Conc - Unpaved** Unpaved Kv= 16.1 fps
0.7	100	0.0200	2.28		**Shallow Concentrated Flow, Shallow Conc - Unpaved** Unpaved Kv= 16.1 fps
3.8	109	0.0092	0.48		**Shallow Concentrated Flow, Shallow Conc - Woods** Woodland Kv= 5.0 fps
1.9	148	0.0067	1.32		**Shallow Concentrated Flow, Shallow Conc - Unpaved** Unpaved Kv= 16.1 fps
1.0	112	0.0089	1.92		**Shallow Concentrated Flow, Shallow Conc - Paved** Paved Kv= 20.3 fps
129.4	1,250	0.0001	0.16		**Shallow Concentrated Flow, Shallow Conc - Unpaved** Unpaved Kv= 16.1 fps
20.5	740	0.0014	0.60		**Shallow Concentrated Flow, Shallow Conc - Unpaved** Unpaved Kv= 16.1 fps
0.2	46	0.0437	3.37		**Shallow Concentrated Flow, Shallow Conc - Unpaved** Unpaved Kv= 16.1 fps
166.5	2,694	Total			

Subcatchment DAE-1/C-1: Drainage Area 1 and Contributing Drainage Area 1



Summary for Subcatchment DAE-2: Drainage Area 2

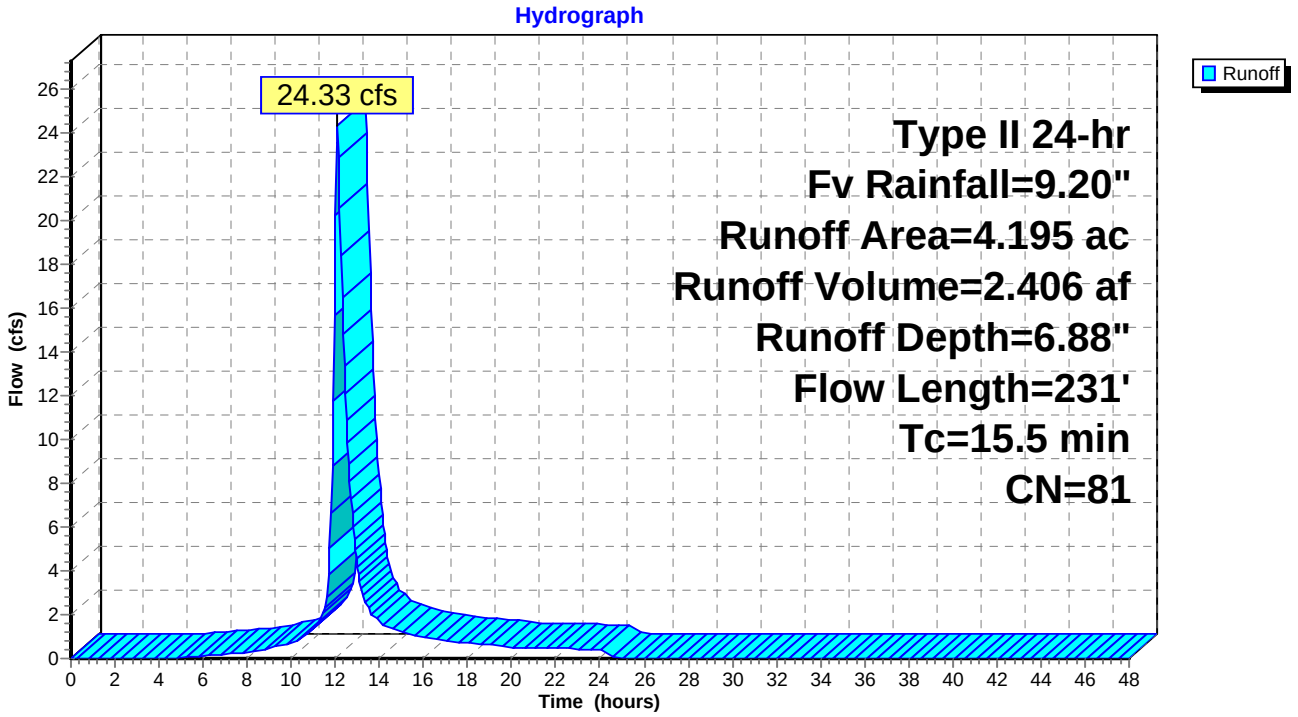
Runoff = 24.33 cfs @ 12.09 hrs, Volume= 2.406 af, Depth= 6.88"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr Fv Rainfall=9.20"

	Area (ac)	CN	Description
	0.016	30	Woods, Good, HSG A
	0.783	39	>75% Grass cover, Good, HSG A
	0.484	96	Gravel surface, HSG A
*	0.193	98	Water Surface, HSG A
	0.432	77	Woods, Good, HSG D
	0.745	80	>75% Grass cover, Good, HSG D
	0.891	96	Gravel surface, HSG D
	0.080	98	Unconnected pavement, HSG D
*	0.080	98	Water Surface, HSG D
	0.491	98	Roofs, HSG D
	4.195	81	Weighted Average
	3.351		79.88% Pervious Area
	0.844		20.12% Impervious Area
	0.080		9.48% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.4	100	0.0071	0.12		**Sheet Flow, Sheet Flow - Grass** Grass: Short n= 0.150 P2= 3.40"
0.9	94	0.0071	1.71		**Shallow Concentrated Flow, Shallow Conc - Paved** Paved Kv= 20.3 fps
0.2	37	0.0268	2.64		**Shallow Concentrated Flow, Shallow Conc - Unpaved** Unpaved Kv= 16.1 fps
15.5	231	Total			

Subcatchment DAE-2: Drainage Area 2



Summary for Subcatchment DAE-3: Drainage Area 3

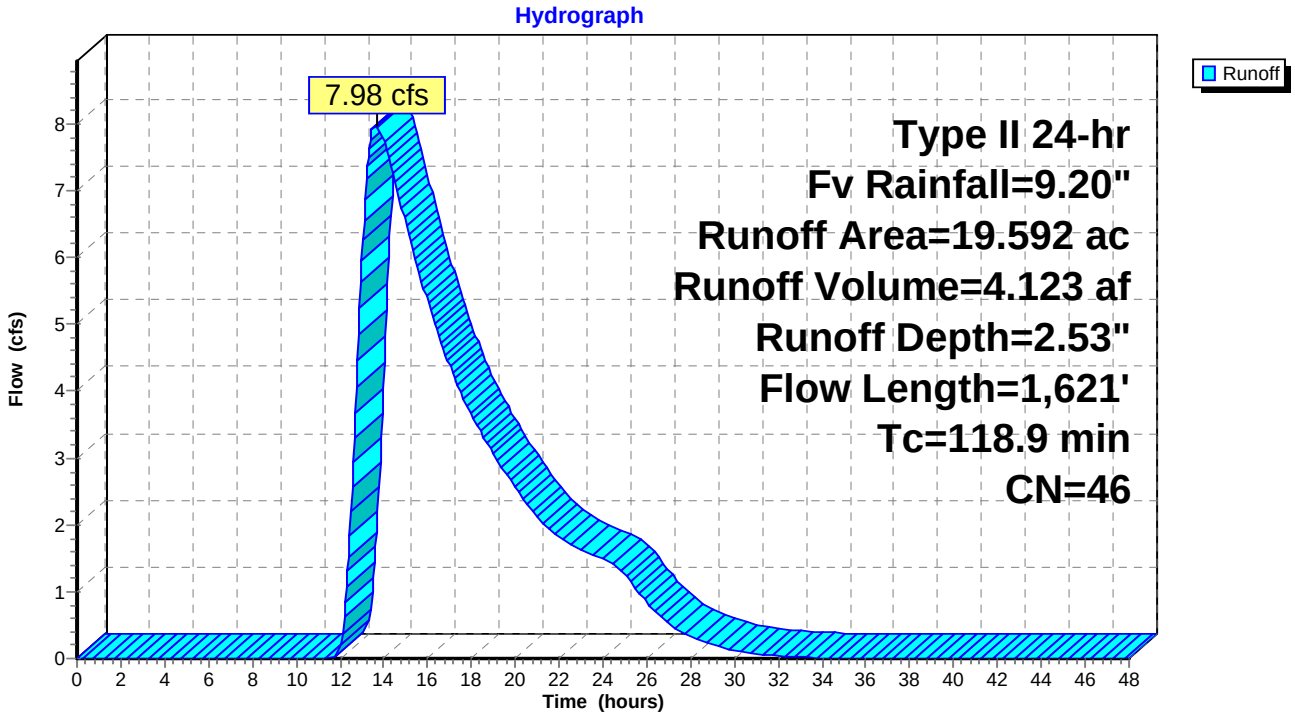
Runoff = 7.98 cfs @ 13.68 hrs, Volume= 4.123 af, Depth= 2.53"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr Fv Rainfall=9.20"

	Area (ac)	CN	Description
	13.014	30	Woods, Good, HSG A
	0.264	39	>75% Grass cover, Good, HSG A
	2.368	70	Woods, Good, HSG C
*	1.362	98	Water Surface, HSG C
	2.442	77	Woods, Good, HSG D
	0.142	80	>75% Grass cover, Good, HSG D
	19.592	46	Weighted Average
	18.230		93.05% Pervious Area
	1.362		6.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
28.2	100	0.0094	0.06		**Sheet Flow, Sheet Flow - Woods** Woods: Light underbrush n= 0.400 P2= 3.40"
6.8	197	0.0094	0.48		**Shallow Concentrated Flow, Shallow Conc - Woods** Woodland Kv= 5.0 fps
27.1	507	0.0039	0.31		**Shallow Concentrated Flow, Shallow Conc - Woods** Woodland Kv= 5.0 fps
56.8	817	0.0023	0.24		**Shallow Concentrated Flow, Shallow Conc - Woods** Woodland Kv= 5.0 fps
118.9	1,621	Total			

Subcatchment DAE-3: Drainage Area 3



Summary for Subcatchment DAE-4: Drainage Area 4

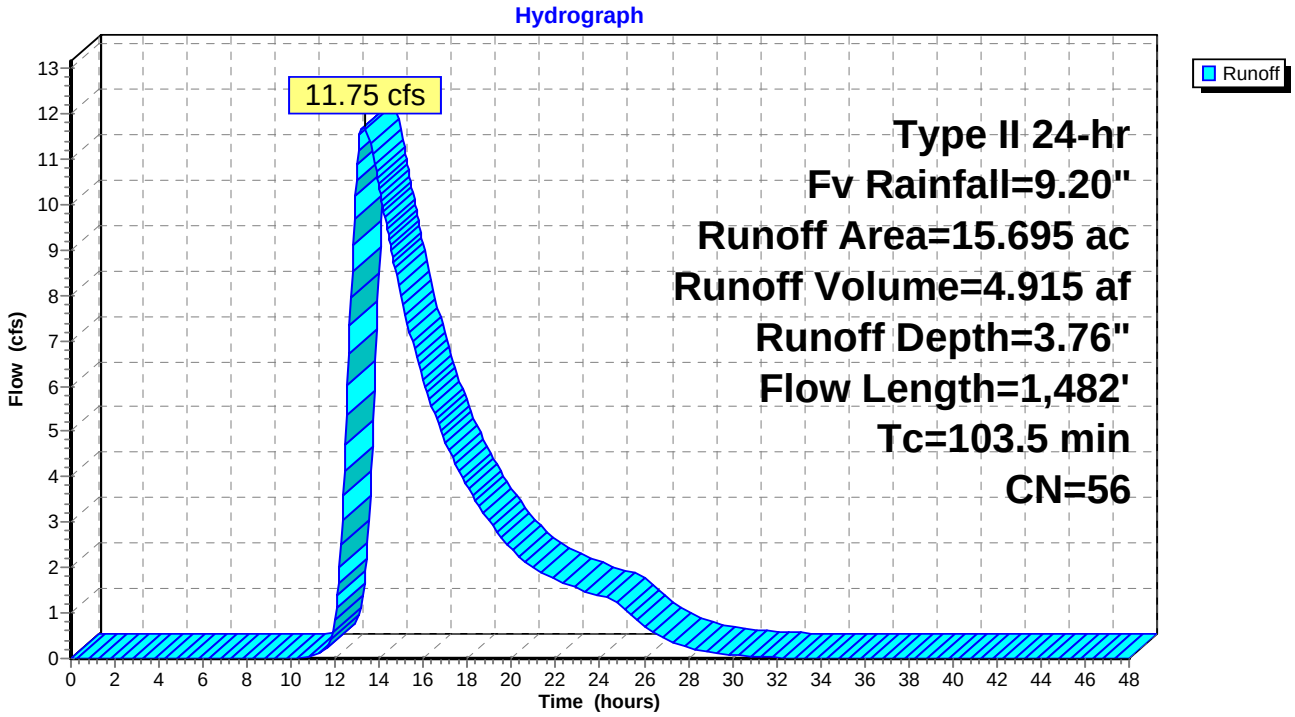
Runoff = 11.75 cfs @ 13.33 hrs, Volume= 4.915 af, Depth= 3.76"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr Fv Rainfall=9.20"

	Area (ac)	CN	Description
	6.225	30	Woods, Good, HSG A
	0.971	39	>75% Grass cover, Good, HSG A
	0.126	96	Gravel surface, HSG A
	7.386	77	Woods, Good, HSG D
	0.875	80	>75% Grass cover, Good, HSG D
*	0.112	98	Water Surface, HSG D
	15.695	56	Weighted Average
	15.583		99.29% Pervious Area
	0.112		0.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.5	100	0.0083	0.12		**Sheet Flow, Sheet Flow - Grass** Grass: Short n= 0.150 P2= 3.40"
0.5	42	0.0083	1.47		**Shallow Concentrated Flow, Shallow Conc - Unpaved** Unpaved Kv= 16.1 fps
9.3	369	0.0017	0.66		**Shallow Concentrated Flow, Shallow Conc - Unpaved** Unpaved Kv= 16.1 fps
18.5	229	0.0017	0.21		**Shallow Concentrated Flow, Shallow Conc - Woods** Woodland Kv= 5.0 fps
18.3	310	0.0032	0.28		**Shallow Concentrated Flow, Shallow Conc - Woods** Woodland Kv= 5.0 fps
43.4	432	0.0011	0.17		**Shallow Concentrated Flow, Shallow Conc - Woods** Woodland Kv= 5.0 fps
103.5	1,482	Total			

Subcatchment DAE-4: Drainage Area 4



Summary for Subcatchment DAE-5: Drainage Area 5

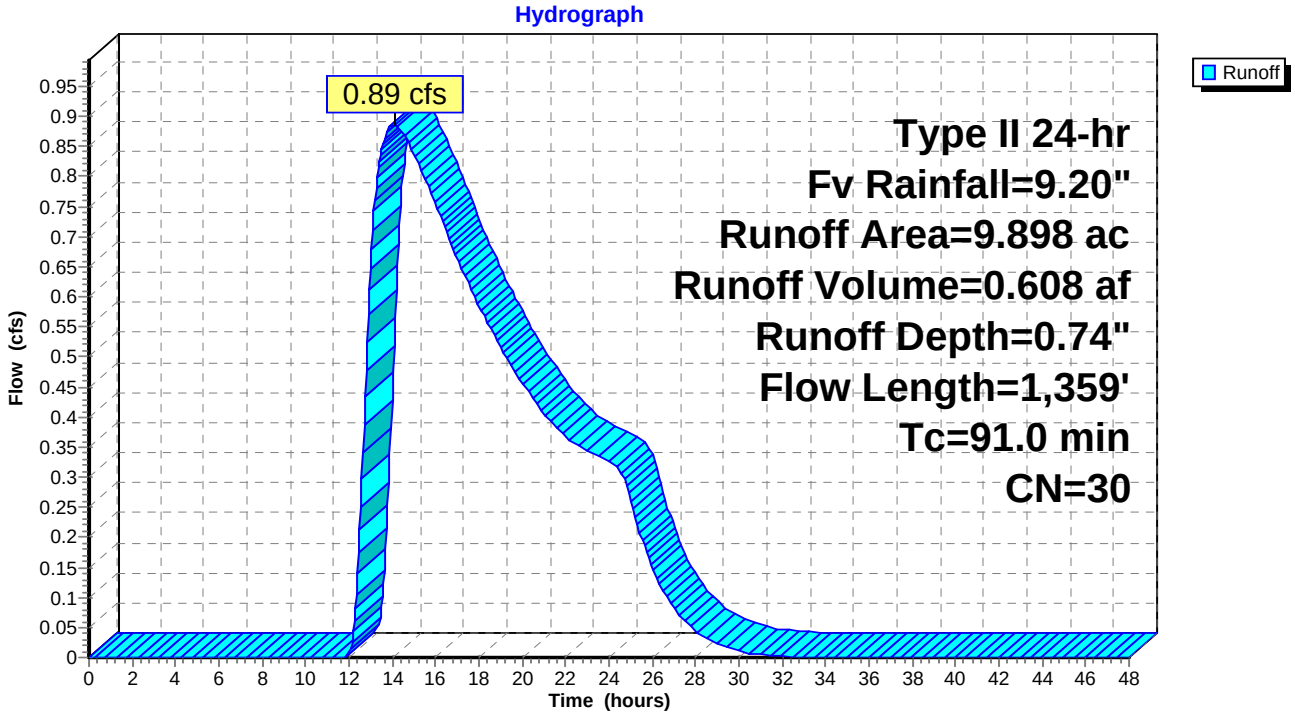
Runoff = 0.89 cfs @ 14.13 hrs, Volume= 0.608 af, Depth= 0.74"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr Fv Rainfall=9.20"

Area (ac)	CN	Description
9.898	30	Woods, Good, HSG A
9.898		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.6	100	0.0489	0.11		**Sheet Flow, Sheet Flow - Woods** Woods: Light underbrush n= 0.400 P2= 3.40"
1.7	110	0.0489	1.11		**Shallow Concentrated Flow, Shallow Conc - Woods** Woodland Kv= 5.0 fps
3.0	117	0.0170	0.65		**Shallow Concentrated Flow, Shallow Conc - Woods** Woodland Kv= 5.0 fps
5.1	133	0.0075	0.43		**Shallow Concentrated Flow, Shallow Conc - Woods** Woodland Kv= 5.0 fps
56.1	652	0.0015	0.19		**Shallow Concentrated Flow, Shallow Conc - Woods** Woodland Kv= 5.0 fps
10.5	247	0.0061	0.39		**Shallow Concentrated Flow, Shallow Conc - Woods** Woodland Kv= 5.0 fps
91.0	1,359	Total			

Subcatchment DAE-5: Drainage Area 5

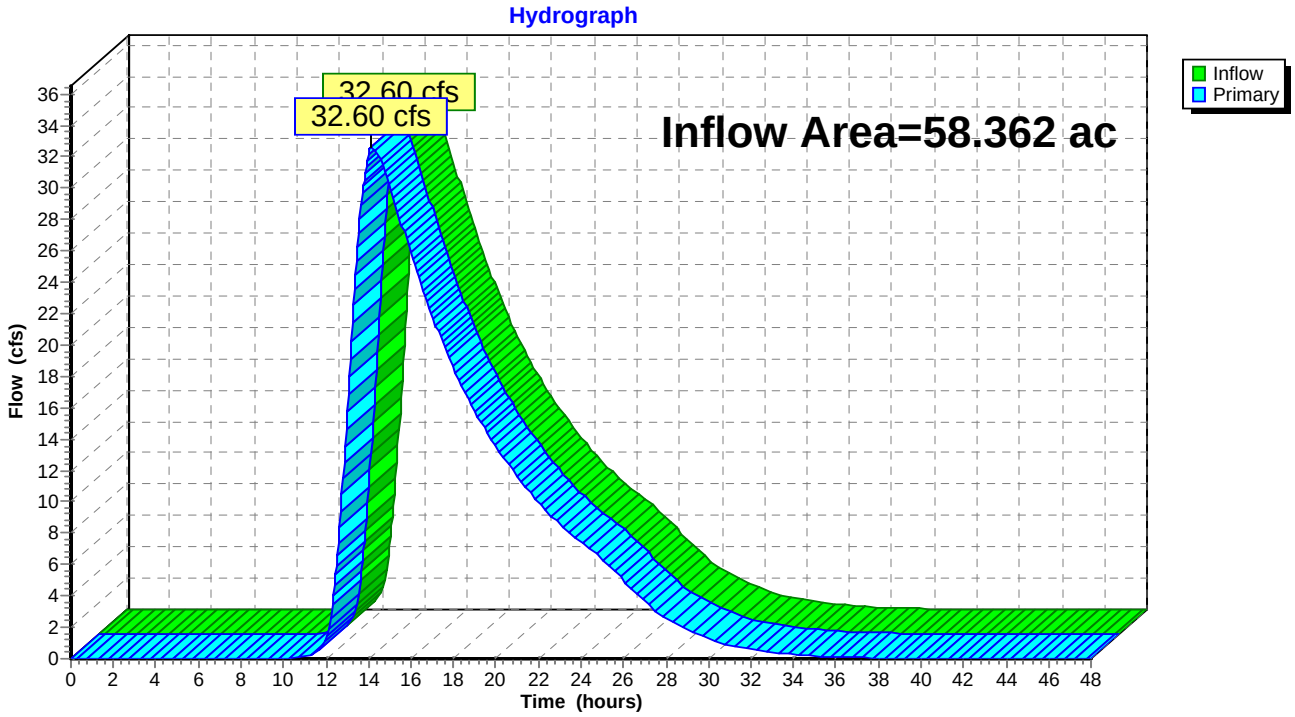


Summary for Link POA 1: POA #1

Inflow Area = 58.362 ac, 5.75% Impervious, Inflow Depth = 4.01" for Fv event
Inflow = 32.60 cfs @ 14.11 hrs, Volume= 19.492 af
Primary = 32.60 cfs @ 14.11 hrs, Volume= 19.492 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link POA 1: POA #1

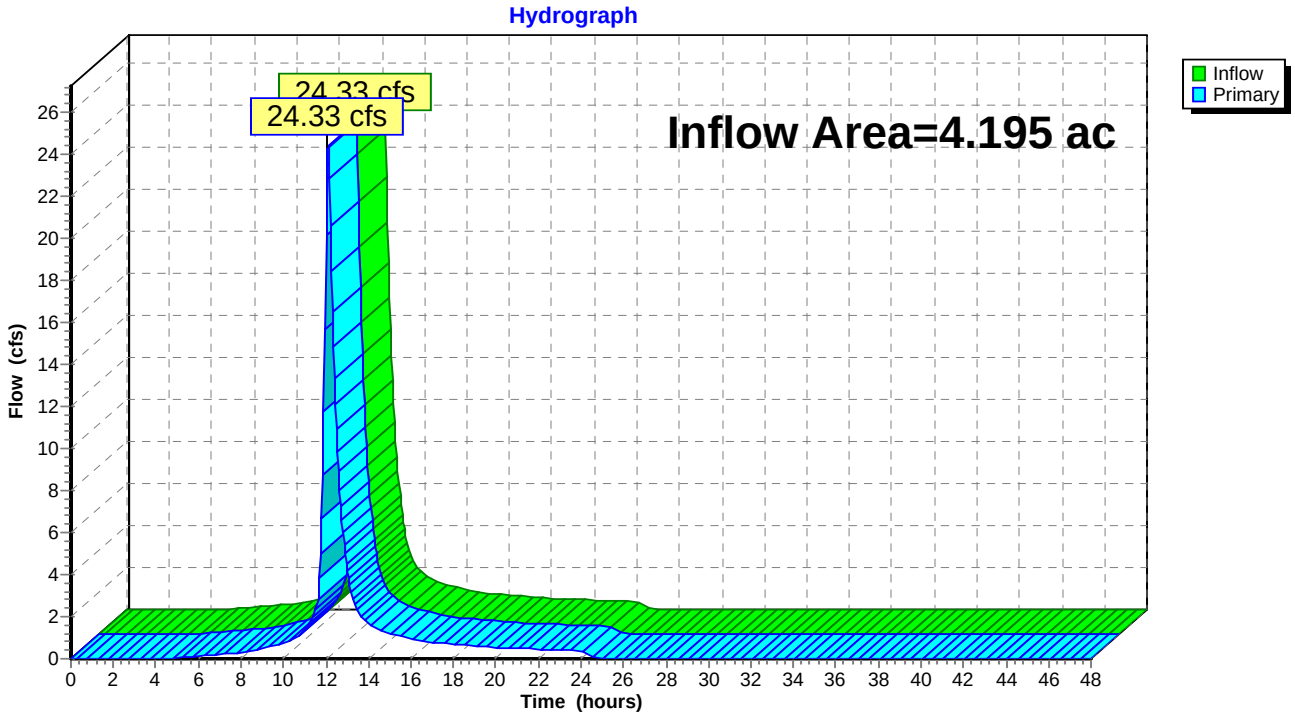


Summary for Link POA 2: POA #2

Inflow Area = 4.195 ac, 20.12% Impervious, Inflow Depth = 6.88" for Fv event
Inflow = 24.33 cfs @ 12.09 hrs, Volume= 2.406 af
Primary = 24.33 cfs @ 12.09 hrs, Volume= 2.406 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link POA 2: POA #2

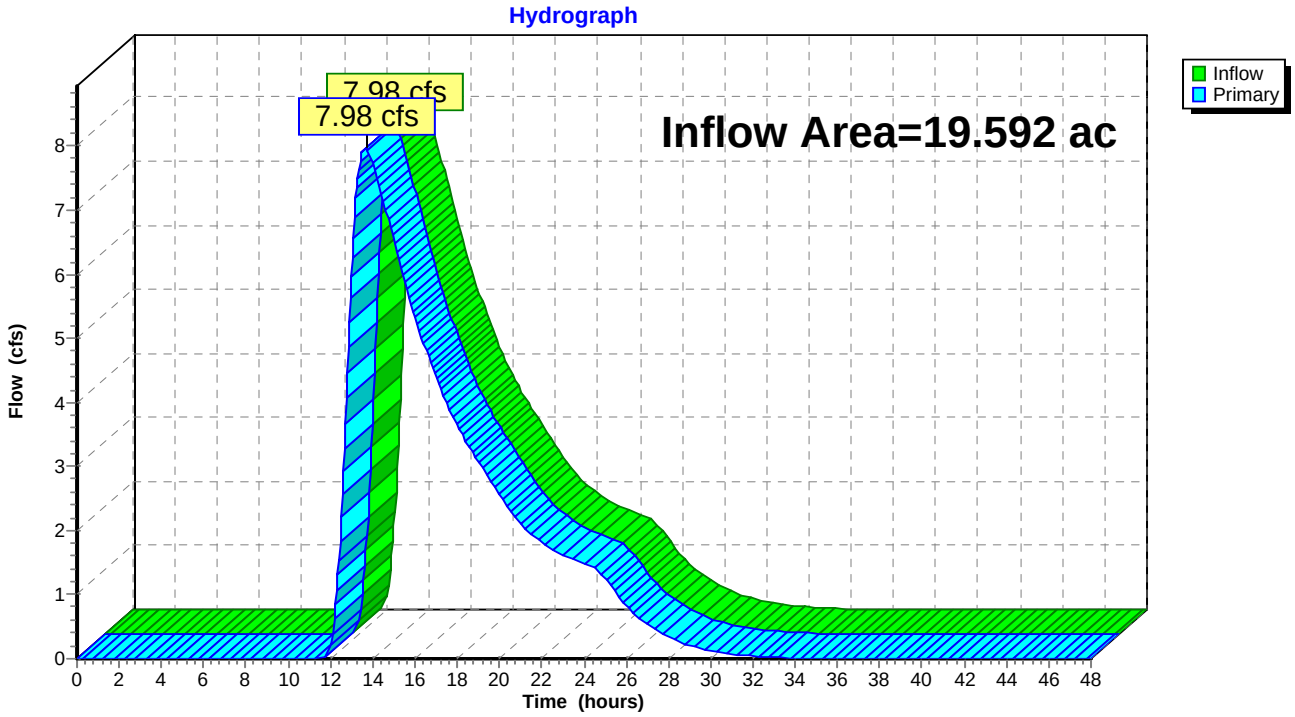


Summary for Link POA 3: POA #3

Inflow Area = 19.592 ac, 6.95% Impervious, Inflow Depth = 2.53" for Fv event
Inflow = 7.98 cfs @ 13.68 hrs, Volume= 4.123 af
Primary = 7.98 cfs @ 13.68 hrs, Volume= 4.123 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link POA 3: POA #3

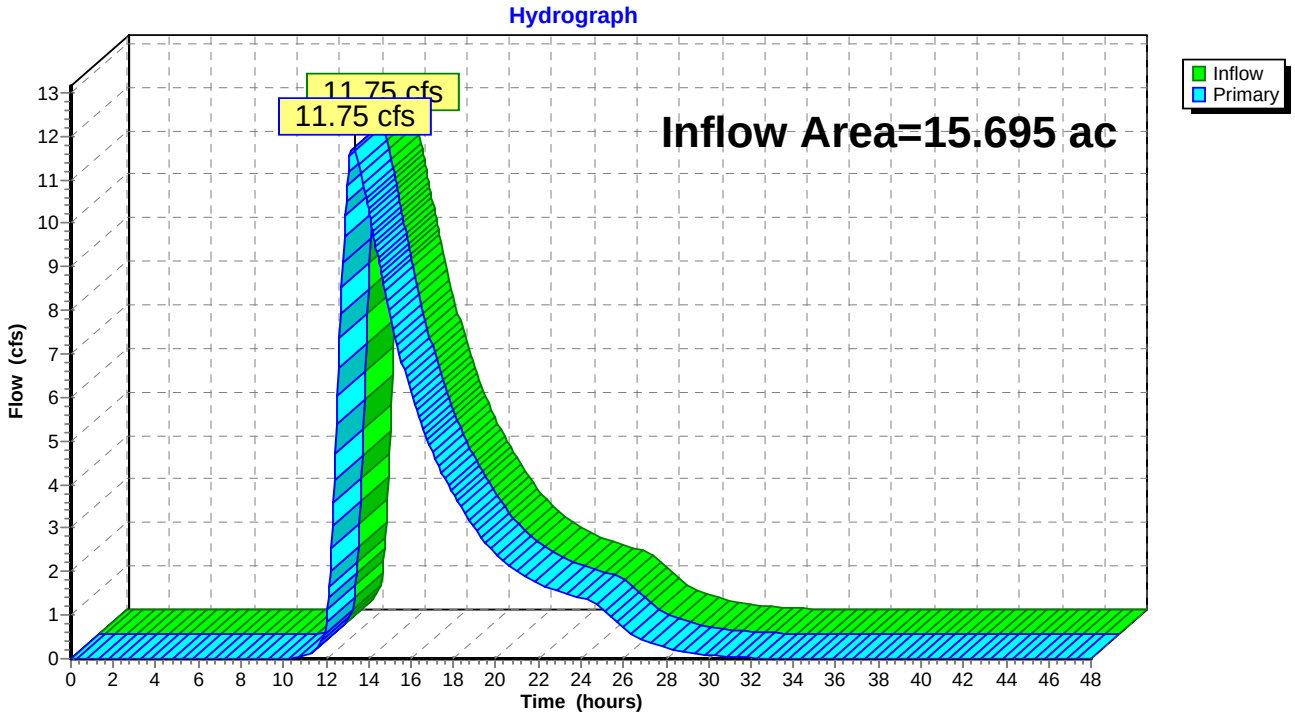


Summary for Link POA 4: POA #4

Inflow Area = 15.695 ac, 0.71% Impervious, Inflow Depth = 3.76" for Fv event
Inflow = 11.75 cfs @ 13.33 hrs, Volume= 4.915 af
Primary = 11.75 cfs @ 13.33 hrs, Volume= 4.915 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link POA 4: POA #4



Summary for Link POA 5: POA #5

Inflow Area = 9.898 ac, 0.00% Impervious, Inflow Depth = 0.74" for Fv event
Inflow = 0.89 cfs @ 14.13 hrs, Volume= 0.608 af
Primary = 0.89 cfs @ 14.13 hrs, Volume= 0.608 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link POA 5: POA #5

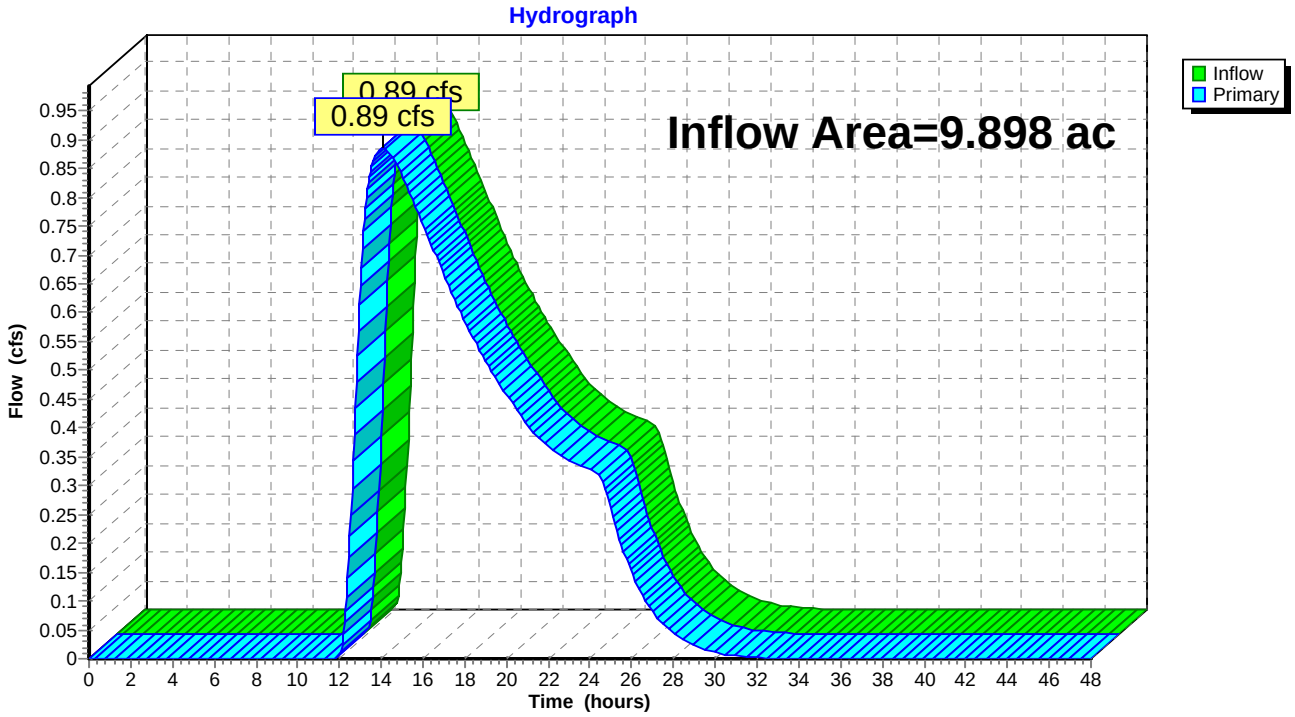


EXHIBIT 7

ADJACENT WELL AND SEPTIC LOCATION DATA

Permits Detail for:

Facility On Parcel 36317

Street Address: **Type:** Other

Permit -- 36317

Start Date: 6/15/1976 **Expires:** 6/15/1977 **Permit Number:** 36317 **For:** Construction/Operation

Status: Active **Description:** **Name As Issued:**

Comment: driller-Lester Williams 55 **Issued By:** **Issued To:** Turner, Henry

DNREC Project Officer: **Permittee Contact:** **Program:** Well

Permits Detail for:

Facility On Parcel 1-32-00.60-0231.00

Street Address: **Type:** Other

Permit -- 37513

Start Date: 12/7/1976 **Expires:** 12/7/1977 **Permit Number:** 37513 **For:** Construction/Operation

Status: Active **Description:** **Name As Issued:**

Comment: Driller-Lester Williams-55 expired. **Issued By:** **Issued To:** Taylor, Jerry L

DNREC Project Officer: **Permittee Contact:** **Program:** Well

Permits Detail for:

Facility On Parcel 1-32-00.70-0018.02

Street Address: **Type:** Other

Permit -- 37515

Start Date: 12/7/1976 **Expires:** 12/7/1977 **Permit Number:** 37515 **For:** Construction/Operation

Status: Active **Description:** **Name As Issued:**

Comment: Driller-Lester Williams-55 expired **Issued By:** **Issued To:** Nanticoke Real Estate

DNREC Project Officer: **Permittee Contact:** **Program:** Well

Permits Detail for:

Facility On Parcel 40058

Street Address: **Type:** Other

Permit -- 40058

Start Date: 11/30/1977 **Expires:** 11/30/1978 **Permit Number:** 40058 **For:** Construction/Operation

Status: Active **Description:** **Name As Issued:**

Comment: Lester William-55 **Issued By:** **Issued To:** Massey, Floyd A

DNREC Project Officer: **Permittee Contact:** **Program:** Well

Permits Detail for:

Facility On Parcel 43998

Street Address: **Type:** Other

Permit -- 43998

Start Date: 7/18/1979 **Expires:** 7/18/1980 **Permit Number:** 43998 **For:** Construction/Operation

Status: Active **Description:** **Name As Issued:**

Comment: Burns-7 **Issued By:** **Issued To:** Billings, Ira M

DNREC Project Officer: **Permittee Contact:** **Program:** Well

Permits Detail for:

Facility On Parcel 1-32-00.60-0231.00

Street Address: **Type:** Other

Permit -- 50142

Start Date: 12/7/1981 **Expires:** 12/7/1982 **Permit Number:** 50142 **For:** Construction/Operation

Status: Active **Description:** **Name As Issued:**

Comment: Burns-7 **Issued By:** **Issued To:** Taylor, Jerry L

DNREC Project Officer: **Permittee Contact:** **Program:** Well

Permits Detail for:

Facility On Parcel 056600

Street Address: **Type:** Other

Permit -- 56600

Start Date: 4/3/1984 **Expires:** 4/3/1985 **Permit Number:** 56600 **For:** Construction/Operation

Status: Active **Description:** **Name As Issued:**

Comment: drilling contractor id = 973HARRRL **Issued By:** **Issued To:** Harris, Ray L

DNREC Project Officer: **Permittee Contact:** **Program:** Well

Permits Detail for:

Facility On Parcel 058659

Street Address: **Type:** Other

Permit -- 58659

Start Date: 9/26/1984 **Expires:** 9/26/1985 **Permit Number:** 58659 **For:** Construction/Operation

Status: Active **Description:** **Name As Issued:**

Comment: drilling contractor id = 000000081 **Issued By:** **Issued To:** Eisenbrey, Donald

DNREC Project Officer: **Permittee Contact:** **Program:** Well

Permits Detail for:

Facility On Parcel 060392

Street Address: **Type:** Other

Permit -- 60392

Start Date: 4/3/1985 **Expires:** 4/3/1986 **Permit Number:** 60392 **For:** Construction/Operation

Status: Active **Description:** **Name As Issued:**

Comment: drilling contractor id = 000000257 **Issued By:** **Issued To:** Morgan, William,jr H

DNREC Project Officer: **Permittee Contact:** **Program:** Well

Permits Detail for:

Facility On Parcel 060901

Street Address: **Type:** Other

Permit -- 60901

Start Date: 5/24/1985 **Expires:** 5/24/1986 **Permit Number:** 60901 **For:** Construction/Operation

Status: Active **Description:** **Name As Issued:**

Comment: drilling contractor id = 000000016 **Issued By:** **Issued To:** Allen, Robert W

DNREC Project Officer: **Permittee Contact:** **Program:** Well

Permits Detail for:

Facility On Parcel 063051

Street Address: **Type:** Other

Permit -- 63051

Start Date: 10/16/1985 **Expires:** 10/16/1986 **Permit Number:** 63051 **For:** Construction/Operation

Status: Active **Description:** **Name As Issued:**

Comment: drilling contractor id = 000000050 **Issued By:** **Issued To:** Sammons, Roland J

DNREC Project Officer: **Permittee Contact:** **Program:** Well

Permits Detail for:

Facility On Parcel 063079

Street Address: **Type:** Other

Permit -- 63079

Start Date: 11/1/1985 **Expires:** 11/1/1986 **Permit Number:** 63079 **For:** Construction/Operation

Status: Active **Description:** **Name As Issued:**

Comment: drilling contractor id = 000000435 **Issued By:** **Issued To:** Wilson, Jack

DNREC Project Officer: **Permittee Contact:** **Program:** Well

Permits Detail for:

Facility On Parcel 065305

Street Address: **Type:** Other

Permit -- 65305

Start Date: 6/5/1986 **Expires:** 6/5/1987 **Permit Number:** 65305 **For:** Construction/Operation

Status: Active **Description:** **Name As Issued:**

Comment: drilling contractor id = 000000282 **Issued By:** **Issued To:** Forster, Richard

DNREC Project Officer: **Permittee Contact:** **Program:** Well

Permits Detail for:

Facility On Parcel 066655

Street Address: **Type:** Other

Permit -- 66655

Start Date: 9/10/1986 **Expires:** 9/10/1987 **Permit Number:** 66655 **For:** Construction/Operation

Status: Active **Description:** **Name As Issued:**

Comment: drilling contractor id = 000000007 **Issued By:** **Issued To:** Judson, E W

DNREC Project Officer: **Permittee Contact:** **Program:** Well

Permits Detail for:

Facility On Parcel 069742

Street Address: **Type:** Other

Permit -- 69742

Start Date: 6/25/1987 **Expires:** 6/25/1988 **Permit Number:** 69742 **For:** Construction/Operation

Status: Active **Description:** **Name As Issued:**

Comment: drilling contractor id = 000000257 **Issued By:** **Issued To:** Bowers, Michael E

DNREC Project Officer: **Permittee Contact:** **Program:** Well

Permits Detail for:

Facility On Parcel 069862

Street Address: **Type:** Other

Permit -- 69862

Start Date: 6/25/1987 **Expires:** 6/25/1988 **Permit Number:** 69862 **For:** Construction/Operation

Status: Active **Description:** **Name As Issued:**

Comment: drilling contractor id = 000000257 **Issued By:** **Issued To:** Glenn, Steve

DNREC Project Officer: **Permittee Contact:** **Program:** Well

Permits Detail for:

Facility On Parcel 070751

Street Address: **Type:** Other

Permit -- 70751

Start Date: 8/18/1987 **Expires:** 8/18/1988 **Permit Number:** 70751 **For:** Construction/Operation

Status: Active **Description:** **Name As Issued:**

Comment: drilling contractor id = 000000007 **Issued By:** **Issued To:** Bailey, David A

DNREC Project Officer: **Permittee Contact:** **Program:** Well

Permits Detail for:

Facility On Parcel 072865

Street Address: **Type:** Other

Permit -- 72865

Start Date: 2/9/1988 **Expires:** 2/9/1989 **Permit Number:** 72865 **For:** Construction/Operation

Status: Active **Description:** **Name As Issued:**

Comment: drilling contractor id = 000000257 **Issued By:** **Issued To:** Farmer, James C

DNREC Project Officer: **Permittee Contact:** **Program:** Well

Permits Detail for:

Facility On Parcel 073403

Street Address: **Type:** Other

Permit -- 73403

Start Date: 3/22/1988 **Expires:** 3/22/1989 **Permit Number:** 73403 **For:** Construction/Operation

Status: Active **Description:** **Name As Issued:**

Comment: drilling contractor id = 000000257 **Issued By:** **Issued To:** Mcglaughlin, John & Cathy Jr F

DNREC Project Officer: **Permittee Contact:** **Program:** Well

Permits Detail for:

Facility On Parcel 073564

Street Address: **Type:** Other

Permit -- 73564

Start Date: 4/5/1988 **Expires:** 4/5/1989 **Permit Number:** 73564 **For:** Construction/Operation

Status: Active **Description:** **Name As Issued:**

Comment: drilling contractor id = 000000007 **Issued By:** **Issued To:** Bailey, David A

DNREC Project Officer: **Permittee Contact:** **Program:** Well

Permits Detail for:

Facility On Parcel 076096

Street Address: **Type:** Other

Permit -- 76096

Start Date: 10/12/1988 **Expires:** 10/12/1989 **Permit Number:** 76096 **For:** Construction/Operation

Status: Active **Description:** **Name As Issued:**

Comment: drilling contractor id = 000000257 **Issued By:** **Issued To:** Ward, Edith

DNREC Project Officer: **Permittee Contact:** **Program:** Well

Permits Detail for:

Facility On Parcel 076956

Street Address: **Type:** Other

Permit -- 76956

Start Date: 12/5/1988 **Expires:** 12/5/1989 **Permit Number:** 76956 **For:** Construction/Operation

Status: Active **Description:** **Name As Issued:**

Comment: drilling contractor id = 000000257 **Issued By:** **Issued To:** Ockles, Martin

DNREC Project Officer: **Permittee Contact:** **Program:** Well

Permits Detail for:

Facility On Parcel 077038

Street Address: **Type:** Other

Permit -- 77038

Start Date: 12/13/1988 **Expires:** 12/13/1989 **Permit Number:** 77038 **For:** Construction/Operation

Status: Active **Description:** **Name As Issued:**

Comment: drilling contractor id = 000000257 **Issued By:** **Issued To:** Robinson, Rose M

DNREC Project Officer: **Permittee Contact:** **Program:** Well

Permits Detail for:

Facility On Parcel 077039

Street Address: **Type:** Other

Permit -- 77039

Start Date: 12/13/1988 **Expires:** 12/13/1989 **Permit Number:** 77039 **For:** Construction/Operation

Status: Active **Description:** **Name As Issued:**

Comment: drilling contractor id = 000000257 **Issued By:** **Issued To:** Robinson, Rose M

DNREC Project Officer: **Permittee Contact:** **Program:** Well

Permits Detail for:

Facility On Parcel 078207

Street Address: **Type:** Other

Permit -- 78207

Start Date: 4/3/1989 **Expires:** 4/3/1990 **Permit Number:** 78207 **For:** Construction/Operation

Status: Active **Description:** **Name As Issued:**

Comment: drilling contractor id = 000000257 **Issued By:** **Issued To:** Kountz, Tex K

DNREC Project Officer: **Permittee Contact:** **Program:** Well

Permits Detail for:

Facility On Parcel 079063

Street Address: **Type:** Other

Permit -- 79063

Start Date: 6/12/1989 **Expires:** 6/12/1990 **Permit Number:** 79063 **For:** Construction/Operation

Status: Active **Description:** **Name As Issued:**

Comment: drilling contractor id = 000000435 **Issued By:** **Issued To:** Allen, Robert W

DNREC Project Officer: **Permittee Contact:** **Program:** Well

Permits Detail for:

Facility On Parcel 079069

Street Address: **Type:** Other

Permit -- 79069

Start Date: 6/12/1989 **Expires:** 6/12/1990 **Permit Number:** 79069 **For:** Construction/Operation

Status: Active **Description:** **Name As Issued:**

Comment: drilling contractor id = 000000257 **Issued By:** **Issued To:** O'neal, Fred

DNREC Project Officer: **Permittee Contact:** **Program:** Well

Permits Detail for:

Facility On Parcel 079268

Street Address: **Type:** Other

Permit -- 79268

Start Date: 6/21/1989 **Expires:** 6/21/1990 **Permit Number:** 79268 **For:** Construction/Operation

Status: Active **Description:** **Name As Issued:**

Comment: drilling contractor id = 000000257 **Issued By:** **Issued To:** Givens, R, Ralph

DNREC Project Officer: **Permittee Contact:** **Program:** Well

Permits Detail for:

Facility On Parcel 082957

Street Address: **Type:** Other

Permit -- 82957

Start Date: 6/26/2000 **Expires:** 6/1/1991 **Permit Number:** 82957 **For:** Construction/Operation

Status: Void **Description:** **Name As Issued:**

Comment: drilling contractor id = 000000257 **Issued By:** **Issued To:** Holt, Joe

DNREC Project Officer: **Permittee Contact:** **Program:** Well

Permits Detail for:

Facility On Parcel 1-32-11-45.4

Street Address: **Type:** Other

Permit -- 87905

Start Date: 8/6/1991 **Expires:** 2/6/1992 **Permit Number:** 87905 **For:** Construction/Operation

Status: Active **Description:** **Name As Issued:**

Comment: drilling contractor id = 000000600 **Issued By:** **Issued To:** Singleton, Peter H

DNREC Project Officer: **Permittee Contact:** **Program:** Well

Permits Detail for:

Facility On Parcel 094326

Street Address: **Type:** Other

Permit -- 94326

Start Date: 3/1/1993 **Expires:** 9/1/1993 **Permit Number:** 94326 **For:** Construction/Operation

Status: Cancelled **Description:** **Name As Issued:**

Comment: drilling contractor id = 000000101 **Issued By:** **Issued To:** Fleetwood, E Jean

DNREC Project Officer: **Permittee Contact:** **Program:** Well

Permits Detail for:

Facility On Parcel 095444

Street Address: **Type:** Other

Permit -- 95444

Start Date: 5/24/1993 **Expires:** 11/24/1993 **Permit Number:** 95444 **For:** Construction/Operation

Status: Active **Description:** **Name As Issued:**

Comment: drilling contractor id = 000000257 **Issued By:** **Issued To:** Adams, Franklin M

DNREC Project Officer: **Permittee Contact:** **Program:** Well

Permits Detail for:

Facility On Parcel 096088

Street Address: **Type:** Other

Permit -- 96088

Start Date: 6/29/1993 **Expires:** 12/29/1993 **Permit Number:** 96088 **For:** Construction/Operation

Status: Active **Description:** **Name As Issued:**

Comment: drilling contractor id = 000000007 **Issued By:** **Issued To:** Barone, Joe

DNREC Project Officer: **Permittee Contact:** **Program:** Well

Permits Detail for:

Facility On Parcel 096613

Street Address: **Type:** Other

Permit -- 96613

Start Date: 8/11/1993 **Expires:** 2/11/1994 **Permit Number:** 96613 **For:** Construction/Operation

Status: Active **Description:** **Name As Issued:**

Comment: drilling contractor id = 000000435 **Issued By:** **Issued To:** Robertson, Ivan

DNREC Project Officer: **Permittee Contact:** **Program:** Well

Permits Detail for:

Facility On Parcel 097797

Street Address: **Type:** Other

Permit -- 97797

Start Date: 11/18/1993 **Expires:** 5/18/1994 **Permit Number:** 97797 **For:** Construction/Operation

Status: Active **Description:** **Name As Issued:**

Comment: drilling contractor id = 000000435 **Issued By:** **Issued To:** Hill, Clara E

DNREC Project Officer: **Permittee Contact:** **Program:** Well

Permits Detail for:

Facility On Parcel 099964

Street Address: **Type:** Other

Permit -- 99964

Start Date: 5/31/1994 **Expires:** 11/30/1994 **Permit Number:** 99964 **For:** Construction/Operation

Status: Active **Description:** **Name As Issued:**

Comment: drilling contractor id = 000000101 **Issued By:** **Issued To:** Dickerson, Edward N

DNREC Project Officer: **Permittee Contact:** **Program:** Well

Permits Detail for:

Facility On Parcel 0100036

Street Address: **Type:** Other

Permit -- 100036

Start Date: 6/2/1994 **Expires:** 12/2/1994 **Permit Number:** 100036 **For:** Construction/Operation

Status: Active **Description:** **Name As Issued:**

Comment: drilling contractor id = 000000257 **Issued By:** **Issued To:** Joseph, Donald

DNREC Project Officer: **Permittee Contact:** **Program:** Well

Permits Detail for:

Facility On Parcel 0101573

Street Address: **Type:** Other

Permit -- 101573

Start Date: 10/6/1994 **Expires:** 4/6/1995 **Permit Number:** 101573 **For:** Construction/Operation

Status: Active **Description:** **Name As Issued:**

Comment: drilling contractor id = 000000435 **Issued By:** **Issued To:** Riley, Charles

DNREC Project Officer: **Permittee Contact:** **Program:** Well

Permits Detail for:

Facility On Parcel 0103281

Street Address: **Type:** Other

Permit -- 103281

Start Date: 3/14/1995 **Expires:** 9/14/1995 **Permit Number:** 103281 **For:** Construction/Operation

Status: Active **Description:** **Name As Issued:**

Comment: drilling contractor id = 000000101 **Issued By:** **Issued To:** Fleetwood, Roland

DNREC Project Officer: **Permittee Contact:** **Program:** Well

Permits Detail for:

Facility On Parcel 0104188

Street Address: **Type:** Other

Permit -- 104188

Start Date: 5/30/1995 **Expires:** 11/30/1995 **Permit Number:** 104188 **For:** Construction/Operation

Status: Active **Description:** **Name As Issued:**

Comment: drilling contractor id = 000000257 **Issued By:** **Issued To:** Waldron, Jean

DNREC Project Officer: **Permittee Contact:** **Program:** Well

Permits Detail for:

Facility On Parcel 0105454

Street Address: **Type:** Other

Permit -- 105454

Start Date: 9/1/1995 **Expires:** 3/1/1996 **Permit Number:** 105454 **For:** Construction/Operation

Status: Active **Description:** **Name As Issued:**

Comment: drilling contractor id = 000001004 **Issued By:** **Issued To:** Hall, Claire

DNREC Project Officer: **Permittee Contact:** **Program:** Well

Permits Detail for:

Facility On Parcel 0105662

Street Address: **Type:** Other

Permit -- 105662

Start Date: 9/18/1995 **Expires:** 3/18/1996 **Permit Number:** 105662 **For:** Construction/Operation

Status: Active **Description:** **Name As Issued:**

Comment: drilling contractor id = 000000435 **Issued By:** **Issued To:** Hitch, Barbara

DNREC Project Officer: **Permittee Contact:** **Program:** Well

Permits Detail for:

Facility On Parcel 0109847

Street Address: **Type:** Other

Permit -- 109847

Start Date: 10/11/1996 **Expires:** 4/11/1997 **Permit Number:** 109847 **For:** Construction/Operation

Status: Active **Description:** **Name As Issued:**

Comment: drilling contractor id = 000001051 **Issued By:** **Issued To:** Wilson, Irene

DNREC Project Officer: **Permittee Contact:** **Program:** Well

Permits Detail for:

Facility On Parcel 1-32-00.70-0018.00

Street Address: **Type:** Other

Permit -- 205587

Start Date: 12/8/2004 **Expires:** 12/8/2005 **Permit Number:** 205587 **For:** Construction/Operation

Status: Active **Description:** **Name As Issued:**

Comment: **Issued By:** **Issued To:** Waldridge, Abraham & Michelle

DNREC Project Officer: **Permittee Contact:** **Program:** Well

Permits Detail for:

Facility on 1-32-06.00-0096.00

Street Address: 1900 Laurel Highway, Seaford, DE 19973 US **Type:** Other

Permit -- 221717

Start Date: 10/22/2007 **Expires:** 10/22/2008 **Permit Number:** 221717 **For:**

Status: Active **Description:** **Name As Issued:**

Comment: **Issued By:** **Issued To:** Sussex Manor Inc

DNREC Project Officer: **Permittee Contact:** **Program:** Well

Permits Detail for:

Facility on 1-32-06.00-0096.00

Street Address: 1900 Laurel Highway, Seaford, DE 19973 US **Type:** Other

Permit -- 221718

Start Date: 10/22/2007 **Expires:** 10/22/2008 **Permit Number:** 221718 **For:**

Status: Active **Description:** **Name As Issued:**

Comment: **Issued By:** **Issued To:** Sussex Manor Inc

DNREC Project Officer: **Permittee Contact:** **Program:** Well

Permits Detail for:

Facility on 1-32-06.00-0096.00

Street Address: 1900 Laurel Highway, Seaford, DE 19973 US **Type:** Other

Permit -- 221719

Start Date: 10/22/2007 **Expires:** 10/22/2008 **Permit Number:** 221719 **For:**

Status: Active **Description:** **Name As Issued:**

Comment: **Issued By:** **Issued To:** Sussex Manor Inc

DNREC Project Officer: **Permittee Contact:** **Program:** Well

Permits Detail for:

Facility on 1-32-06.00-0096.00

Street Address: 1900 Laurel Highway, Seaford, DE 19973 US **Type:** Other

Permit -- 221720

Start Date: 10/22/2007 **Expires:** 10/22/2008 **Permit Number:** 221720 **For:**

Status: Active **Description:** **Name As Issued:**

Comment: **Issued By:** **Issued To:** Sussex Manor Inc

DNREC Project Officer: **Permittee Contact:** **Program:** Well

Permits Detail for:

Facility on 1-32-06.00-0096.00

Street Address: 1900 Laurel Highway, Seaford, DE 19973 US **Type:** Other

Permit -- 221721

Start Date: 10/22/2007 **Expires:** 10/22/2008 **Permit Number:** 221721 **For:**

Status: Active **Description:** **Name As Issued:**

Comment: **Issued By:** **Issued To:** Sussex Manor Inc

DNREC Project Officer: **Permittee Contact:** **Program:** Well

Permits Detail for:

Facility on 1-32-06.00-0096.00

Street Address: 1900 Laurel Highway, Seaford, DE 19973 US **Type:** Other

Permit -- 221722

Start Date: 10/22/2007 **Expires:** 10/22/2008 **Permit Number:** 221722 **For:**

Status: Active **Description:** **Name As Issued:**

Comment: **Issued By:** **Issued To:** Sussex Manor Inc

DNREC Project Officer: **Permittee Contact:** **Program:** Well

Permits Detail for:

Facility on 1-32-06.00-0096.00

Street Address: 1900 Laurel Highway, Seaford, DE 19973 US **Type:** Other

Permit -- 221723

Start Date: 10/22/2007 **Expires:** 10/22/2008 **Permit Number:** 221723 **For:**

Status: Active **Description:** **Name As Issued:**

Comment: **Issued By:** **Issued To:** Sussex Manor Inc

DNREC Project Officer: **Permittee Contact:** **Program:** Well

Permits Detail for:

Facility on Parcel 1-32-11-41

Street Address: **Type:** Other

Permit -- 251968

Start Date: 8/28/2015 **Expires:** **Permit Number:** 251968 **For:**

Status: Revoked **Description:** **Name As Issued:**

Comment: **Issued By:** **Issued To:** Agrirecycle Llc, Puedue

DNREC Project Officer: **Permittee Contact:** **Program:** Well

Permits Detail for:

Facility on Parcel 1-32-11-41

Street Address: **Type:** Other

Permit -- 252287

Start Date: 10/6/2015 **Expires:** 11/20/2015 **Permit Number:** 252287 **For:**

Status: Void **Description:** **Name As Issued:**

Comment: **Issued By:** **Issued To:** Agrirecycle Llc, Puedue

DNREC Project Officer: **Permittee Contact:** **Program:** Well

Permits Detail for:

Facility on 1-32-06.00-0088.01

Street Address: Enviro Way, Seaford, DE 19973 US **Type:** Other

Permit -- 255102

Start Date: 7/27/2016 **Expires:** 9/30/2016 **Permit Number:** 255102 **For:**

Status: Void **Description:** **Name As Issued:**

Comment: **Issued By:** **Issued To:** Seaford Agrisoil

DNREC Project Officer: **Permittee Contact:** **Program:** Well

Permits Detail for:

Facility on Parcel 1-32-11-41

Street Address: **Type:** Other

Permit -- 255346

Start Date: 7/27/2016 **Expires:** 8/11/2016 **Permit Number:** 255346 **For:**

Status: Expired **Description:** **Name As Issued:**

Comment: **Issued By:** **Issued To:** Agrirecycle Llc, Puedue

DNREC Project Officer: **Permittee Contact:** **Program:** Well

Permits Detail for:

Facility on parcel1-32-6-112

Street Address: **Type:** Other

Permit -- 258397

Start Date: 5/18/2017 **Expires:** 5/18/2018 **Permit Number:** 258397 **For:**

Status: Active **Description:** **Name As Issued:**

Comment: **Issued By:** **Issued To:** Weedon, Carly

DNREC Project Officer: **Permittee Contact:** **Program:** Well

Permits Detail for:

Facility on Parcel 1-32-6-95

Street Address: **Type:** Other

Permit -- 405-96S

Start Date: 4/25/1996 **Expires:** 4/25/1998 **Permit Number:** 405-96S **For:**

Status: Completion Report Received **Description:** **Name As Issued:**

Comment: Original System Type = ST DC LPP Ž **Issued By:** **Issued To:** Fleetwood, E Jean

DNREC Project Officer: **Permittee Contact:** **Program:** Septic System

Permits Detail for:

Facility on Parcel 1-32-6-95 PLANT

Street Address: **Type:** Other

Permit -- 171524

Start Date: 4/27/2000 **Expires:** 4/27/2001 **Permit Number:** 171524 **For:**

Status: Completion Report Received **Description:** **Name As Issued:** Perdue Farms Incorporated

Comment: System undersized by designer. Sent current LPP sizingŽŽcriteria on 4-13-00. **Issued By:** **Issued To:** Perdue Farms Incorporated

DNREC Project Officer: **Permittee Contact:** **Program:** Septic System

Permits Detail for:

Facility on 1-32-11.00-0041.00

Street Address: 28338 Enviro Way, Seaford, DE 19973 US **Type:** Other

Permit -- 229451

Start Date: **Expires:** **Permit Number:** 229451 **For:** Construction Then Operation

Status: On Hold **Description:** Septic System Permit **Name As Issued:** Perdue Agrirecycle, LLC

Comment: **Issued By:** **Issued To:** Perdue Agrirecycle, LLC

DNREC Project Officer: **Permittee Contact:** **Program:** Septic System

Permits Detail for:

Facility on 1-32-11.00-0041.00

Street Address: 28338 Enviro Way, Seaford, DE 19973 US **Type:** Other

Permit -- 229596

Start Date: **Expires:** **Permit Number:** 229596 **For:** Construction Then Operation

Status: Completion Report Received **Description:** Septic System Permit **Name As Issued:** Perdue-AgriRecycle, LLC

Comment: **Issued By:** **Issued To:** Perdue-AgriRecycle, LLC

DNREC Project Officer: **Permittee Contact:** **Program:** Septic System

APPENDIX 12

DOCUMENTS RELATED TO ON-SITE WATER SUPPLY WELLS

MAIL TO:

WATER SUPPLY SECTION
DIVISION OF WATER RESOURCES
89 KINGS HIGHWAY
DOVER, DELAWARE 19901
PHONE: 302-739-3665
FAX: 302-739-2296

BM

STATE OF DELAWARE
DEPARTMENT OF NATURAL RESOURCES
AND ENVIRONMENTAL CONTROL

http://www.dnrec.state.de.us/

APPLICATION MUST BE SUBMITTED AND PERMIT RECEIVED BEFORE DRILLING IS STARTED.

APPLICATION FOR A PERMIT TO CONSTRUCT A WELL

- OFFICIAL USE ONLY -

PAGE # 4 OF 4 PAGES
PERMIT NO: 171453-W

PLEASE TYPE OR PRINT - USE BLUE OR BLACK INK ONLY -
ILLEGIBLE OR INCOMPLETE FORMS WILL BE RETURNED

GENERAL INFORMATION

Property Owner: Purdue - Agricycle L.L.C.
Address: P.O. Box 1537
City: Salisbury State: MD Zip: 21802
Telephone Number: 410-543-3380
Application Preparer/WC: A.C. Schultes of Delaware
Lic. #: 14 Date of Application: 4-3-00
Estimated Construction Date: 4-17-00
Purpose: ☑ Test or ☐ Permanent

Use: ☐ Domestic ☑ Industrial ☐ Public ☐ Miscellaneous Public ☐ Temporary For Well Construction ☐ Irrigation ☐ Agricultural ☐ Heat Pump Recharge ☐ Closed Loop Heat Pump ☐ Heat Pump Supply

☐ Other (Specify): _____

Is this a replacement well? ☑ NO ☐ YES reason: _____
Is public water available? ☑ NO ☐ YES (Specify): _____
On public sewage: ☐ YES OR Septic system permit #: N/A

PROPOSED WELL CONSTRUCTION

	Inner Casing	Outer Casing
Approximate total depth:	100'	
Casing top (above grade):	12"	
Casing bottom (below grade):	60'	
Casing diameter:	4"	
Casing material:	PVC	

Tentative screen setting: 60' (top) To: 100'
Tentative screen length: 40' Material: PVC
Type of Grout: CIM From: 0' (top) To: 50'
Gravel pack: ☐ NO ☑ YES From: 50' To: 100'
Desired capacity: TEST (GPM) Est. Max. Daily Use: _____ (GPD)

Will the operation of this well by itself or in combination with any other well(s) owned or operated by the permittee withdraw greater than 50,000 gallons in any 24 hr. period? ☑ NO ☐ YES

I HEREBY AFFIRM THE INFORMATION I HAVE SUBMITTED IS ACCURATE AND CORRECT.

Bill Denny 4-3-00
Signature - Application Preparer / Water Well Contractor Date

Michael A. Chatwick Project MANAGER
Signature - Property Owner Date

Please release the contractor's copy of the permit and the well tag to the water well contractor.
☑ YES ☐ NO

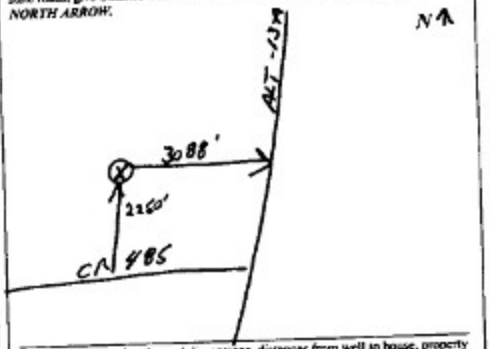
LOCATION MAP - ROAD MAP

County: ☐ New Castle ☐ Kent ☑ Sussex
Subdivision: _____
Lot no: _____
Tax Map#: 1-32-6-95
Name of nearest town: Blades
Distance to nearest town: 2.1 mi

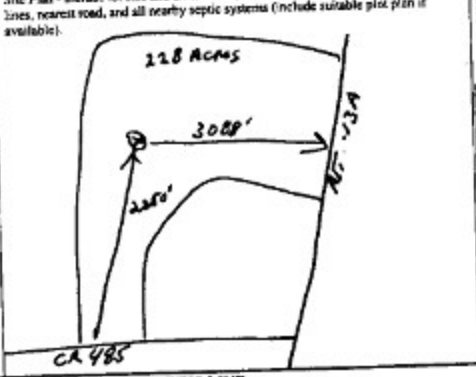
DIRECTION OF WELL FROM TOWN (CIRCLE DIRECTION)

NW N NE W TOWN E SW S SE

Draw a sketch below showing location of well in relation to at least two county or state roads, give distance from well site to nearest road junction and show a *NORTH ARROW.*



Site Plan - Include lot size and dimensions, distances from well to house, property lines, nearest road, and all nearby septic systems (include suitable plot plan if available).



Permit Number: 171453-W

FOR OFFICIAL USE ONLY - DO NOT WRITE BELOW THIS LINE

Received By: RECEIVED
Amount: FEB 7 2002
Date:
WATER SUPPLY

Modified Grid: 094-094
Drainage Basin: 304
Quad: Laurel

DRBC: ☐ YES ☑ NO
Formation: _____
Aquifer: _____

X-Coord: 1933804
Y-Coord: 6070356
DOT #: NO

Canary - Work • Pink - Owner • Goldenrod - Contractor

Doc No. 40-08/85/05/01-EC 2

MAIL TO:

WATER SUPPLY SECTION
DIVISION OF WATER RESOURCES
89 KINGS HIGHWAY
DOVER, DELAWARE 19901
PHONE: 302-739-3663
FAX: 302-739-2296

STATE OF DELAWARE
DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL
WELL COMPLETION REPORT

WELL COMPLETION REPORT MUST BE RETURNED WITHIN 30 DAYS OF CONSTRUCTION.

PAGE 1 OF 2 PAGES

PLEASE PRINT OR TYPE - ILLEGIBLE OR INCOMPLETE FORMS WILL BE RETURNED

PERMIT NO. 171453 LOCAL ID TW#1

TAX MAP # 1-32-6-95

PROPERTY OWNER Perdue-Agrirecycle

WELL CONTRACTOR ACSD

LIC# 14 CONSTRUCTION DATE 5/1/00

WELL CONSTRUCTION METHOD

- ☐ AUGERED
- ☐ DRIVEN
- ☑ MUD ROTARY
- ☐ OTHER
- ☐ BORED
- ☐ JETTED
- ☐ REVERSE
- ☐ CABLE TOOL
- ☐ AIR ROTARY
- ☐ WASHED

(Specify)

TOTAL DEPTH OF EXCAVATION: 140'

CASING INSTALLATION

	INNER CASING(S)					OUTER CASING
CASING TOP	+2'					
CASING BOTTOM	70'					
CASING DIAMETER	4"					
CASING MATERIAL	PVC					

SCREEN INSTALLATION

	INNER CASING(S)				
SCREEN TOP	70'				
SCREEN BOTTOM	130'				
SCREEN DIAMETER	4"				
SCREEN MATERIAL	PVC				

RECEIVED
MAY 1 : 2000
WATER SUPPLY

GRAVEL PACK FROM 30 TO 140 FEET

GROUT TYPE: ☐ CEMENT (c) ☑ BENTONITE CLAY (b)

OTHER (o) _____

FROM 0 (ft.) TO 30 FROM _____ (ft.) TO _____ FEET

NON-GROUT BACKFILL OF WELL ANNULUS

TYPE _____ FROM _____ TO _____

STATIC WATER LEVEL OF (DATE) 5/1/00

6.23 FT. (Below/Above) GROUND SURFACE

PUMPING WATER LEVEL 24.5 FT. ON 5/1/00 (DATE)

AFTER 8 HOURS AT 112.5 GPM.

WAS A GEOPHYSICAL LOG TAKEN? ☐ YES ☑ NO

WELL HEAD COMPLETION:

TYPE: ☐ PITLESS ADAPTER ☐ STANDARD "T" ☐ WELL PIT ☐ PAD MOUNT ☑ OTHER 4" CAP

24 INCHES ABOVE GRADE

WAS THE WELL TAG ATTACHED? ☑ YES ☐ NO

IF "NO", EXPLAIN _____

TYPE OF PERMANENT PUMP INSTALLED:

PUMP MANUFACTURE _____

RATED CAPACITY (GPM) N/A

PUMP INTAKE SETTING _____ FT. BELOW GRADE _____

THE LOCATION AND CONSTRUCTION OF THIS WELL IS IN COMPLIANCE WITH ALL PERMIT CONDITIONS AND WITH ALL APPLICABLE WELL CONSTRUCTION REGULATIONS. ☑ YES ☐ NO

If "no," attach a copy of the approved well permit which has the revised location clearly marked.

NOTE: Completed Formation Log must be attached.

COMMENTS: _____

I HEREBY AFFIRM THE INFORMATION I HAVE SUBMITTED IS ACCURATE AND CORRECT.

Signature of Well Driller in Charge

License# 770 Date 5/9/00

White - DNREC • Canary - Contractor • Pink - Owner

Doc No. 40-08/78/01/03 - EC 7

MAIL TO:

WATER SUPPLY SECTION
DIVISION OF WATER RESOURCES
89 KINGS HIGHWAY
DOVER, DELAWARE 19901
PHONE: 302-739-3665
FAX: 302-739-2296

STATE OF DELAWARE
DEPARTMENT OF NATURAL RESOURCES
AND ENVIRONMENTAL CONTROL

WELL COMPLETION REPORT MUST BE RETURNED WITHIN 30 DAYS OF CONSTRUCTION DATE

FORMATION LOG

PAGE 2 OF 2 PAGES

PLEASE PRINT OR TYPE - ILLEGIBLE OR INCOMPLETE FORMS WILL BE RETURNED

PERMIT# 171453 LOCAL ID# TW#1

PROPERTY OWNER Perdue - Agrirecycle

WELL CONTRACTOR ACSD LIC# 14

DESCRIPTION	TOP OF STRATA	BOTTOM OF STRATA
Top Soil	0	1
Tan sand w/clay layers	1	23
Tan clay	23	31
Gray clay	31	67
Med Brown Sand	67	132
Gray clay + silt	132	140

30'

OTHER COMMENTS:

RECEIVED
MAY 1 : 2000
WATER SUPPLY

I HEREBY AFFIRM THE INFORMATION I HAVE SUBMITTED IS ACCURATE AND CORRECT

Signature of Well Driller In Charge: [signature] License#: 770 Date: 5/9/00

White - DNREC • Canary - Contractor • Pink - Owner

Doc. No. 40-08-82-12-11

MAIL TO:

WATER SUPPLY SECTION
DIVISION OF WATER RESOURCES
89 KINGS HIGHWAY
DOVER, DELAWARE 19901
PHONE: 302-739-3665
FAX:302-739-2296

STATE OF DELAWARE
DEPARTMENT OF NATURAL RESOURCES
AND ENVIRONMENTAL CONTROL

http://www.dnrec.state.de.us/

APPLICATION MUST BE SUBMITTED AND PERMIT RECEIVED BEFORE DRILLING IS STARTED.

APPLICATION FOR A PERMIT TO CONSTRUCT A WELL

- OFFICIAL USE ONLY -

PAGE # 5 OF 5 PAGES
PERMIT NO: 171860

PLEASE TYPE OR PRINT - USE BLUE OR BLACK INK ONLY -
ILLEGIBLE OR INCOMPLETE FORMS WILL BE RETURNED

GENERAL INFORMATION

Property Owner: Perdue - Agricycle L.L.C.
Address: P.O. Box 1537
City: Salisbury State: Md Zip: 21802
Telephone Number: 410-543-3380
Application Preparer/WC: A.C. Schultes of Del.
Lic. #: 14 Date of Application: 4-3-00
Estimated Construction Date: 5-10-00
Purpose: ☐ Test or ☐ Permanent

Use: ☐ Domestic ☐ Industrial ☐ Public ☐ Miscellaneous Public ☐ Temporary For Well Construction ☐ Irrigation ☐ Agricultural ☐ Heat Pump Recharge ☐ Closed Loop Heat Pump ☐ Heat Pump Supply
☐ Other (Specify):

Is this a replacement well? ☐ NO ☐ YES reason:
Is public water available? ☐ NO ☐ YES (Specify):
On public sewage: ☐ YES OR Septic system permit #: N/A

PROPOSED WELL CONSTRUCTION

	Inner Casing	Outer Casing
Approximate total depth:	100'	
Casing top (above grade):	12"	
Casing bottom (below grade):	60'	
Casing diameter:	8"	
Casing material:	PVC	

Tentative screen setting: 60' (top) To: 100'
Tentative screen length: 40' Material: S.S.
Type of Grout: C/MT From: 0' (top) To: 50'
Gravel pack: ☐ NO ☐ YES From: 50' To: 100'
Desired capacity: 500 (GPM) Est. Max. Daily Use: (GPD)

Will the operation of this well by itself or in combination with any other well(s) owned or operated by the permittee withdraw greater than 50,000 gallons in any 24 hr. period? ☐ NO ☐ YES

I HEREBY AFFIRM THE INFORMATION I HAVE SUBMITTED IS ACCURATE AND CORRECT.

Bill Penny 4-3-00
Signature - Application Preparer / Water Well Contractor Date

Michael A. Schultes Robert Hunsicker
Signature - Property Owner Date

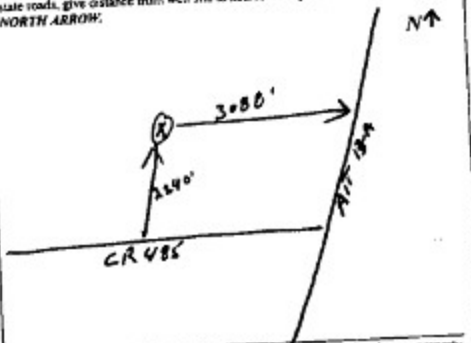
Please release the contractor's copy of the permit and the well tag to the water well contractor.
☐ YES ☐ NO

LOCATION MAP - ROAD MAP

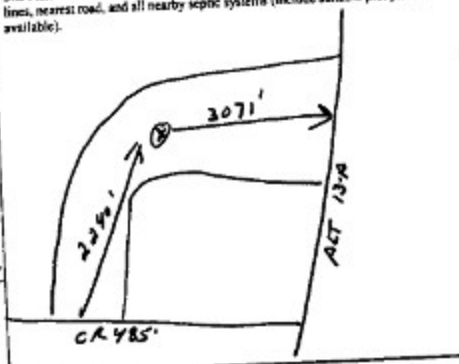
County: ☐ New Castle ☐ Kent ☒ Sussex
Subdivision:
Lot no:
Tax Map#: 1-32-6-95
Name of nearest town: Blades
Distance to nearest town: 2.1 miles

DIRECTION OF WELL FROM TOWN (CIRCLE DIRECTION)
N, NE, E, SE, S, SW, W, NW

Draw a sketch below showing location of well in relation to at least two county or state roads, give distance from well site to nearest road junction and show a NORTH ARROW.



Site Plan - Include lot size and dimensions, distances from well to house, property lines, nearest road, and all nearby septic systems (include suitable plot plan if available).



Permit Number: 171860

FOR OFFICIAL USE ONLY - DO NOT WRITE BELOW THIS LINE

Received By: RECEIVED
Amount: MAR 7 2000
Date:
WATER SUPPLY

Modified Grid: 091-054
Drainage Basin: 304
Quad: Laurel

DRBC: ☐ YES ☒ NO
Formation:
Aquifer:

X-Coord: 183906
Y-Coord: 6702128
DOT #: N/A

Canary - Work • Pink - Owner • Goldenrod - Contractor

Dde No. 40-08/85/05/01-EC 2

http://www.dnrec.state.de.us/

MAIL TO:

WATER SUPPLY SECTION
DIVISION OF WATER RESOURCES
89 KINGS HIGHWAY
DOVER, DELAWARE 19901

PHONE: 302-739-3605
FAX: 302-739-7764

STATE OF DELAWARE
DEPARTMENT OF NATURAL RESOURCES
AND ENVIRONMENTAL CONTROL

WELL COMPLETION REPORT

WELL COMPLETION REPORT MUST BE RETURNED WITHIN 30 DAYS OF CONSTRUCTION. A WELL FORMATION LOG MUST BE INCLUDED WITH THIS REPORT.

- OFFICIAL USE ONLY -

PAGE _____ OF _____ PAGES

ILLEGIBLE OR INCOMPLETE FORMS WILL BE RETURNED

PLEASE PRINT OR TYPE - USE BLUE OR BLACK INK ONLY

Permit # of completed well: 171860 Local ID: PW1
Tax Map/Parcel #: 1-32-6-95
Property Owner: Perdue - Agricyde LLC
Water Well Contractor: ACSD WC Lic #: 14
Well Driller in Charge during Construction: S. Willey

WELL CONSTRUCTION METHOD

- ☐ Augered
- ☐ Driven
- ☒ Mud Rotary
- ☐ Other (Specify): _____
- ☐ Bored
- ☐ Jetted
- ☐ Reverse
- ☐ Cable Tool
- ☐ Air Rotary
- ☐ Washed

Total Depth of Excavation: 140
Construction Date: 11/30/00

CASING INSTALLATION:

	INNER CASING (1)	(2)	(3)	(4)	(5)	(6)	OUTER CASING
CASING TOP:	+2						
CASING BOTTOM:	70'						
CASING DIAMETER:	8"						
CASING MATERIAL:	Blk Steel						

SCREEN INSTALLATION

SCREEN TOP:	70'					
SCREEN BOTTOM:	130'					
SCREEN DIAMETER:	8"					
SCREEN MATERIAL:	S. Steel					

Gravel Pack From: 50 ft. To: 140 ft.
Grout Type: ☒ Cement ☐ Bentonite Clay
☐ Other: _____ From: 0 ft. To: 50 ft.
Type of Non-Grout backfill of Well Annulus: _____
From: _____ To: _____
Static Water Level: 6 ft. ☒ Below OR ☐ Above Ground Surface
On (date): 11/30/00
Pumping Water Level: 24 ft. On (date): 11/30/00
After: 8 hrs. Pumping at: 113 GPM
Was a Geophysical Log Taken? ☐ YES ☒ NO

WELL HEAD COMPLETION:

Type: ☒ Pitless Adapter ☐ Standard "T" ☐ Well Pit ☐ Pad Mount
☐ Other - Specify: _____
Well Head Completed: _____ inches ☐ Above (OR) ☐ Below Ground Surface
Was the Well Tag attached in accordance with current regulations?
☒ YES ☐ NO If "NO", Please Explain: _____

TYPE OF PERMANENT PUMP INSTALLED:

Pump Manufacturer: Gould's
Rated Capacity (GPM): 250
Pump Intake Setting: 74 Ft. Below Ground Surface
Pump Installed By: J. Walter On (date): 12/14/00

The location and construction of this well is in Compliance with all permit conditions and all applicable well construction regulations.
☒ YES ☐ NO
If "NO," attach a copy of the approved well permit showing the revised location clearly marked.

COMMENTS: _____

RECEIVED
DEC 2 0 2000
WATER SUPPLY

I HEREBY AFFIRM THE INFORMATION I HAVE SUBMITTED IS ACCURATE AND CORRECT.

Signature - Well Driller in Charge of Well Construction

License # 991 Date 12/15/00

White - DNREC • Canary - Contractor • Pink - Owner

Doc No. 40-08/7&01/03 - EC 7

MAIL TO:

WATER SUPPLY SECTION
DIVISION OF WATER RESOURCES
89 KINGS HIGHWAY
DOVER, DELAWARE 19901
PHONE: 302-739-3665
FAX: 302-739-2296

STATE OF DELAWARE
DEPARTMENT OF NATURAL RESOURCES
AND ENVIRONMENTAL CONTROL

WELL COMPLETION REPORT MUST BE RETURNED WITHIN 30 DAYS OF CONSTRUCTION DATE

FORMATION LOG

PLEASE PRINT OR TYPE - ILLEGIBLE OR INCOMPLETE FORMS WILL BE RETURNED

PERMIT# 171860 LOCAL ID# PW1

PROPERTY OWNER Perdue - Agricycle LLC

WELL CONTRACTOR ACSD LIC# 14

DESCRIPTION	TOP OF STRATA	BOTTOM OF STRATA
Topsoil	0	1
Tan Sand w/ Clay Layers	1	23
Tan Clay	23	31
Gray Clay	31	67
Med Brown Sand	67	132
Gray Clay & Silt	132	140

OTHER COMMENTS:

RECEIVED
DEC 2 0 2000
WATER SUPPLY

I HEREBY AFFIRM THE INFORMATION I HAVE SUBMITTED IS ACCURATE AND CORRECT

Signature of Well Driller In Charge — License# 991 — Date 12/15/00

White - DNREC • Canary - Contractor • Pink - Owner

Doc. No. 40-08-82-12-11

DNREC – Water Supply

LEGAL NOTICE

Well Permits

Tom Ryan to construct one 8 inch by 73 foot deep irrigation well. To be located approximately 1000' northeast of county road 402, 1000' south of Rt. 26, 2 miles northeast of Frankford in Sussex County. The desired capacity of this well is 800 gpm.

Wolfe Pointe LLC to construct one 8 inch by 100 foot deep irrigation well. To be located approximately 580' south of county road 267, south of 2000' of CR 207 1 ½ miles south of Lewes in Sussex County. The desired capacity of this well is 150 gpm.

Tidewater Utilities to construct one 10 inch by 225 foot deep Public well. To be constructed approximately 35' east of county road 377 .7 mile south of county road 31. One mile southeast of Magnolia in Kent County. The desired capacity is 500 gpm.

Arthur Steward to construct one 12 inch by 100' deep irrigation well. To be located approximately 2800 foot south of Rt. 260 and .4 miles west of Rt. 12, 1 mile northeast of Harrington in Kent County. The desired capacity of this well is 800 gpm.

Perdue – Agricycle LLC. To construct one 8 inch by 100' deep Industrial well. To be located approximately 2200' north of County Road 485 and 3000' west of Alt. Rt. 13. 2 miles south of Blades in Sussex County. The desired capacity of this well is 500 gpm.

The applications above are available for inspection or copies may be obtained by contacting:

Dawna L. Nickerson
Water Supply Section
89 Kings Highway, Dover, DE 19901
(302) 739-4793

May 2nd

A public hearing on the above applications will NOT be held unless the Secretary of DNREC determines that a public hearing is in the public interest or if a written meritorious objection to the application is received within 15 days from this notice. A public hearing request shall be deemed meritorious if it exhibits a familiarity with the application and provides a reasoned statement of the action's probably impact.

Publication instructions:
Please publish in the Delaware State News and the News Journal as a two-column display ad on the following date:

April 16, 2000

MAIL TO:

WATER SUPPLY SECTION
DIVISION OF WATER RESOURCES
89 KINGS HIGHWAY
DOVER, DELAWARE 19901

PHONE: 302-739-9944
FAX: 302-739-7764

STATE OF DELAWARE
DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL

http://www.dnrec.state.de.us/

APPLICATION MUST BE SUBMITTED AND PERMIT RECEIVED BEFORE DRILLING IS STARTED.

APPLICATION FOR A PERMIT TO CONSTRUCT A WELL

- OFFICIAL USE ONLY -

PAGE # _____ OF _____ PAGES

PERMIT #: 252846

Owner:	Perdue Agrirecycle Llc
Address:	PO Box 1537
	Salisbury MD US 21802
Telephone:	
Email:	
Licensed Preparer / WC:	Atlantic Well Drilling Inc
License #:	789
Date of Application:	11/13/2015
Estimated Construction Date:	11/20/2015
Purpose:	Permanent
Use:	Public Standard
Use Other:	
Is an Emergency well?	No
Is a Replacement well?	No
Reason:	
Is public water available?	No
Utility:	
On public sewege?	No
Septic Permit #:	Existing

PROPOSED WELL CONSTRUCTION:

Approximate Total Depth:	130.00 feet
Maximum capacity:	45.00 (GPM)
Max. Daily Withdrawal:	10,800.00 (GPD)

Casing	Top	Bottom	Diameter	Material
Inner Casing	0.00	120.00	4.00	PVC

Screen Material:	PVC		
Top:	120.00	**Bottom:**	130.00
Type of Grout:	Bentonite		
Top:	0.00	**Bottom:**	40.00
Gravel Pack Interval:			
Top:	40.00	**Bottom:**	130.00
Type of Non-Grout Backfill of Well Annulus:			None
Top:	0.00	**Bottom:**	0.00

Will the operation of this well by itself or in combination with any other well(s), owned or operated be the permittee, withdraw greater than 1,000,000 gallons in any 24hr. period? ☐ Yes ☒ No

I HEREBY AFFIRM THE INFORMATION I HAVE SUBMITTED IS ACCURATE AND CORRECT.

Signature - Licensed Preparer/Well Contractor **Date**

Signature - Property Owner **Date**

LOCATION MAP - ROAD MAP

County:	Sussex
Tax Parcel:	1-32-11.00-0041.00
Lot #:	
Subdivision:	
ADC Map Grid:	28 J4
Name of Nearest Town:	Seaford
Distance to Nearest Town:	2.00
X:	183791.28
Y:	66655.88

Parcel Size:	Greater than 0.5 Acre
Proposed Well will be:	
200.00	**Feet of the FRONT property line**
2425.00	**Feet of the BACK property line**
770.00	**Feet of the LEFT property line**
2015.00	**Feet of the RIGHT property line**
200.00	**Feet from the NEAREST road**
750.00	**Feet from the SEPTIC TANK and all components**
600.00	**Feet from the SEPTIC DRAINFIELD/CESSPOOL**
0.00	**Feet from the CENTRAL SEWER LINE**

Ref#: 16200

MAIL TO:

WATER SUPPLY SECTION
DIVISION OF WATER RESOURCES
89 KINGS HIGHWAY
DOVER, DELAWARE 19901

PHONE: 302-739-9944
FAX: 302-739-7764

STATE OF DELAWARE
DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL

WELL COMPLETION REPORT

http://www.dnrec.state.de.us/

APPLICATION MUST BE SUBMITTED AND PERMIT RECEIVED BEFORE DRILLING IS STARTED.

- OFFICIAL USE ONLY -

PAGE # _____ OF _____ PAGES

PERMIT #: 252846

Owner:	Perdue Agrirecycle Llc
Address:	PO Box 1537
	Salisbury MD US 21802
Telephone:	
Email:	
Permit #:	252846
Local ID:	
Licensed Preparer / WC:	Atlantic Well Drilling Inc
License #:	789
Well Driller in Charge:	
License #:	62
Construction Method:	Mud Rotary
Total Depth of Excavation:	118.00 feet
Construction Date:	5/11/2016

Casing	Top	Bottom	Diameter	Material
Inner Casing	0.00	88.00	4.00	PVC

Screen Material:	PVC	**Diameter:**	4.00
Top:	88.00	**Bottom:**	118.00
Type of Grout:	Bentonite		
Top:	0.00	**Bottom:**	70.00
Gravel Pack Interval:			
Top:	75.00	**Bottom:**	118.00
Type of Non-Grout Backfill of Well Annulus:			Natural
Top:	70.00	**Bottom:**	75.00

Screen Slot Size:	15	
Gravel Pack Size:	1	
Static Water Level:	7.00 ft.	Below Ground Surface
Date:	5/11/2016	
Pumping Water Level:	11.0000 ft.	
Date:	5/11/2016	
After:	2.00 hrs.	
Pumping at:	100.00 GPM	
Was a Geophysical Log Taken?		No
Parcel Size:	Greater than 0.5 Acre	

Proposed Well will be:

70.00	**Feet of the FRONT property line**
2575.00	**Feet of the BACK property line**
1115.00	**Feet of the LEFT property line**
1685.00	**Feet of the RIGHT property line**
380.00	**Feet from the NEAREST road**
750.00	**Feet from the SEPTIC TANK and all components**
600.00	**Feet from the SEPTIC DRAINFIELD/CESSPOOL**
0.00	**Feet from the CENTRAL SEWER LINE**

I HEREBY AFFIRM THE INFORMATION I HAVE SUBMITTED IS ACCURATE AND CORRECT.

Signature - Licensed Preparer/Well Contractor **Date**

Signature - Property Owner **Date**

LOCATION MAP - ROAD MAP

County:	Sussex
Tax Parcel:	1-32-11.00-0041.00
Lot #:	

WELL HEAD COMPLETION

Type:	Pitless Adaptor
Other:	
Well Head Completed:	12.00 in.

Above Ground Surface

Was the Well Tag attached in accordance with current regulations?
Yes

Comments:

X:	183803.19
Y:	66751.92

Ref#: 19055

MAIL TO:

WATER SUPPLY SECTION
DIVISION OF WATER RESOURCES
89 KINGS HIGHWAY
DOVER, DELAWARE 19901

PHONE: 302-739-9944
FAX: 302-739-7764

STATE OF DELAWARE
DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL

WELL COMPLETION REPORT

http://www.dnrec.state.de.us/

APPLICATION MUST BE SUBMITTED AND PERMIT RECEIVED BEFORE DRILLING IS STARTED.

- OFFICIAL USE ONLY -

PAGE # _____ OF _____ PAGES

PERMIT #: _____

FORMATION LOG

Formation Type:	TopSoil	**Other:**	
Formation Type With:	Other	**Other:**	topsoil
From:	0.00	**To:**	1.00
Color:	brown		
Texture		**Other:**	
To:		**Other:**	
Cement:		**Other**	
Sorting:		**Other:**	
Hardness:		**Other:**	
Comment:			

Formation Type:	Medium Sand	**Other:**	
Formation Type With:	Other	**Other:**	medium sand
From:	1.00	**To:**	8.00
Color:	brown		
Texture	Medium	**Other:**	
To:	Medium	**Other:**	
Cement:		**Other**	
Sorting:		**Other:**	
Hardness:		**Other:**	
Comment:			

Formation Type:	Clay	**Other:**	
Formation Type With:	Clay	**Other:**	
From:	8.00	**To:**	11.00
Color:	white		
Texture		**Other:**	
To:		**Other:**	
Cement:		**Other**	
Sorting:		**Other:**	
Hardness:		**Other:**	
Comment:			

Formation Type:	Medium Sand	**Other:**	
Formation Type With:	Other	**Other:**	course sand
From:	11.00	**To:**	48.00
Color:	tan		
Texture	Medium	**Other:**	
To:	Medium	**Other:**	
Cement:		**Other**	
Sorting:		**Other:**	
Hardness:		**Other:**	
Comment:			

Formation Type:	Medium Sand	**Other:**	
Formation Type With:	Other	**Other:**	medium sand
From:	48.00	**To:**	61.00
Color:	tan		
Texture	Medium	**Other:**	
To:	Medium	**Other:**	
Cement:		**Other**	
Sorting:		**Other:**	
Hardness:		**Other:**	

MAIL TO:

WATER SUPPLY SECTION
DIVISION OF WATER RESOURCES
89 KINGS HIGHWAY
DOVER, DELAWARE 19901

PHONE: 302-739-9944
FAX: 302-739-7764

STATE OF DELAWARE
DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL

WELL COMPLETION REPORT

http://www.dnrec.state.de.us/

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- OFFICIAL USE ONLY -

PAGE # _____ OF _____ PAGES

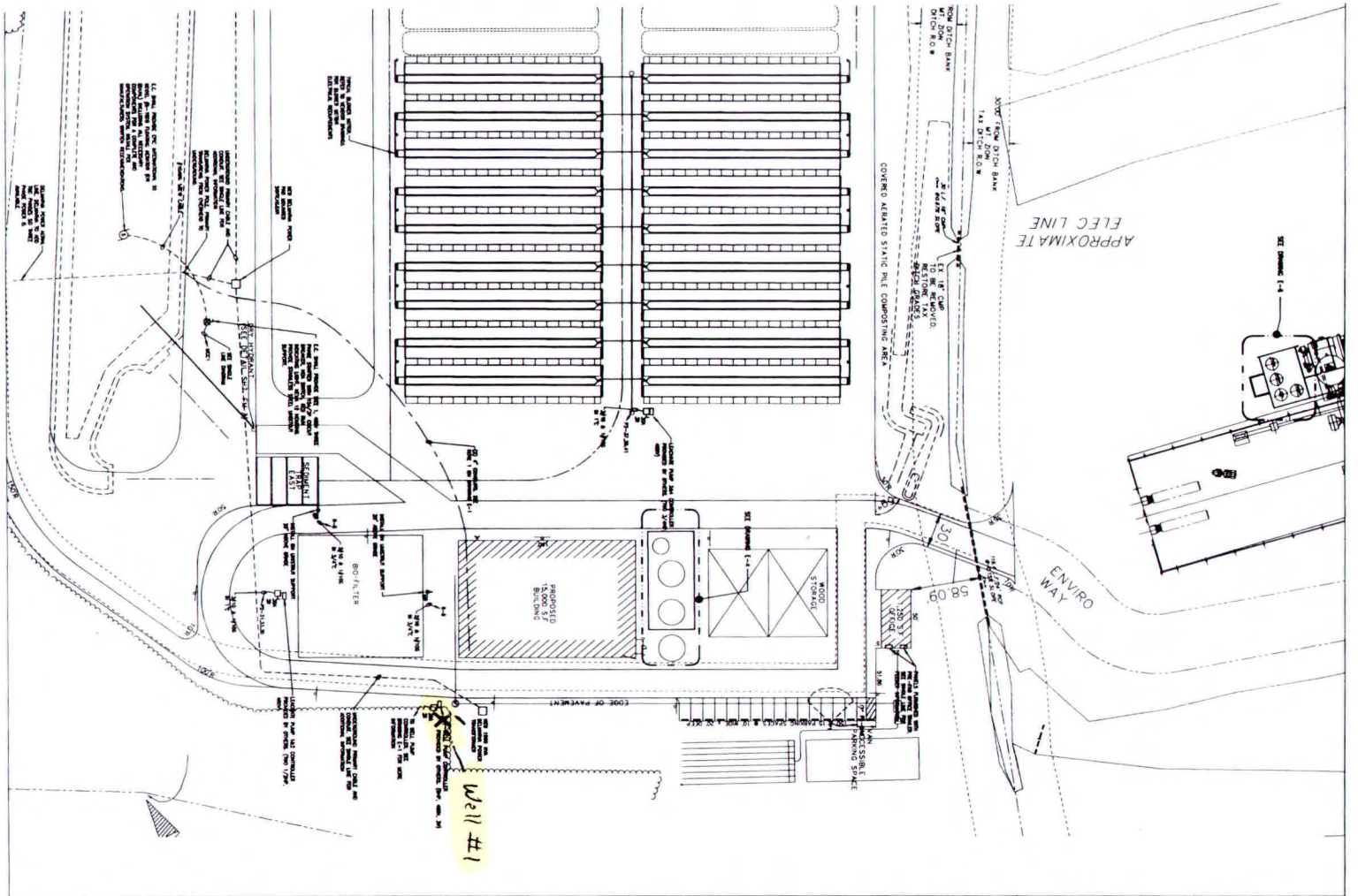
PERMIT #: _____

Comment:

Formation Type:	Fine Sand	**Other:**	
Formation Type With:	Other	**Other:**	medium sand
From:	61.00	**To:**	80.00
Color:	brown		
Texture	Fine	**Other:**	
To:	Fine	**Other:**	
Cement:		**Other**	
Sorting:		**Other:**	
Hardness:		**Other:**	
Comment:			

Formation Type:	Medium Sand	**Other:**	
Formation Type With:	Other	**Other:**	course sand
From:	80.00	**To:**	118.00
Color:	brown		
Texture	Medium	**Other:**	
To:	Medium	**Other:**	
Cement:		**Other**	
Sorting:		**Other:**	
Hardness:		**Other:**	
Comment:			

Ref#: 19055



DWG NO.: E-3	SEAFORD AGRISOIL FACILITY 28338 ENVIRO WAY SEAFORD, SUSSEX COUNTY, DELAWARE	PROJECT NO.: 13135	SEAL
	ELECTRICAL: SITE PLAN	SCALE: AS NOTED	
		DRAWN BY: JDI	
		CHECKED BY: JCV	
		APPROVED BY: JCV	
		DATE: 12/09/2013	

BLAKE & VAUGHAN
ENGINEERING, INC.
MECHANICAL/ELECTRICAL
CONSULTING ENGINEERS
800 WOODLAWN AVENUE
WILMINGTON, DE 19805
(P) 302.888.1780, (F) 302.888.1781

REV	REVISION RECORD	DESIGN	CHK'D	APPV'D	DATE
A	ISSUED FOR BIDS	JDI	JCV	JCV	05/01/15

MAIL TO:

WATER SUPPLY SECTION
DIVISION OF WATER RESOURCES
89 KINGS HIGHWAY
DOVER, DELAWARE 19901

PHONE: 302-739-9944
FAX: 302-739-7764

STATE OF DELAWARE
DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL

http://www.dnrec.state.de.us/

APPLICATION MUST BE SUBMITTED AND PERMIT RECEIVED BEFORE DRILLING IS STARTED.

APPLICATION FOR A PERMIT TO CONSTRUCT A WELL

- OFFICIAL USE ONLY -

PAGE # _____ OF _____ PAGES

PERMIT #: 252847

Owner:	Perdue Agrirecycle Llc
Address:	PO Box 1537
	Salisbury MD US 21802
Telephone:	
Email:	
Licensed Preparer / WC:	Atlantic Well Drilling Inc
License #:	789
Date of Application:	11/13/2015
Estimated Construction Date:	11/20/2015
Purpose:	Permanent
Use:	Public Miscellaneous
Use Other:	
Is an Emergency well?	No
Is a Replacement well?	No
Reason:	
Is public water available?	No
Utility:	
On public sewege?	No
Septic Permit #:	Existing

PROPOSED WELL CONSTRUCTION:

Approximate Total Depth:	130.00 feet
Maximum capacity:	100.00 (GPM)
Max. Daily Withdrawal:	20,000.00 (GPD)

Casing	Top	Bottom	Diameter	Material
Inner Casing	0.00	120.00	6.00	PVC

Screen Material:	PVC		
Top:	120.00	**Bottom:**	130.00
Type of Grout:	Bentonite		
Top:	0.00	**Bottom:**	40.00
Gravel Pack Interval:			
Top:	40.00	**Bottom:**	130.00
Type of Non-Grout Backfill of Well Annulus:			None
Top:	0.00	**Bottom:**	0.00

Will the operation of this well by itself or in combination with any other well(s), owned or operated be the permittee, withdraw greater than 1,000,000 gallons in any 24hr. period? ☐ Yes ☒ No

I HEREBY AFFIRM THE INFORMATION I HAVE SUBMITTED IS ACCURATE AND CORRECT.

Signature - Licensed Preparer/Well Contractor **Date**

Signature - Property Owner **Date**

LOCATION MAP - ROAD MAP

County:	Sussex
Tax Parcel:	1-32-11.00-0041.00
Lot #:	
Subdivision:	
ADC Map Grid:	28 J4
Name of Nearest Town:	Seaford
Distance to Nearest Town:	2.00
X:	183426.95
Y:	66728.37

Parcel Size:	Greater than 0.5 Acre
Proposed Well will be:	
1285.00	**Feet of the FRONT property line**
1300.00	**Feet of the BACK property line**
1045.00	**Feet of the LEFT property line**
855.00	**Feet of the RIGHT property line**
780.00	**Feet from the NEAREST road**
1180.00	**Feet from the SEPTIC TANK and all components**
1210.00	**Feet from the SEPTIC DRAINFIELD/CESSPOOL**
0.00	**Feet from the CENTRAL SEWER LINE**

Ref#: 16201

MAIL TO:

WATER SUPPLY SECTION
DIVISION OF WATER
RESOURCES
89 KINGS HIGHWAY
DOVER, DELAWARE 19901

PHONE: 302-739-9944
FAX: 302-739-7764

STATE OF DELAWARE
DEPARTMENT OF NATURAL RESOURCES
AND ENVIRONMENTAL CONTROL

WELL COMPLETION REPORT

http://www.dnrec.state.de.us/

APPLICATION MUST BE SUBMITTED AND PERMIT RECEIVED BEFORE DRILLING IS STARTED.

- OFFICIAL USE ONLY -

PAGE # _____ OF _____ PAGES

PERMIT #: 252847

Owner:	Perdue Agrirecycle Llc
Address:	PO Box 1537
	Salisbury MD US 21802
Telephone:	
Email:	
Permit #:	252847
Local ID:	
Licensed Preparer / WC:	Atlantic Well Drilling Inc
License #:	789
Well Driller in Charge:	
License #:	62
Construction Method:	Mud Rotary
Total Depth of Excavation:	118.00 feet
Construction Date:	5/12/2016

Casing	Top	Bottom	Diameter	Material
Inner Casing	0.00	58.00	6.00	PVC

Screen Material:	PVC	**Diameter:**	6.00
Top:	58.00	**Bottom:**	118.00
Type of Grout:	Bentonite		
Top:	0.00	**Bottom:**	40.00
Gravel Pack Interval:			
Top:	40.00	**Bottom:**	118.00
Type of Non-Grout Backfill of Well Annulus:			None
Top:	0.00	**Bottom:**	0.00
Screen Slot Size:	20		
Gravel Pack Size:	1		
Static Water Level:	7.00 ft.		Below Ground Surface
Date:	5/12/2016		
Pumping Water Level:	12.0000 ft.		
Date:	5/12/2016		
After:	4.00 hrs.		
Pumping at:	100.00 GPM		
Was a Geophysical Log Taken?			No
Parcel Size:	Greater than 0.5 Acre		

Proposed Well will be:

1240.00	**Feet of the FRONT property line**
1370.00	**Feet of the BACK property line**
1165.00	**Feet of the LEFT property line**
800.00	**Feet of the RIGHT property line**
718.00	**Feet from the NEAREST road**
1180.00	**Feet from the SEPTIC TANK and all components**
1210.00	**Feet from the SEPTIC DRAINFIELD/CESSPOOL**
0.00	**Feet from the CENTRAL SEWER LINE**

I HEREBY AFFIRM THE INFORMATION I HAVE SUBMITTED IS ACCURATE AND CORRECT.

Signature - Licensed Preparer/Well Contractor **Date**

Signature - Property Owner **Date**

LOCATION MAP - ROAD MAP

County:	Sussex
Tax Parcel:	1-32-11.00-0041.00
Lot #:	

WELL HEAD COMPLETION

Type:	Pitless Adaptor
Other:	
Well Head Completed:	12.00 in.

Above Ground Surface

Was the Well Tag attached in accordance with current regulations?
Yes

Comments:

X:	183446.26
Y:	66739.48

Ref#: 19057

MAIL TO:

WATER SUPPLY SECTION
DIVISION OF WATER
RESOURCES
89 KINGS HIGHWAY
DOVER, DELAWARE 19901

PHONE: 302-739-9944
FAX: 302-739-7764

STATE OF DELAWARE
DEPARTMENT OF NATURAL RESOURCES
AND ENVIRONMENTAL CONTROL

WELL COMPLETION REPORT

http://www.dnrec.state.de.us/

APPLICATION MUST BE SUBMITTED AND PERMIT RECEIVED BEFORE DRILLING IS STARTED.

- OFFICIAL USE ONLY -

PAGE # _____ OF _____ PAGES

PERMIT #: _____

FORMATION LOG

Formation Type:	TopSoil	**Other:**	
Formation Type With:	Other	**Other:**	topsoil
From:	0.00	**To:**	1.00
Color:	brown		
Texture		**Other:**	
To:		**Other:**	
Cement:		**Other**	
Sorting:		**Other:**	
Hardness:		**Other:**	
Comment:			

Formation Type:	Medium Sand	**Other:**	
Formation Type With:	Other	**Other:**	medium sand
From:	1.00	**To:**	7.00
Color:	brown		
Texture	Medium	**Other:**	
To:	Medium	**Other:**	
Cement:		**Other**	
Sorting:		**Other:**	
Hardness:		**Other:**	
Comment:			

Formation Type:	Clay	**Other:**	
Formation Type With:	Clay	**Other:**	
From:	7.00	**To:**	15.00
Color:	white		
Texture		**Other:**	
To:		**Other:**	
Cement:		**Other**	
Sorting:		**Other:**	
Hardness:		**Other:**	
Comment:			

Formation Type:	Medium Sand	**Other:**	
Formation Type With:	Other	**Other:**	course sand
From:	15.00	**To:**	48.00
Color:	tan		
Texture	Medium	**Other:**	
To:	Medium	**Other:**	
Cement:		**Other**	
Sorting:		**Other:**	
Hardness:		**Other:**	
Comment:			

Formation Type:	Medium Sand	**Other:**	
Formation Type With:	Other	**Other:**	medium sand
From:	48.00	**To:**	60.00
Color:	tan		
Texture	Medium	**Other:**	
To:	Medium	**Other:**	
Cement:		**Other**	
Sorting:		**Other:**	
Hardness:		**Other:**	

MAIL TO:

WATER SUPPLY SECTION
DIVISION OF WATER RESOURCES
89 KINGS HIGHWAY
DOVER, DELAWARE 19901

PHONE: 302-739-9944
FAX: 302-739-7764

STATE OF DELAWARE
DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL

WELL COMPLETION REPORT

http://www.dnrec.state.de.us/

APPLICATION MUST BE SUBMITTED AND PERMIT RECEIVED BEFORE DRILLING IS STARTED.

- OFFICIAL USE ONLY -

PAGE # _____ OF _____ PAGES

PERMIT #: _____

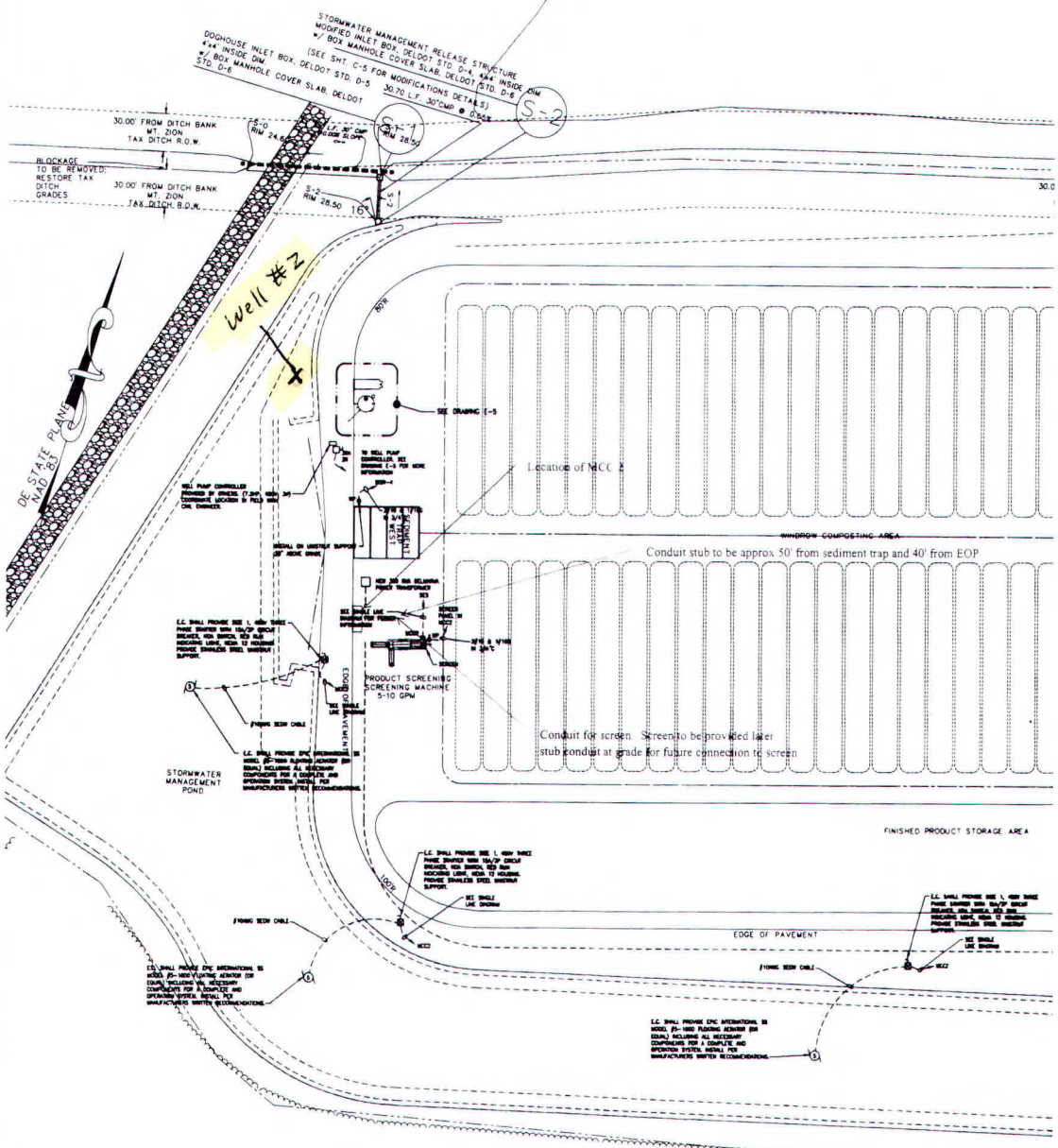
Comment:			
Formation Type:	Fine Sand	**Other:**	
Formation Type With:	Other	**Other:**	medium sand
From:	60.00	**To:**	80.00
Color:	brown		
Texture	Fine	**Other:**	
To:	Fine	**Other:**	
Cement:		**Other**	
Sorting:		**Other:**	
Hardness:		**Other:**	
Comment:			
Formation Type:	Medium Sand	**Other:**	
Formation Type With:	Other	**Other:**	course sand
From:	80.00	**To:**	118.00
Color:	brown		
Texture	Medium	**Other:**	
To:	Medium	**Other:**	
Cement:		**Other**	
Sorting:		**Other:**	
Hardness:		**Other:**	
Comment:			

Ref#: 19057

DRAWING NOTES:

1. E.C. SHALL PROVIDE (1) 1" CONDUIT UNDERGROUND BETWEEN OFFICE BUILDING AND COMM BOX LOCATED IN PUMP CONTROLS SHED. INSTALL OUTDOOR 2 PAIR FIBER OPTIC CABLE IN CONDUIT FOR MONITORING AND CONTROL OF PUMP SYSTEMS.

2. E.C. SHALL PROVIDE 5" PVC SCHEDULE 40 CONDUIT UNDERGROUND FOR DELMARVA POWER USE FOR ALL NEW PRIMARY CABLING. DELMARVA SHALL FURNISH AND INSTALL 3 PHASE PRIMARY CABLING, PRIMARY TERMINATIONS AND ALL AERIAL DESIK. E.C. SHALL FURNISH SECONDARY LUGS FOR DELMARVA POWER INSTALLATION AT NEW TRANSFORMERS. E.C. SHALL PROVIDE TRANSFORMER AND PRIMARY SWITCHGEAR EQUIPMENT PADS. ALL WORK SHALL BE IN ACCORDANCE WITH DELMARVA POWER STANDARDS. CONTACT MIKE KRAFT AT DELMARVA POWER (302) 395-1231.



ELECTRICAL: SITE PLAN

SCALE: 1" = 50'-0"

Information Derived from Delaware Open Data Website

PermitNumber
252846
Reference Number
16200
LocalWellID
WellType
Public - Miscellaneous
WellStatus
Completed
URL for Permit Details
Owner
BDG DE LLC
EstConstructDate
11/20/2015
AppRecDate
11/13/2015
LocReviewDate
11/13/2015
ProposedConstructionReviewDate
1/22/2016
PermitApprovalDate
1/22/2016
CompletionReportDate
6/9/2016
TotalDepthProp
130
EstMaxCapacity
45
EstDailyUse
10,800
MinWellDiameter
4
MaxWellDiameter
4
ScreenTop
88
ScreenBase
118

ScreenMaterial
PVC
InnerCasingTop
0
InnerCasingBase
88
InnerCasingMaterial
PVC
GroutTop
0
GroutBase
70
GroutMaterial
Bentonite
gravelTop
75
gravelBase
118
GravelMaterial
Gravel
ProposedDrillMethod
Mud Rotary
SepticPermitNumber
Existing
LicenseNumber
789
WellContractor
Atlantic Well Drilling Inc
wellauthcode
3465971
LocationMethod
Photo Interpolation-2007 Orthophoto

County
Sussex
Watershed
Nanticoke River
basin
Chesapeake Bay
Potable
Yes
TestTemp
No
GMZ
No
WellPit
No
Replacement
No
AllocReview
Yes
RequiresAllocPermit
YES
Sampled
Yes
CPCN
No
AgPrecDistrict
No
Floodplain

Facility On Parcel 0103281

Street address: , **Facility type:** Other

Permit name: Fleetwood, Roland
Permit number: 103281
Program: Well
Permit type: Well Permit
Permit type description: Well Permits
Permit status: Active
Permit start date: 3/14/1995
Permit expires: 9/14/1995
Permit for: Construction/Operation
Permit description: N/A
Permittee name as issued: N/A
Permit comment: drilling contractor id = 000000101
Issued by: N/A
Issued to: Fleetwood, Roland
DNREC project officer: N/A
Permittee contact: N/A

Permit Events

Event Date (All)	Event (All)	Comments
2/23/1995	Proposed Construction Review	N/A
2/23/1995	Location Review	N/A
2/23/1995	Permit Approval	N/A
2/23/1995	Application Received	N/A
2/23/1995	Well Conditions Completed	N/A
2/23/1995	Call-in Authorization	N/A
2/23/1995	Well Type Event Completed	N/A
4/25/1995	Well Construction Completed	N/A
4/25/1995	Completion Report Received	N/A

Documents

Document	Program	Document Date		
PRE- DEN ARCHIVE DOCUMENT FILE	Well Permitting	2000.01.12		
Well Inspection Form	Well Permitting	1995.10.11		
Well Completion Report	Well Permitting	1995.05.31		
PRE- DEN ARCHIVE DOCUMENT FILE	Well Permitting	1995.03.15		
PRE- DEN ARCHIVE DOCUMENT FILE	Well Permitting	1995.03.15		
PRE- DEN ARCHIVE DOCUMENT FILE	Well Permitting	1995.02.26		
Well Permits Application	Well Permitting	1995.02.23		
PRE- DEN ARCHIVE DOCUMENT FILE	Well Permitting	1995.02.23		

DIVISIONS

Office of the Secretary
Environmental Finance
Division of Community Affairs
Division of Climate, Coastal, & Energy
Division of Air Quality
Division of Water
Division of Waste and Hazardous Substances
Division of Fish & Wildlife
Division of Parks and Recreation
Division of Watershed Stewardship

Topics of Interest
Contact Us
DNREC Newsroom
Public Meetings
About DNREC
DNREC Divisions
Regulations
Employment
DNREC Improvements
Public Notices
DNREC Open Data
FOIA Requests

MAIL TO:

WATER SUPPLY BRANCH
DIVISION OF WATER RESOURCES
P.O. BOX 1401
DOVER, DELAWARE 19903

STATE OF DELAWARE
DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL

APPLICATION FOR A PERMIT TO DRILL A WELL

APPLICATION MUST BE SUBMITTED AND PERMIT RECEIVED BEFORE DRILLING IS STARTED. IF APPROVED, THIS APPLICATION CONSTITUTES A WELL PERMIT.

A COMPLETION REPORT MUST BE FILED WITH THE WATER SUPPLY BRANCH WITHIN THIRTY (30) DAYS AFTER COMPLETION OF THIS WELL. FAILURE TO DO SO MAY RESULT IN LICENSE SUSPENSION.

PLEASE PRINT OR TYPE

GENERAL INFORMATION

Owner: Roland Fleetwood
Address: Rt 4 Box 493
City: Laurel State: Del Zip: 19956
Telephone Number: 875-2045
Well Contractor: K Wood Lic. No. 101
Pump Installer: Lic. No.
Date of Application: 2-22-95
Estimated Construction Date: soon
Purpose: ☐ Test ☐ Permanent
Use: ☐ Domestic ☐ Agricultural ☐ Commercial ☐ Industrial ☐ Irrigation ☐ Public ☐ Observation ☐ Dewatering ☐ Heat Pump Recharge ☐ Heat Pump Supply ☐ Other (Specify)

Is public water service available? ☐ Yes ☐ No
Is this a replacement well? ☐ Yes ☐ No
Replacement reason
Abandonment date for old well
Type of abandonment
Septic system permit no. NA

DRILLING METHOD

☐ Augered ☐ Bored ☐ Cable Tool
☐ Driven ☐ Jetted ☐ Air Rotary
☐ Mud Rotary ☐ Reverse ☐ Washed
☐ Other (Specify)

PROPOSED WELL CONSTRUCTION

Approximate total depth: 80

	Inner casing	Outer casing
Casing top (above grade)	+1	
Casing bottom (below grade)	20	
Casing diameter	8	
Casing material	PVC	

Tentative screen setting: 20 (Top) to 80
Tentative screen length: 60 Material: PVC
Type of Grout: bent From: 0 (Top) to: 20
Gravel pack ☐ Yes ☐ No 20 to 80
Gravel pack interval from: 350 GPM.
Desired capacity: 504,000 GPD.
Maximum daily use:

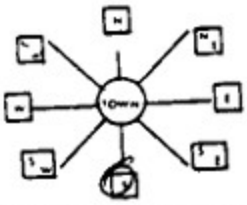
I HEREBY AFFIRM THE INFORMATION I HAVE SUBMITTED IS ACCURATE AND CORRECT.

K Wood Applicant ☐ Representative ☐

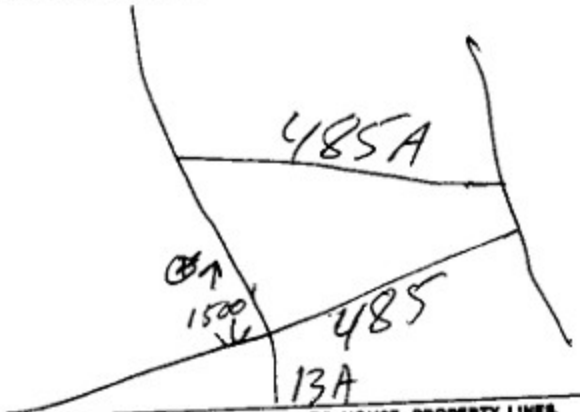
LOCATION MAP - ROAD MAP

Project County: Sussex
Subdivision:
Lot no.:
Name of nearest town: Blades
Distance to nearest town: 2 mi

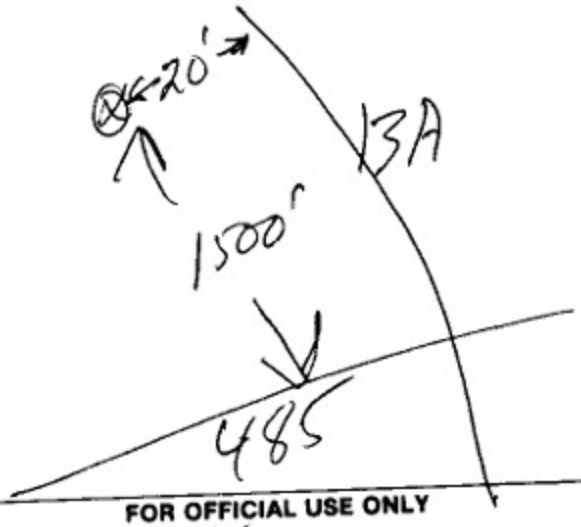
DIRECTION OF WELL FROM TOWN (CIRCLE BOX)



DRAW A SKETCH BELOW SHOWING LOCATION OF WELL IN RELATION TO ROADS AND GIVE DISTANCE FROM WELL SITE TO NEAREST ROAD JUNCTION.



SITE PLAN - INCLUDE DISTANCES FROM WELL TO HOUSE, PROPERTY LINES, NEAREST ROAD AND ALL NEARBY SEPTIC SYSTEMS (INCLUDE SUITABLE PLOT PLAN IF AVAILABLE).



PERMIT NO. 103281

FOR OFFICIAL USE ONLY

Modified Grid: 094-084 Formation:
Drainage Basin: 304 Local ID:
Aquifer: Tax ID:

FOR OFFICIAL USE ONLY - DO NOT WRITE BELOW THIS LINE

RECEIVED
FEB 23 1995
WATER SUPPLY

Application Fee Received
Date: Amount:
Received by:
Receipt No.

SEE ATTACHED CONDITIONS

PURSUANT TO PROVISIONS OF 7 DELAWARE CODE, CHAPTER 60, PERMISSION IS HEREBY GRANTED TO CONSTRUCT AND USE A WELL AS DESCRIBED ABOVE AND SUBJECT TO THOSE CONDITIONS ATTACHED. ALL CURRENT REGULATIONS GOVERNING WELL CONSTRUCTION AND WATER RESOURCE USE MUST BE FOLLOWED.

Signed: [illegible]

Permit Expires 9/14/95 Report Filed Permit No. 103281

WHITE - WATER SUPPLY • CANARY - WORK • PINK - OWNER • GOLDENROD - WELL CONTRACTOR

Doc. # 40-08/85/05/01 - EC 2

GROUND WATER
DISCHARGES SECTION
(302) 739 - 4761
DOMESTIC SEPTIC
PERMITS BRANCH
LARGE WASTEWATER
SYSTEMS BRANCH
FAX: (302) 739 - 3491

STATE OF DELAWARE
DEPARTMENT OF NATURAL RESOURCES
& ENVIRONMENTAL CONTROL
DIVISION OF WATER RESOURCES
89 KINGS HIGHWAY, P.O. BOX 1401
DOVER, DELAWARE 19903

WATER SUPPLY SECTION
LIFETIME (302) 739 - 4793
WATER ALLOCATION
BRANCH
GROUND WATER
PROTECTION BRANCH
WELL PERMITTING BRANCH
FAX: (302) 739 - 3491

WELL PERMIT NUMBER 103281

Pursuant to provisions of 7 Delaware Code, Chapter 60, permission is hereby granted to:

Roland Fleetwood

Route 4 Box 473

Laurel, DE 19956

to **Construct**

the **Irrigation**

Well(s) as described on attached application form(s).

Authorized Signature: [signature]

This permit expires six months from date: March 15, 1995

The construction and/or operation of **this well is subject to the conditions checked on the reverse side of this permit.** Failure to adhere to these conditions will result in revocation or suspension of this permit and other penalties under law. The well shall be constructed by a well contractor and driller licensed as such by the State of Delaware.

All laws and regulations governing the construction, operation, maintenance and repair of water wells and water supplies in the State of Delaware shall be obeyed.

A Completion Report must be filed for this well within (30) days of well completion.

This permit does not cover the structural stability of the project nor guarantee any specific quantity or quality of ground water.

This permit is nontransferable.

***** SEE REVERSE SIDE!!! *****

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MAIL TO:
WATER SUPPLY BRANCH
DIVISION OF ENVIRONMENTAL CONTROL
P.O. BOX 1401
DOVER, DELAWARE 19903

STATE OF DELAWARE
DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL
WELL COMPLETION REPORT

WELL COMPLETION REPORT MUST BE RETURNED 30 DAYS AFTER CONSTRUCTION DATE

PLEASE PRINT

PERMIT NO. 103281 LOCAL ID ____

OWNER Roland Fleetwood

CONSTRUCTION DATE 4-25-95

PURPOSE: ☐ TEST ☑ PERMANENT

USE: ☐ DOMESTIC ☐ COMMERCIAL ☑ IRRIGATION ☐ OBSERVATION ☐ HEAT PUMP RECHARGE ☐ OTHER (Specify) ____ ☐ AGRICULTURAL ☐ INDUSTRIAL ☐ PUBLIC ☐ DEWATERING ☐ HEAT PUMP SUPPLY

IS THIS A REPLACEMENT WELL? YES ☐ NO ☑

ABANDONMENT DATE FOR OLD WELL ____

ABANDONMENT METHOD ____

DRILLING METHOD

☐ AUGERED ☐ DRIVEN ☑ MUD ROTARY ☐ OTHER (Specify) ____ ☐ BORED ☐ JETTED ☐ REVERSE ☐ CABLE TOOL ☐ AIR ROTARY ☐ WASHED

TOTAL DEPTH DRILLED 80

CASING SEQUENCE

	INNER	OUTER
CASING TOP	+1	
CASING BOTTOM	20	
CASING DIAMETER	8	
CASING MATERIAL	PVC	

SCREEN SEQUENCE

	INNER	OUTER
SCREEN TOP	20	
SCREEN BOTTOM	80	
SCREEN DIAMETER	8	
SCREEN MATERIAL	PVC	

WRITTEN APPROVAL FOR SCREENING/GRAVEL PACKING MORE THAN ONE AQUIFER MUST BE OBTAINED FROM DNREC.

GROUT TYPE: CEMENT ☐ BENTONITE CLAY ☑

OTHER: ____

FROM 0 TO 20 FEET

NON-GROUT BACKFILL OF WELL ANNULUS

TYPE NONE FROM ____ TO ____ FEET

GRAVEL PACK: TYPE Grip

FROM 20 TO 80 FEET

STATIC WATER LEVEL: DATE 4-25-95

5 FT. (Below, above) GROUND SURFACE

PUMPING WATER LEVEL 8 FT. BELOW GRADE

AFTER 3 HOURS AT 400 GPM.

WELL HEAD COMPLETION:

TYPE: PITLESS ADAPTOR ☑

OTHER ☐ ____

12 INCHES ABOVE GRADE.

TYPE OF PERMANENT PUMP INSTALLED:

PUMP MANUFACTURE ____

RATED CAPACITY (GPM) ____

PUMP INTAKE SETTING ____ FT. BELOW GRADE

THE COMPLETED WELL IS?

	YES	NO
A. AT LEAST 15' FROM ANY FOUNDATION	☐	☐
B. AT LEAST 50' FROM ANY SEPTIC TANK	☐	☐
C. AT LEAST 10' FROM TOWN SEWER LINE	☐	☐
D. AT LEAST 100' FROM THE NEAREST EDGE OF ANY TILE FIELD	☐	☐

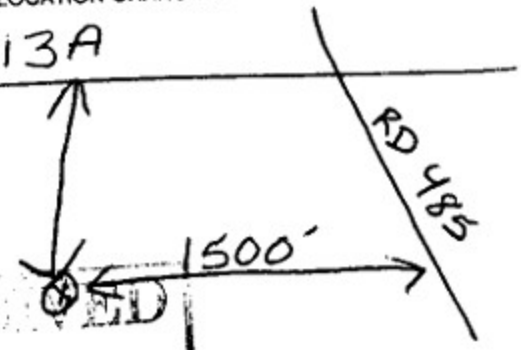
THE NEAREST NEIGHBORS (CIRCLE ONE)

SEPTIC TILE FIELD CESSPOOL OR PRIVY

IS 100' FROM COMPLETED WELL.

IS COMPLETED WELL LOCATED AS SHOWN ON APPLICATION FORM? ☐ ☐

IF NO, DESCRIBE LOCATION CHANGE OR OTHER COMMENTS.



RECEIVED
MAY 31 1995
WATER SUPPLY

DRILLERS LOG DESCRIPTION	TOP OF STRATA	BOTTOM OF STRATA
Top Soil	0	2
White sand	2	5
Tan + gray clay	5	16
Med. Tan sand	16	20
Coarse light Tan sand	20	65
Coarse Dark Tan sand + gravel	65	80

SUPPLEMENTAL DRILLERS LOG ATTACHED YES ☐ NO ☒

PAGE 1 OF ____ PAGES

COMPANY NAME Lifetime Well Drilling

SIGNATURE OF DRILLER IN CHARGE: Bill Wood DATE 5/19/95

DOCUMENT NO. 40-98/78-01/03 FC 7

WHITE - DNREC CANARY - CONTRACTOR PINK - OWNER

STATE OF DELAWARE
DEPARTMENT OF NATURAL RESOURCES
& ENVIRONMENTAL CONTROL
DIVISION OF WATER RESOURCES
89 KINGS HIGHWAY, P.O. BOX 1401
DOVER, DELAWARE 19903

March 15, 1995

Roland Fleetwood
Route 4 Box 473
Laurel, DE 19956

Dear Mr. Fleetwood:

Enclosed is your approved Irrigation well permit(s)#103281 which Lifetime applied for in your behalf. Please read it carefully. Please note condition #1 states that before putting the well(s) into operation you must apply for and receive a water allocation permit.

The Department of Natural Resources and Environmental Control (DNREC) adopted a set of Regulations Governing the Allocation of Water on October 2, 1986. The regulations, which were effective on March 1, 1987, were implemented in an effort to more closely monitor ground and surface water supplies in the state. Based on these regulations, all water users with a withdrawal greater than 50,000 gallons in any 24 hour period are required to obtain a water allocation permit from DNREC.

I have enclosed a "short form" application for you to complete and return to DNREC. As stated in the application, this will confer temporary authorization to use your water system. A convenient time will then be arranged to meet and discuss the specifics of the full application and permit.

If you have any additional questions, please contact Stewart Lovell at (302)739-4793.

Sincerely,

Dave Schepens
Environmental Control Tech. III
Water Supply Section

DS/gd
Enclosures
cc: Well Driller

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STATE OF DELAWARE
DEPARTMENT OF NATURAL RESOURCES &
ENVIRONMENTAL CONTROL
DIVISION OF WATER RESOURCES
89 KINGS HIGHWAY
DOVER, DELAWARE 19901

January 12, 2000

Perdue, Inc.
6906 Zion Church Road
Salisbury, MD 21804
Attn: Mr. Michael Chituck

Dear Mr. Chituck:

The Well Permits Branch has searched for permits of existing wells located on Delaware parcels 1-32-11-41 and 1-32-6-95. Any well on these properties automatically becomes the property of whoever buys the land. Enclosed are copies of four well permits. The only positively identified well remains #103281, an eight inch irrigation well located 1500 feet North of CR 485 (1-32-6-95). I strongly suspect that #82957 and #83122 are located on 1-32-11-41. Wheatley Farms, Inc. stated that Mr. Joe Holt used to own the property (till 1995), and both permits were taken out in his name on a 100~ acre farm in the general location. An inspection for #82957 states the well location in a 150 acre field, on a private road, near a ditch – sounds suspicious. The last permit (#35219) appears to be for a single lot, developed in 1976 – so this probably was cut out of the farm. Two of the well contractors listed on the permits, Lifetime and Wootten, are still in business in Delaware.

The only well you expressed interest in was #103281, and since it is a large capacity well, Perdue, Inc. will be responsible for obtaining maintaining a Water Allocation Permit. For more information on Water Allocations, I suggest you contact Ms. Patricia Buckley at 302-739-4793. Any of the wells located on these parcels are fine to use as long as their current use is not changed. If their use is to be changed (ie. from Irrigation to Industrial, from Domestic to Agriculture, etc), an "Application to Reclassify the Use of an Existing Well" must be filled out by a licensed well contractor, and signed by the property owner. The form is then submitted to the Wells Permits Branch for review and possible approval. Any water wells that will not be used, on the involved parcels, must be properly abandoned by a Delaware licensed Water Well Driller. As a rule, all work on water wells; (abandonment, construction, etc.) must be done by or under the direct on-site supervision of a licensed well driller. Also, construction of any well requires prior permit approval. I have enclosed several reclassification forms, a current list of well contractors, and a copy of the current well regulations (see definitions of well uses in Section 2).

Any excavation requiring the pumpage of ground water (ie. storm water pond construction, etc.) requires prior approval by the Water Allocations Branch at (302) 739-4793. The deliberate pumping of ground water for use from either a natural body of water - or any excavation - must also be reported to the Water Allocations Branch.

Should you have any questions concerning these comments, please contact me at (302) 739-3665.

Sincerely,

Harry T. Hudson, III
Environmental Control Technician

pc. file 103281

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