ATLANTIC COAST PIPELINE, LLC
ATLANTIC COAST PIPELINE

Stormwater Pollution Prevention Plan

APPENDIX G

Erosion and Sediment Control and Stormwater Management Plan

for

Brunswick M&R Station

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ATTACHMENTS

LIST OF ACRONYMS AND ABBREVIATIONS

ACP	Atlantic Coast Pipeline
BMP	best management practices
BSRF	Belted Silt Retention Fence
DETI	Dominion Energy Transmission, Inc. (formerly with Dominion Transmission, Inc.)
DTI	Dominion Transmission, Inc. (now Dominion Energy Transmission, Inc.)
EI	Environmental Inspector
ESC	erosion and sediment control
ESC Plan	Erosion and Sediment Control Plan
FERC	Federal Energy Regulatory Commission
lb/ac/yr	pounds per acre per year
M&R	metering and regulating
M&R Station	Brunswick M&R Station
NRCS	U.S. Department of Agriculture, Natural Resources Conservation Service
OSHA	Occupational Safety and Health Administration
Power Station	Brunswick Electric Power Station
SWM	stormwater management
SWM Plan	Stormwater Management Plan
SWPPP	Stormwater Pollution Prevention Plan
USDA	U.S. Department of Agriculture
VDEQ	Virginia Department of Environmental Quality
VEP	Virginia Electric and Power Company
VESCP	Virginia Erosion and Sedimentation Control Program
VESCH	Virginia Erosion and Sediment Control Handbook
VSMP	Virginia Stormwater Management

1.0 INTRODUCTION

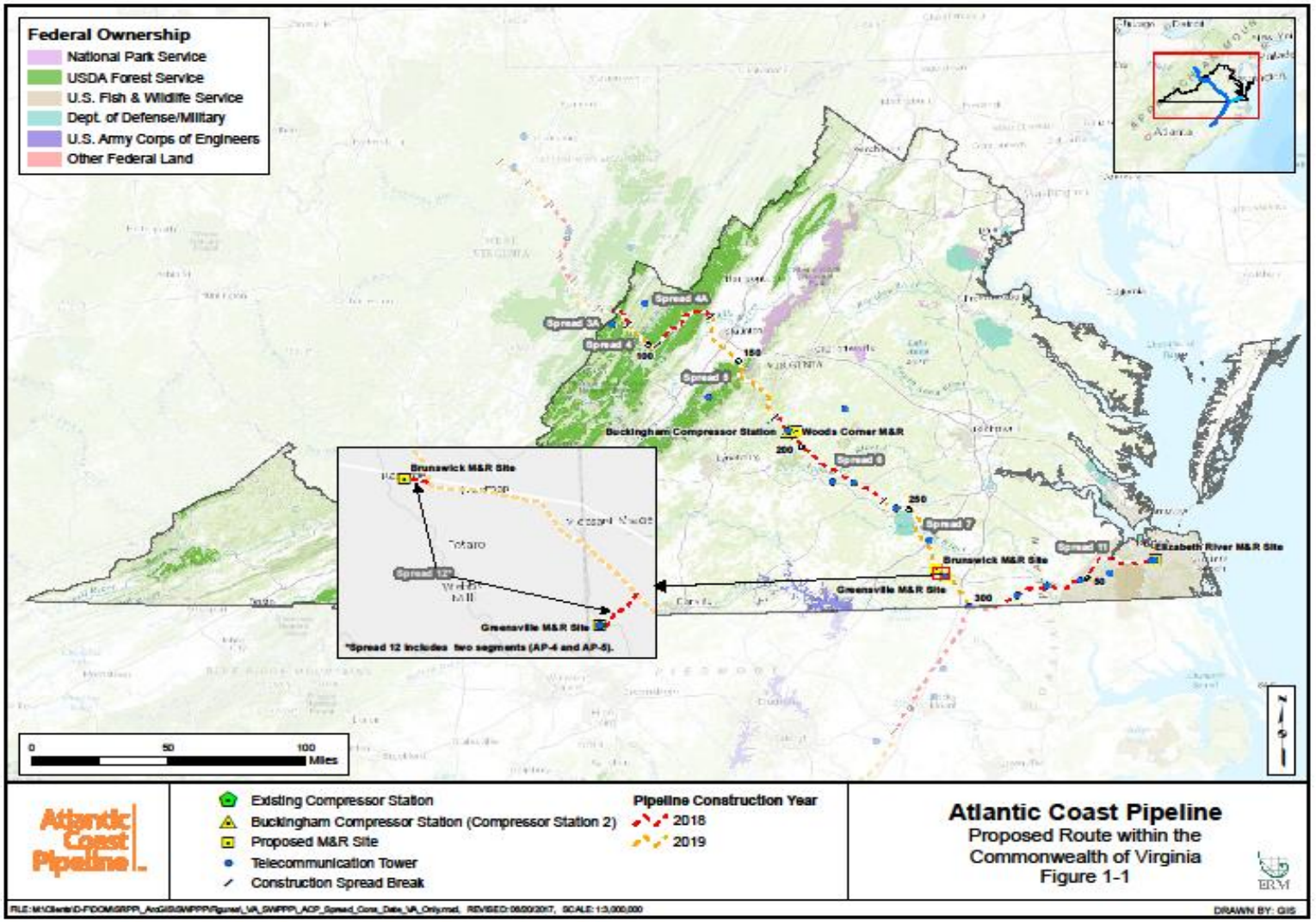
As part of the Atlantic Coast Pipeline (ACP), Dominion Energy Transmission, Inc. (DETI), formerly Dominion Transmission, Inc. (DTI) is proposing to construct an approximately 1.4-acre aboveground metering and regulating (M&R) station at 20100 Governor Harrison Parkway in Freeman, Brunswick County, Virginia. This station, referred to as the Brunswick M&R Station (M&R Station), will be co-located with the Virginia Electric and Power Company (VEP) Brunswick Electric Power Station (Power Station).[1]

The purpose of this Appendix is to specifically address existing site conditions; planned land-disturbing activities; construction sequence and procedures; erosion and sediment control (ESC) measures; and post-construction stormwater management (SWM) methods to be used at the M&R Station. This Appendix is intended to supplement the main body of the Stormwater Pollution Prevention Plan (SWPPP), which primarily addresses the linear portion of the Project. However, general provisions contained within the main body of the SWPPP, including pollution prevention practices and procedures; roles and responsibilities of personnel; inspection and maintenance; employee training; and notification, recordkeeping, and reporting will be followed during construction of the M&R Station, as applicable to the aboveground facility. Land-disturbing activities will conform, at a minimum, to the same regulations and guidelines listed in Section 1.0 of the SWPPP, as appropriate and applicable. In circumstances where multiple overlapping regulatory requirements and guidelines apply, DETI selected the more stringent or protective of the requirements and guidelines set forth by the Federal Energy Regulatory Commission (FERC) and the Virginia Department of Environmental Quality (VDEQ).

A description of the M&R Station is provided in the following sections. A Site Plan is provided in Attachment 1. Figure 1-1 below shows the location of the M&R Station in relation to the ACP.

[1] In May 2017, Dominion Transmission, Inc. (DTI) had a legal name change to Dominion Energy Transmission, Inc. (DETI).

Figure 1-1 Brunswick M&R Station Location



2.0 LOCATION AND DESCRIPTION

The M&R Station will be located at milepost 0.4 of the AP-4 lateral section of the ACP pipeline, within Brunswick County, Virginia. The M&R Station will be located within the property owned by Virginia Electric and Power Company. Specifically, the property is west of Emporia, Virginia, located south of Governor Harrison Parkway (U.S. Highway 58), about one mile west of Freemans Cross Road (County Road 634) in Freeman, Virginia. The M&R Station is co-located with the Power Station (parcel no.55-64D). The 1.4-acre M&R Station is located on developed land. The M&R Station will be located on the northern portion of the greater parcel, south of Governor Harrison Parkway (U.S. Highway 58). The stormwater drains southwest to an existing retention pond containing a shelf constructed as part of the larger existing Power Station.

2.1 EXISTING SITE CONDITIONS

The M&R Station is located on developed land, and is currently a gravel parking lot. Therefore, there will be no net increase in impervious area as a result of M&R Station construction. The water quality and water quantity requirements for the drainage area are addressed using a retention pond containing a shelf. The Site Plan included in Attachment 1 depicts the location of existing and proposed utilities.

The greater parcel is located adjacent to Reedy Creek's flood plain along the western and southern boundaries.

2.2 EXISTING AND PROPOSED TOPOGRAPHY

The topography at the M&R Station is characterized by gently to moderately sloping terrain. Elevation at the M&R Station is approximately 230 feet above mean sea level. The proposed development may require minor grading to achieve proper drainage.

Existing topography of the M&R Station can be found in the topographical map, Attachment 2. In addition, the proposed grading plan for the M&R Station is provided in Attachment 1.

2.3 PROMINENT VEGETATION

The current M&R Station site location is located on land previously developed for the larger Power Station. The M&R Station will be developed with one dekatherm building (used to house equipment such as gas chromatographs, communications equipment, etc.) as well as a regulation skid, a metering skid, a microwave tower, and a small supply building surrounded by a chain-link security fence. In addition, aboveground sections of piping, gas filter/separator, meters, tank, three gas heaters, and regulators will be present. The ground surface around the building structures and aboveground equipment will be covered with gravel. DETI will utilize an existing road to access the M&R Station from U.S. Highway 58. Vehicles will then enter the M&R Station using a new gravel access road. If existing roads are damaged during construction, DETI will restore these roads to preconstruction condition or better. The proposed Site Plan is provided in Attachment 1.

2.4 LAND-DISTURBING ACTIVITIES AND ASSOCIATED WORK AREAS

Construction of the M&R Station will affect approximately 1.4 acres of land. The 1.4 acres of land affected will be retained for operation of the new M&R Station. The Site Plan in Attachment 1 depicts the proposed land use with a tabulation of the percentage of surface area to be adapted to various uses, including but not limited to planned locations of utilities, structures, roads, parking areas, SWM facilities, and easements.

2.5 CONSTRUCTION SCHEDULE

Subject to receipt of the required permits and regulatory approvals, initial construction activities are expected to commence in January 2018. DETI anticipates that the M&R Station construction will be completed in the third quarter of 2019.

2.6 ADJACENT PROPERTIES

The M&R Station is co-located with the Power Station.

2.7 OFF-SITE AREAS

This ESC and SWM Plan addresses land-disturbing activities within the M&R Station. Project plans do not include any additional off-site land-disturbing activities (such as borrow sites or disposal areas). Similar to adjacent properties, DETI will minimize any potential impact to off-site areas during the Project.

2.8 SOILS

The M&R Station will be located just west of the fall line within the Southeastern Piedmont Physiographic Province. Specifically, the site lies within a narrow mapped belt of mylonite, mylonitic gneiss, and cataclastic rocks. Natural soils within the Piedmont Province are the residual product of chemical and physical weathering of the parent rock materials. The typical residual profile consists of finer grained silts and clays near the surface which gradually transition to more silty and sandy materials with depth. In many locations, the transitional zone between soil and rock is not well defined. Locally, the transitional zone is termed partially weathered rock. For engineering purposes, partially weathered rock is considered residual material in which standard penetration test N-values exceed 100 blows per foot.

According to the U.S. Department of Agriculture's (USDA) Natural Resources Conservation Services (NRCS), soils beneath the developed land of the M&R Station consist of Appling Mattaponi Complex and Wedowee gravelly sandy loam.

Table 2.8-1 depicts the soil units of the Brunswick M&R Station.

TABLE 2.8-1

Soil Units

Map Unit Symbol/Name	USDA Texture Depth Description (inches)	USDA Texture Depth Description (inches)	Depth to Water Table (inches)	Drainage Class
2B: Appling – Mattaponi	Appling 0–12 sandy loam 12–18 clay loam 18–37 clay 37–61 clay loam	Mattaponi 0–14 sandy loam 14–35 clay 35–60 clay loam	30–72	Well to moderately well drained
29C: Wedowee	0–6 gravelly sandy loam 6–23 sandy clay 23–61 sandy clay loam	---	>72	Well drained

The NRCS assigns soils to one of four hydrologic soil groups based on estimates of runoff potential, 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.

The hydrologic soil groups assigned by NRCS for the soils mapped at the M&R Station are as follows: Appling (Group B), Mattaponi (Group C), and Wedowee (Group B).

Appendix M of the main SWPPP document lists the various soil mapping units crossed by the proposed ACP Project and provides general information about the nature and properties of each soil and/or map unit.

2.9 RECEIVING WATERS

The M&R Station will drain southwest to an existing retention pond and then to Reedy Creek. The M&R Station is located within the Reedy Creek watershed identified by the U.S.

Geological Survey as hydrologic unit code 030102040602. DETI does not intend to connect to and/or discharge into a municipal separate storm sewer system (MS4).

2.10 EXEPTIONAL AND IMPAIRED WATERS

The proposed M&R Station does not impact Tier 3 exceptional waters identified in 9 VAC 25-260-30 A.

DETI reviewed the 2014 list of 305(b)/303(d) Impaired Waters for the Commonwealth of Virginia to identify waterbodies classified as impaired or for which a Total Maximum Daily Load wasteload allocation has been established and approved for (i) sediment or a sediment-related parameter (i.e., total suspended solids or turbidity) or (ii) nutrients (i.e., nitrogen or phosphorus) (VDEQ, 2015). The M&R Station drains to Reedy Creek which has not been designated as impaired water.

2.11 CRITICAL/SENSITIVE AREAS

Preconstruction assessments and field surveys were completed by DETI to delineate the location of critical or sensitive environmental areas within the areas of land disturbance proposed by the M&R Station.

2.11.1 Wetlands and Waterbodies

M&R stations have been sited such that impacts to wetlands will be avoided and minimized to the maximum extent practicable. There are no wetlands impacted by construction of the Brunswick M&R Station.

2.11.2 Threatened and Endangered Species

DETI consulted with the U.S. Fish and Wildlife Service Ecological Services Field Office in Virginia to identify federally and Commonwealth-listed endangered, threatened, and proposed species as potentially occurring in the ACP Project area. Field surveys and consultations with the U.S. Fish and Wildlife Service regarding these species are on-going. Virginia has separate laws protecting threatened and endangered species. DETI requested and received data on known occurrences of Commonwealth-listed species in Virginia from the Virginia Department of Conservation and Recreation Natural Heritage Program. DETI additionally has consulted and continues to consult with the Virginia Department of Game and Inland Fisheries and Virginia Department of Conservation and Recreation regarding impacts on Commonwealth-listed threatened and endangered species.

There are no endangered, threatened, or proposed species that are known to occur at the proposed M&R Station.

3.0 EROSION AND SEDIMENT CONTROL

All ESC measures to be undertaken as part of this Project will be done in accordance with the VDEQ-approved DETI Standards and Specifications. These standards and specifications will be met through the implementation of the FERC's Upland Erosion Control, Revegetation, and Maintenance Plan and Wetland and Waterbody Construction and Mitigation Procedures, Minimum Standards of the Virginia Erosion and Sedimentation Control Regulations (9VAC25-840-40), by the design, construction and maintenance of the ESCs in accordance with the Virginia Erosion and Sediment Control Handbook (VESCH) (1992, 3rd Edition), and the application of environmental site design principles.

3.1 GENERAL M&R STATION CONSTRUCTION

M&R Station construction stages and the erosion and sediment control measures to be installed for each of these stages are described below. The erosion and sediment control drawings for the M&R Station, including typical drawings of general erosion and sediment control measures, are provided in Attachment 1.

During construction, the effectiveness of temporary erosion control devices will be monitored by DETI's Environmental Inspectors (EIs). The effectiveness of permanent erosion control measures will be monitored for the life of the project by DETI operating personnel during the long-term operation and maintenance of the M&R Station.

Site Preparation

- Survey and flag the construction site and mark environmentally-sensitive areas, as needed.
- Install temporary construction entrance.
- Install safety fences prior to erosion and sediment control installation.
- Install all perimeter erosion and sediment controls prior to any bulk earth-moving activity (road grading, log skidding, grubbing, etc.) Erosion and sediment control measures will be inspected and maintained throughout construction.
- Segregate topsoil where necessary.

M&R Station Construction

- Begin site bulk grading.
- Grade entrance road, laydown areas and parking areas.
- Grade building pads and dig excavations for footings, foundations, and utilities.
- Install utilities.
- Construct buildings and pipeline M&R facilities.
- Spread topsoil on disturbed areas, as needed.
- Complete finish grading.
- Install gravel base around buildings and M&R facilities.

Restoration

- Conduct site restoration and cleanup. As soon as slopes, channels, ditches, and other disturbed areas reach final grade, they must be stabilized within seven days.
- Apply soil amendments, permanent seed, mulch and/or erosion control fabric, as necessary.
- Restore temporary access roads or any paved surfaces to original condition.
- Remove temporary sediment barriers from an area when replaced by permanent erosion control measures or when the area has been successfully restored to uniform perennial vegetation. Temporary erosion control best management practices (BMPs) will not be removed until inspection by the EI to confirm site stabilization.

3.1.1 Survey and Flagging

- The limits of the approved work areas, and the location of the underground utilities must be marked in the field prior to the start of mechanized activities.
- Orange plastic fencing may be more useful than flagging to assure that equipment operators stay out of critical areas. Only unavoidable work will take place within critical areas and their buffers.
- Per VESCH **Std. & Spec. 3.01 (Safety Fence)**, safety fencing will be installed as needed during grading at public access points or around open unattended excavations to warn pedestrians of possible hazards. Stakes will be installed to the maximum extent of 18" as practical in the field to ensure the functionality of the safety fence. In areas where adequate embedment depth cannot be achieved, due to terrain/substrate constraints; additional measures including but not limited to sandbags, mounded earth, etc. will be utilized to secure the fence. In addition, lights, signs and other warnings are required at road entrances and road crossings (see Virginia Department of Transportation (VDOT) permits and regulations).
- Flagging or marking will be maintained throughout construction.

3.1.2 Construction Entrance

In accordance with VESCH **Std. & Spec. 3.02 (Stone Construction Entrance)**, a construction entrance will be constructed at any point where construction equipment leaves the right-of-way and enters a paved public road or other paved surface. Typically, a construction entrance is comprised of filter fabric overlain by six inches of coarse aggregate (Virginia Department of Transportation #1) extending a minimum of 70 feet from the edge of the pavement. The area of the entrance must be excavated three inches prior to laying the filter fabric underliner. The entrance must extend the full width of the vehicular ingress and egress area and have a minimum 12-foot width. Conveyance of surface water through culverts under the entrance will be provided, as necessary. If such a conveyance is impossible, the construction of a "mountable" berm with 5:1 slopes will be permitted.

The construction entrance must function to remove mud from vehicles and equipment leaving the site. As mud accumulates on the entrance, clean stone must be added or the tire mats lifted and shaken to remove mud. Any mud that is carried onto the pavement must be thoroughly removed by the end of the day by shoveling or sweeping. The mud will be returned to the site. The use of water to remove sediment tracked onto roadways is permitted only after sediment is removed as stated above.

If the majority of the mud is not removed by the vehicles traveling over the stone, then tires of the vehicles must be washed before entering the public road. A wash rack may be used to make washing more convenient and effective. Wash water must be carried away from the entrance to a settling area to remove sediment before discharge.

Maintenance of the construction entrance may require periodic top dressing with additional stone and cleanout of any structures used to trap sediment. Additionally, the construction entrance may need to be shoveled then swept, followed by washing of the entrance to remove any sediment build up. If any inadvertently sediment tracking occurs on the public roadway, the road will be cleaned thoroughly by the end of each day.

3.1.3 Wind Erosion Control

Consistent with VESCH **Std. & Spec. 3.39 (Wind Erosion Contro**l), the following temporary sediment controls will be used, as applicable, to minimize the surface and air movement of dust during land disturbing and construction activities:

- In areas with little or no construction traffic, a vegetatively stabilized surface will reduce dust emissions.
- Mulch will be used in areas without heavy traffic pathways.
- Tillage will be used only in an emergency situation before wind erosion begins. Plowing on the windward side of the site with chisel-type plows spaced approximately 12 inches apart.
- The contractors will have one or more water trucks available per spread that will load water from approved permitted sources to spray areas for dust control.
- Use of spray-on adhesives may be used on mineral soils only.
- Use crushed stone or course gravel to stabilize roads and other areas during construction.
- A board fence, wind fence, or sediment fence may be used to control air currents and blowing soil. Place barriers perpendicular to prevailing air currents at intervals of about 15 times the barrier height.
- Calcium chloride may be applied by a mechanical spreader as loose, dry granules or flakes at a rate that keeps the surface moist but not so high as to cause water pollution or plant damage.

3.1.4 Silt Fencing

Silt Fencing constructed of synthetic filter fabric stretched across and attached to supporting posts, and in some cases a wire support fence, will be placed across or at the toe of a slope or in a minor drainage way to intercept and detain sediment and decrease flow velocities from drainage areas of limited size. Silt fencing is applicable where sheet and rill erosion or small concentrated flows may be a problem. In accordance with VESCH **Std. & Spec. 3.05 (Silt Fence),** DETI will adhere to the following general construction and maintenance specifications if congruent with the manufacturer's recommended installation and use. In the event of conflicting specifications, DETI will always follow the manufacturer's recommendations on proper installation and use of a product.

- Silt fencing will be used where the size of the drainage area is not more than one quarter acre per 100 feet of silt fence length; the maximum slope length behind the barrier is 100 feet; and the maximum gradient behind the barrier is 50 percent (2:1).
- Silt fencing can be used in minor swales or ditches where the maximum contributing drainage area is no greater than one acre and flow is no greater than one cubic feet per second. In ditches or swales where higher velocity flow is expected, rock check dams will be used in place of silt fence.
- Silt fencing will not be used in areas where rock or some other hard surface prevents the full and uniform depth anchoring of the barrier.
- If wooden stakes are utilized for silt fence construction, they must have a diameter of two inches when oak is used and four inches when pine is used. Wooden stakes must have a minimum length of five feet. Fabric will not be stapled to existing trees.
- If steel posts are utilized, they must have a minimum weight of 1.33 pounds per linear foot and have a minimum length of five feet. Posts will be placed a maximum of six feet apart.
- The height of the fence will be a minimum of 16 inches above grade and will not exceed 34 inches above ground elevation.
- Filter cloth will be spliced together only at support posts with a minimum 6-inch overlap.
- When wire support is not used, extra-strength filter fabric will be fastened to the upslope side of the posts using one inch long (minimum) heavy-duty wire staples or tie wires and eight inches of the fabric will be extended into the trench. The posts will be placed a maximum of six feet apart.
- When wire support is used, the wire mesh fence must be fastened securely to the upslope side of the posts using heavy duty wire staples at least one inch long, tire wires or hog rings. The posts will be placed a maximum of ten feet apart.

- If silt fence is to be constructed across a ditch line or swale, the measure must be of sufficient length to eliminate end flow and the configuration will resemble an arc with the ends oriented upslope. Extra-strength filter fabric must be used for ditch lines or swales with a maximum three-foot spacing of posts.

- Remove accumulated sediments when sediment reaches half the aboveground height of the fence.

- Silt fences will be removed and discarded properly after project completion. Soils will be stabilized and seeded accordingly. Permanent erosion control protective measures will be utilized if seeding alone will not stabilize the site and provide soil stability.

Belted Silt Retention Fence (BSRF)

The primary silt fence product planned for use on the ACP, including the M&R Station, is a patented Belted Silt Retention Fence (BSRF) product which is available in two designs used to address different Site conditions, as follows:

- BSRF Priority 1 (green band) is a heavy-duty silt fence constructed with a 36-inch, non-woven, spun-bond fabric with an internal scrim incorporated into the fabric for additional strength and durability. The system utilizes wood stakes spaced at 4-feet and a specific method of attachment. The system is functionally equivalent to wire back and metal steel post silt fence and is designed for the protection of high priority areas.

- BSRF Priority 2 (black band) is a medium-duty silt fence constructed with a 36-inch, non-woven, spun-bond fabric that is calendared on one side. The system utilizes wood stakes spaced at 6-feet and a specific method of attachment.

Drawings and specifications for the two BSRF products are provided in Attachment 1.

3.1.5 Site Dewatering

Dewatering may be periodically conducted to remove accumulated groundwater or precipitation from the construction area, including from within excavations. The need for erosion controls as well as the type of control used will vary depending on the type and amount of sediment within the water, and volume and rate of discharge.

3.1.5.1 Geotextile Bag/Dewatering Filter Bag

DETI utilizes geotextile bags for dewatering and velocity reduction on a majority of pipeline construction projects as well as the straw bale dewatering practice illustrated in the VESCH **Std. & Spec. 3.26 (Dewatering Structure)**. The purpose, definition, conditions of application and planning considerations are identical. Design criteria and specifications vary by dewatering bag manufacturer; a variety of geotextile dewatering bag products are available on the market. The manufacturers' guidance on the use, design, sizing, maintenance, and application of the geotextile dewatering bag will be followed.

- Conduct dewatering (on or off the construction site) in such a manner that does not cause erosion and does not result in silt-laden water flowing into any waterbody or off-site property.

- Elevate and screen the intake of each hose used to withdraw the water from the trench to minimize pumping of deposited sediments.

- A dewatering bag may not be needed if there is a well-stabilized, vegetated area on site to which water can be discharged. The area must be stabilized so that it can filter sediment and at the same time withstand the velocity of the discharged water without eroding. Per VESCH Std. & Spec. 3.26, a minimum filtering length of 75 feet must be available in order for such a method to be feasible.

- Remove dewatering structures as soon as practicable after the completion of dewatering activities or sooner if sediment build-up prevents the bag from functioning properly. If the bag becomes half full of sediment, discard and replace with a new bag.

3.1.5.2 VESCH Standard Dewatering Structure

As warranted by Site conditions, a standard dewatering structure may be used per the construction and maintenance specifications in VESCH **Std. & Spec. 3.26 (Dewatering Structure)**, including the use of a portable sediment tank, filter box, or straw bale/silt fence pit. The dewatering structure must be sized (and operated) to allow pumped water to flow through the filtering device without overtopping the structure. The filtering devices must be inspected frequently and repaired or replaced once the sediment build-up prevents the structure from functioning as designed. The accumulated sediment which is removed from a dewatering device must be spread on site and stabilized or disposed of at an approved disposal site.

In some cases, DETI could use a modified dewatering structure in combination with a filter bag. The structure is similar to the straw bale/silt fence pit described in the VESCH, but the wet storage area is not excavated 3 ft. below the perimeter measures since the structures are placed off the right-of-way in well vegetated areas. The filter bag discharges into the dewatering structure for additional filtration through the straw bales. Additional energy dissipating devices may be installed downgradient of the dewatering structure, as necessary.

Installation and removal of the referenced dewatering practice does not involve ground disturbance.

3.2 SPECIAL CONSTRUCTION PROCEDURES

Sensitive areas will be treated as separate construction entities. Sensitive areas require additional erosion and sediment control procedures. Additional controls will be shown on the detailed drawings in Attachment 1.

3.2.1 Winter Construction

DETI has developed and filed a project-specific winter construction plan with the FERC application.

The plan addresses:

- Winter construction procedures (e.g., snow handling and removal, soil handling under saturated or frozen conditions, topsoil stripping);
- Stabilization and monitoring procedures if ground conditions will delay restoration until the following spring (e.g., mulching and erosion controls, inspection and reporting, stormwater control during spring thaw conditions); and
- Where areas have been temporarily stabilized or land-disturbing activities will be suspended due to continuous frozen ground conditions and stormwater discharges are unlikely, the inspection frequency may be reduced to once per month. If weather conditions (such as above freezing temperatures or rain or snow events) make discharges likely, the operator will immediately resume the regular inspection frequency.

4.0 EROSION AND SEDIMENT CONTROL MINIMUM STANDARDS

The Virginia ESC regulations specify minimum standards that must be followed for all regulated land-disturbing activities, where applicable to a specific project. Modifying or waiving any of the ESC regulations, including the 19 minimum standards, on a project-specific basis, requires a written variance request to VDEQ for review and approval. DETI will construct the M&R Station in accordance with the following criteria, techniques and methods per minimum standards set forth in 9 VAC 25-840-40, as applicable.

Minimum Standard 1 – Permanent or temporary soil stabilization shall be applied to denuded areas within seven days after final grade is reached on any portion of the site. Temporary soil stabilization shall be applied within seven days to denuded areas that may not be at final grade but will remain dormant for longer than 14 days. Permanent stabilization shall be applied to areas that are to be left dormant for more than one year.

Minimum Standard 2 – During construction of the project, soil stock piles and borrow areas shall be stabilized or protected with sediment trapping measures. The applicant is responsible for the temporary protection and permanent stabilization of all soil stockpiles on site as well as borrow areas and soil intentionally transported from the project site.

Minimum Standard 3 – A permanent vegetative cover shall be established on denuded areas not otherwise permanently stabilized. Permanent vegetation shall not be considered established until a ground cover is achieved that is uniform, mature enough to survive and will inhibit erosion.

Minimum Standard 4 – Sediment basins and traps, perimeter dikes, sediment barriers and other measures intended to trap sediment shall be constructed as a first step in any land-disturbing activity and shall be made functional before upslope land disturbance takes place.

Minimum Standard 5 – Stabilization measures shall be applied to earthen structures such as dams, dikes, and diversions immediately after installation.

Minimum Standard 6 – Sediment traps and sediment basins shall be designed and constructed based upon the total drainage area to be served by the trap or basin.

6.a. The minimum storage capacity of a sediment trap shall be 134 cubic yards per acre of drainage area and the trap shall only control drainage areas less than 3 acres.

6.b. Surface runoff from disturbed areas that is comprised of flow from drainage areas greater than or equal to 3 acres shall be controlled by a sediment basin. The minimum storage capacity of a sediment basin shall be 134 cubic yards per acre of drainage area. The outfall system shall, at a minimum, maintain the structural integrity of the basin during a 25-year storm of 24-hour duration. Runoff coefficients used in runoff calculations shall correspond to a bare earth condition or those conditions expected to exist while the sediment basin is utilized.

Minimum Standard 7 – Cut and fill slopes shall be designed and constructed in a manner that will minimize erosion. Slopes that are found to be eroding excessively within one year of permanent stabilization shall be provided with additional slope stabilizing measures until the problem is corrected.

Minimum Standard 8 – Concentrated runoff shall not flow down cut or fill slopes unless contained within an adequate temporary or permanent channel, flume or slope drain structure.

Minimum Standard 9 – Whenever water seeps from a slope face, adequate drainage or other protection shall be provided.

Minimum Standard 10 – All storm sewer inlets that are made operable during construction shall be protected so that sediment-laden water cannot enter the conveyance system without first being filtered or otherwise treated to remove sediment.

Minimum Standard 11 – Before newly constructed stormwater conveyance channels or pipes are made operational, adequate outlet protection and any required temporary or permanent channel lining shall be installed in both the conveyance channel and receiving channel.

Minimum Standard 12 – When work in a live watercourse is performed, precautions shall be taken to minimize encroachment, control sediment transport, and stabilize the work area to the greatest extent possible during construction. Nonerodible material shall be used for the construction of causeways and cofferdams. Earthen fill may be used for these structures if armored by nonerodible cover materials.

Minimum Standard 13 – When a live watercourse must be crossed by construction vehicles more than twice in any six-month period, a temporary vehicular stream crossing constructed of nonerodible material shall be provided.

Minimum Standard 14 – All applicable federal, state, and local requirements pertaining to working in or crossing live watercourses shall be met.

Minimum Standard 15 – The bed and banks of a watercourse shall be stabilized immediately after work in the watercourse is completed.

Minimum Standard 16 – Underground utility lines shall be installed in accordance with the following standards in addition to other applicable criteria:

16.a. No more than 500 linear feet of trench may be opened at one time.

16.b. Excavated material shall be placed on the uphill side of trenches.

16.c. Effluent from dewatering operations shall be filtered or passed through an approved sediment trapping device, or both, and discharged in a manner that does not adversely affect flowing streams or off-site property.

16.d. Material used for backfilling trenches shall be properly compacted in order to minimize erosion and promote stabilization.

16.e. Restabilization shall be accomplished in accordance with this chapter.

16.f. Applicable safety requirements shall be complied with.

Minimum Standard 17 – Where construction vehicle access routes intersect paved or public roads, provisions shall be made to minimize the transport of sediment by vehicular tracking onto the paved surface. Where sediment is transported onto a paved or public road surface, the road surface shall be cleaned thoroughly at the end of each day. Sediment shall be removed from the roads by shoveling or sweeping and transported to a sediment control disposal area. Street washing shall be allowed only after sediment is removed in this manner. This provision shall apply to individual development lots as well as to larger land-disturbing activities.

Minimum Standard 18 – All temporary erosion and sediment control measures shall be removed within 30 days after final site stabilization or after the temporary measures are no longer needed, unless otherwise authorized by the Virginia Erosion and Sedimentation Control Program (VESCP) authority. Trapped sediment and the disturbed soil areas resulting from the disposition of temporary measures shall be permanently stabilized to prevent further erosion and sedimentation.

Minimum Standard 19 – Properties and waterways downstream from development sites shall be protected from sediment deposition, erosion and damage due to increases in volume, velocity and peak flow rate of stormwater runoff for the stated frequency storm of 24-hour duration in accordance with the following standards and criteria. Stream restoration and relocation projects that incorporate natural channel design concepts are not man-made channels and shall be exempt from any flow rate capacity and velocity requirements for natural or man-made channels:

19.a. Concentrated stormwater runoff leaving a development site shall be discharged directly into an adequate natural or man-made receiving channel, pipe, or storm sewer system. For those sites where runoff is discharged into a pipe or pipe system, downstream stability analyses at the outfall of the pipe or pipe system shall be performed.

19.b. Adequacy of all channels and pipes shall be verified in the following manner:

19.b.(1) The applicant shall demonstrate that the total drainage area to the point of analysis within the channel is one hundred times greater than the contributing drainage area of the project in question; or

19.b.(2)(a) Natural channels shall be analyzed by the use of a two-year storm to verify that stormwater will not overtop channel banks nor cause erosion of channel bed or banks.

19.b.(2)(b) All previously constructed man-made channels shall be analyzed by the use of a 10-year storm to verify that stormwater will not overtop its banks and by the use of a two-year storm to demonstrate that stormwater will not cause erosion of channel bed or banks; and

19.b.(2)(c) Pipes and storm sewer systems shall be analyzed by the use of a 10-year storm to verify that stormwater will be contained within the pipe or system.

19.c. If existing natural receiving channels or previously constructed man-made channels or pipes are not adequate, the applicant shall:

19.c.(1) Improve the channels to a condition where a 10-year storm will not overtop the banks and a two-year storm will not cause erosion to the channel, the bed, or the banks; or

19.c.(2) Improve the pipe or pipe system to a condition where the 10-year storm is contained within the appurtenances;

19.c.(3) Develop a site design that will not cause the pre-development peak runoff rate from a two-year storm to increase when runoff outfalls into a natural channel or will not cause the pre-development peak runoff rate from a 10-year storm to increase when runoff outfalls into a man-made channel; or

19.c.(4) Provide a combination of channel improvement, stormwater detention or other measures which is satisfactory to the VESCP authority to prevent downstream erosion.

19.d. The applicant shall provide evidence of permission to make the improvements.

19.e. All hydrologic analyses shall be based on the existing watershed characteristics and the ultimate development condition of the subject project.

19.f. If the applicant chooses an option that includes stormwater detention, he shall obtain approval from the VESCP of a plan for maintenance of the detention facilities. The plan shall set forth the maintenance requirements of the facility and the person responsible for performing the maintenance.

19.g. Outfall from a detention facility shall be discharged to a receiving channel, and energy dissipators shall be placed at the outfall of all detention facilities as necessary to provide a stabilized transition from the facility to the receiving channel.

19.h. All on-site channels must be verified to be adequate.

19.i. Increased volumes of sheet flows that may cause erosion or sedimentation on adjacent property shall be diverted to a stable outlet, adequate channel, pipe or pipe system, or to a detention facility.

19.j. In applying these SWM criteria, individual lots or parcels in a residential, commercial or industrial development shall not be considered to be separate development projects. Instead, the development, as a whole, shall be considered to be a single development project. Hydrologic parameters that reflect the ultimate development condition shall be used in all engineering calculations.

19.k. All measures used to protect properties and waterways shall be employed in a manner which minimizes impacts on the physical, chemical, and biological integrity of rivers, streams and other waters of the state.

19.l. Any plan approved prior to July 1, 2014, that provides for SWM that addresses any flow rate capacity and velocity requirements for natural or man-made channels shall satisfy the flow rate capacity and velocity requirements for natural or man-made channels if the practices are designed to (i) detain the water quality volume and to release it over 48 hours; (ii) detain and release over a 24-hour period the expected rainfall resulting from the one year, 24-hour storm; and (iii) reduce the allowable peak flow rate resulting from the 1.5-, 2-, and 10-year, 24-hour storms to a level that is less than or equal to the peak flow rate from the site assuming it was in a good forested condition, achieved through multiplication of the forested peak flow rate by a reduction factor that is equal to the runoff volume from the site when it was in a good forested condition divided by the runoff volume from the site in its proposed condition, and shall be exempt from any flow rate capacity and velocity requirements for natural or man-made channels as defined in any regulations promulgated pursuant to §62.1-44.15:54 or 62.1-44.15:65 of the Act.

19.m. For plans approved on and after July 1, 2014, the flow rate capacity and velocity requirements of §62.1-44.15:52 A of the Act and this subsection shall be satisfied by compliance with water quantity requirements in the Stormwater Management Act (§62.1-44.15:24 et seq. of the Code of Virginia) and attendant regulations, unless such land-disturbing activities are in accordance with 9 VAC 25-870-48 of the Virginia Stormwater Management Program (VSMP) Regulation or are exempt pursuant to subdivision C 7 of §62.1-44.15:34 of the Act.

19.n. Compliance with the water quantity minimum standards set out in 9 VAC 25-870-66 of the VSMP Regulation shall be deemed to satisfy the requirements of this subdivision 19.

5.0 STORMWATER MANAGEMENT

As noted in Section 2.1, the M&R Station will be located on developed land in what is currently a gravel parking lot. Consequently, the pre-and post-developed land use conditions are unchanged. The requirements for stormwater quality and quantity are described in the following sections.

5.1 PRE-DEVELOPMENT AND POST-DEVELOPMENT DRAINAGE AREAS

Delineation of the drainage watersheds and proposed management practices are shown on the Site Plan, provided in Attachment 1. The Site Plan depicts the proposed land uses with the imperviousness of the entire Site, and a tabulation of the percentage of surface area to be adapted to various uses, including but not limited to planned locations of utilities, roads, and parking lots. The Site Plan also shows the final drainage patterns and flow paths of the stormwater, in addition to the relationship of the site to upstream and downstream properties and drainage systems.

Stormwater quality and quantity calculations are discussed in Section 5.2 below.

5.2 PRE-DEVELOPMENT AND POST-DEVELOPMENT STORMWATER CALCULATIONS

5.2.1 Water Quantity

A hydrologic analysis for the existing (pre-development) and for the proposed (post-development) conditions, including runoff rates, volumes, and velocities, showing the methodologies used and supporting calculations are presented in this section.

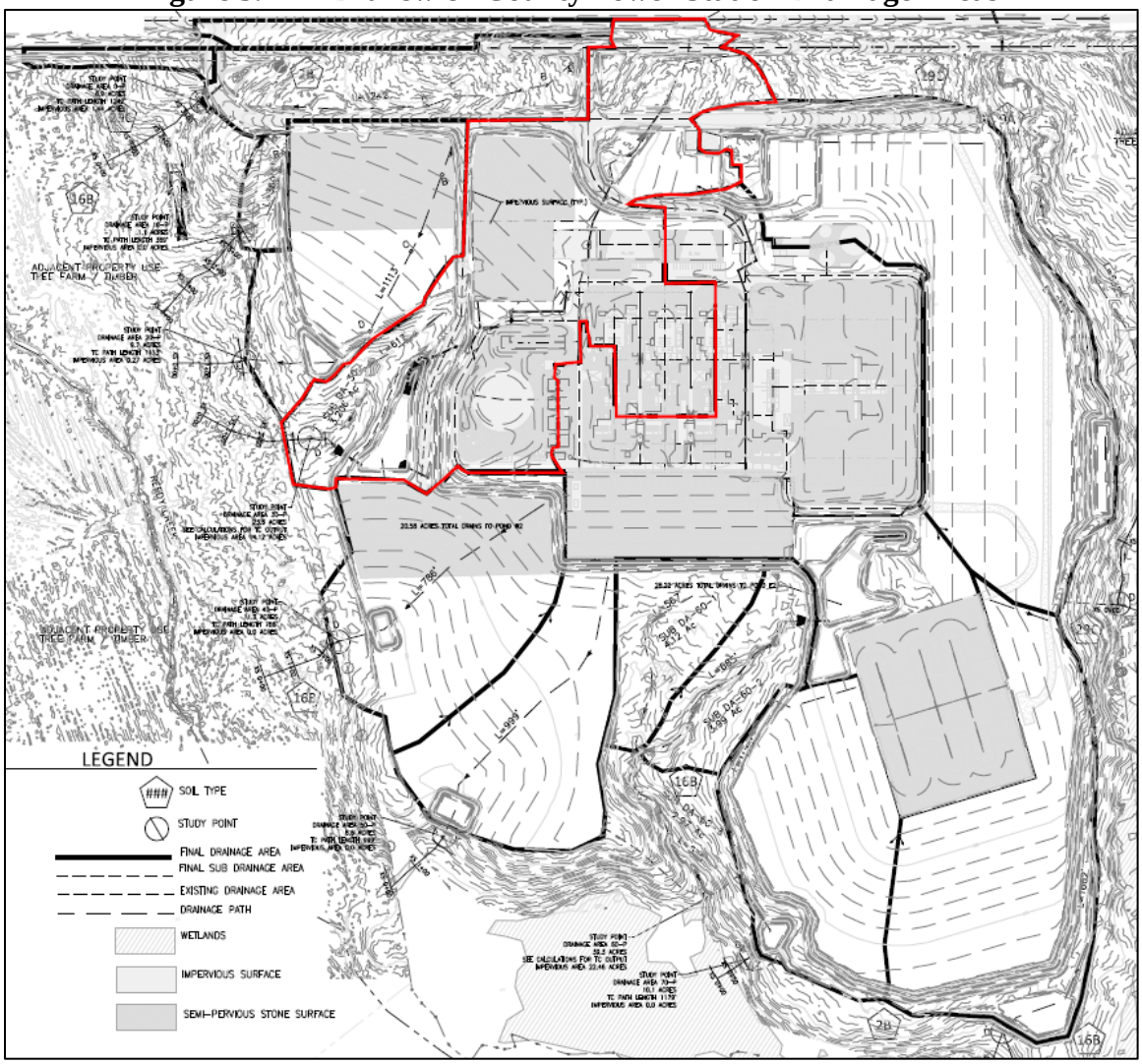
Channel protection and flood protection will be addressed in accordance with the minimum standards set forth in 9 VAC 25-870-66, which are established pursuant to the requirements of § 62.1-44.15:28 of the Code of Virginia. Compliance with the minimum standards set out in this section will be deemed to also satisfy the requirements of Minimum Standard 19 of 9 VAC 25-840-40 (Minimum standards; Virginia Erosion and Sediment Control Regulations, Section 4.0).

The Brunswick M&R Station will be located at the recently-constructed Brunswick County Power Station. A review of the SWM and ESC design documents developed for the Brunswick Power Station was completed. The objective of the review was to understand the post-construction SWM infrastructure constructed for the Power Station and assess the permitting implications and potential need for additional SWM controls for the co-located Brunswick M&R Station.

In the calculations, the overall Power Station site was divided into 10 drainage areas, the Brunswick M&R Station being included in drainage area 30 (DA-30). DA-30 is depicted in the below figure (highlighted in red) and is approximately 20.58 acres in area with 64.17 percent of that area being impervious (13.33 acres). The region of DA-30 within which the Brunswick M&R Station will be located is approximately 1.4 acres and was considered to be gravel (i.e., impervious cover), which is consistent with the land use depicted on the Overall Grading

Site Plan for the Brunswick M&R Station dated September 1, 2016. Therefore, there will be no net increase in impervious area. The water quantity requirements (channel and flood protection) for DA-30 and the M&R Station are addressed using a retention pond containing a shelf. A map of the Power Station's drainage areas is shown on Figure 5.2-1.

Figure 5.2-1 Brunswick County Power Station Drainage Areas



As noted in the SWM design for the Power Station, Win TR-55 was used to demonstrate that the existing channel for DA-30 was adequate for the two-year storm, due to a net increase in flow of only 0.09 cubic feet per second. As part of that analysis Bently Civil Storm software was used to perform routing through a drainage system and permanent retention pond, and weir sizing to show that the post-development 10-year flow did not exceed that from the existing conditions. Relevant calculations from the Power Station SWM design are provided in Attachment 1.

5.2.2 Water Quality

In order to protect the quality of Commonwealth waters and to control the discharge of stormwater pollutants from regulated activities, the following minimum design criteria and statewide standards for SWM will be applied to the site in accordance with 9 VAC25-870-63 for development on prior developed lands:

- For land-disturbing activities disturbing greater than or equal to one acre that result in no net increase in impervious cover from the predevelopment condition, the total phosphorus load will be reduced at least 20 percent below the predevelopment total phosphorus load.

The VSMP regulations suggest the use of the Virginia Runoff Reduction Method (VRRM) for compliance with the water quality criteria in accordance with 9VAC25-870-65. The VRRM for Re-Development spreadsheet was utilized to calculate the pollutant reduction requirement based on the pre- and post-development land cover characteristics.

Based on the entire M&R Station remaining gravel covered (impervious cover), the post-development phosphorus load is 3.03 pounds per acre per year (lb/ac/yr). With a requirement for the total phosphorus load to be reduced 20 percent below the predevelopment load, the required phosphorus reduction for the site is 0.61 lb/ac/yr. This reduction requirement will be satisfied with the purchase of nutrient credits.

Post-Development Project (Treatment Volume and Loads)

Enter Total Disturbed Area *(acres)* →	1.40
Maximum reduction required:	***20%***
The site's net increase in impervious cover (acres) is:	***0***
Post-Development TP Load Reduction for Site (lb/yr):	***0.61***

Pre-ReDevelopment Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals
Forest/Open Space (acres) -- undisturbed, protected forest/open space or reforested land					0.00
Managed Turf (acres) -- disturbed, graded for yards or other turf to be mowed/managed					0.00
Impervious Cover (acres)			1.40		1.40
					1.40

Post-Development Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals
Forest/Open Space (acres) -- undisturbed, protected forest/open space or reforested land					0.00
Managed Turf (acres) -- disturbed, graded for yards or other turf to be mowed/managed					0.00
Impervious Cover (acres)			1.40		1.40
Area Check	OK.	OK.	OK.	OK.	1.40

Final Post-Development Treatment Volume (acre-ft)	0.1108
Final Post-Development Treatment Volume (cubic feet)	4,828
Final Post-Development TP Load (lb/yr)	**3.03**
Final Post-Development TP Load per acre (lb/acre/yr)	2.17

5.2.3 Nutrient Trading Program

As calculations show in Section 5.2.2, the required phosphorus reduction for the M&R Station is 0.61 lb/ac/yr. This phosphorus removal requirement will be offset with the purchase of nutrient credits in accordance with the requirements below.

For that portion of a site's compliance with stormwater nonpoint nutrient runoff water quality criteria being obtained through nutrient credits, DETI will (i) comply with a 1:1 ratio of the nutrient credits to the site's remaining post-development nonpoint nutrient runoff compliance requirement being met by credit use and will (ii) use credits certified as perpetual credits pursuant to Article 4.02 (§ 62.1-44.19:12 et seq.).

Nutrient credits will be acquired in the same tributary as the M&R Station by identifying credits generated within the same or adjacent eight-digit hydrologic unit code as defined by the U.S. Geological Survey. Nutrient credits outside the same or adjacent eight-digit hydrologic unit code may only be used if it is determined that no credits are available within the same or adjacent eight-digit hydrologic unit code. In such cases, credits available within the same tributary may be used. However, in no case will credits from another tributary be used.

Documentation of DETI's acquisition of nutrient credits will be provided to the VDEQ prior to the commencement of land-disturbing activities at the M&R Station in a certification from the credit provider documenting the number of phosphorus nutrient credits acquired at the credit-generating entity (see Attachment 3). Until the effective date of regulations establishing application fees in accordance with § 62.1-44.19:20, the credit provider will pay the VDEQ a water quality enhancement fee equal to six percent of the amount paid by DETI for the credits. Such fee will be deposited into the Virginia Stormwater Management Fund established by § 62.1-44.15:29.

5.3 POST-CONSTRUCTION/PERMANENT BEST MANAGEMENT PRACTICES

5.3.1 Retention Pond

In accordance with VDEQ Stormwater Design Specification No. 14 (**Wet Pond**), DETI will adhere to the following general construction and maintenance specifications at the M&R Station to promote a suitable environment for gravitational settling, biological uptake, and microbial activity. Runoff from each new storm enters the pond and partially displaces pool water from previous storms. The pool acts as a barrier to re-suspension of sediments and other pollutants deposited during prior storms. A retention pond is located southwest of the M&R Station, as shown on the Site Plan (Attachment 1).

In addition, the following constraints will be observed:

- The surface area of a wet pond will normally be at least 1 to 3 percent of its contributing drainage area, depending on the pond's depth.
- A contributing drainage area of 10 to 25 acres is typically recommended for wet ponds to maintain constant water elevations.
- The depth of a wet pond is usually determined by the hydraulic head available on the site. The bottom elevation is normally the invert of the existing downstream conveyance system to which the wet pond discharges. Typically, a minimum of 6 to 8 feet of head are needed for a wet pond to function.

5.3.2 Permanent Seeding and Mulching

A *Restoration and Rehabilitation Plan* was prepared for the ACP to address post-construction restoration and rehabilitation activities. Refer to the Restoration and Rehabilitation Plan (Appendix R of the Virginia ACP SWPPP) for VESCH **Std. & Spec. 3.32 (Permanent Seeding)** and VESCH **Std. & Spec. 3.35 (Mulching)**. Specifically for seedbed preparation, seed mix selection, seeding methods, lime and fertilizer application, mulching, and supplemental planting.

In accordance with Virginia Minimum Standards (MS -1), permanent or temporary soil stabilization will be applied to denuded areas within seven (7) days after final grade is reached on any portion of the site. Temporary soil stabilization will be applied within seven (7) days to denuded areas that may not be at final grade but will remain dormant for longer than 14 days. Permanent stabilization will be applied to areas that are to be left dormant for more than one (1) year. A permanent vegetative cover will be established on denuded areas not otherwise permanently stabilized. Permanent vegetation will not be considered established until a ground cover is achieved that is uniform, mature enough to survive and will inhibit erosion.

5.4 LONG-TERM MAINTENANCE

In accordance with DETI's Standards and Specifications, long-term maintenance of structural SWM facilities must be conducted in accordance with 9VAC25-870-112. To be consistent with the provisions of 9VAC25-870-112, maintenance plans for the stormwater facilities must be submitted to DETI for formal review and approval prior to initiating the land disturbing activity, made available to VDEQ upon request, and must provide for inspections and maintenance and the submission of inspection and maintenance reports to the VDEQ. DETI transmission easements over land under which permanent SWM facilities will be placed must further assure the following:

- Be stated to run with the land;
- Provide for all necessary access to the property for purposes of maintenance and regulatory inspections; and
- Be enforceable by all appropriate governmental parties.

According to VDEQ Stormwater Design Specification No. 14 (**Wet Pond**), all wet ponds must be covered by a drainage easement to allow inspection and maintenance.

5.5 INSPECTIONS AND ONGOING MAINTENANCE

Maintenance of a wet pond is driven by annual inspections that evaluate the condition and performance of the pond, including the following:

- Measure sediment accumulation levels in the forebay.
- Inspect the condition of stormwater inlets to the pond for material damage, erosion, or undercutting.
- Inspect the banks of upstream and downstream channels for evidence of sloughing, animal burrows, boggy areas, woody growth, or gully erosion that may undermine embankment integrity.
- Inspect the pond outfall channel for erosion, undercutting, rip-rap displacement, woody growth, etc.
- Inspect the condition of the principal spillway and riser for evidence of spalling, joint failure, leakage, corrosion, etc.
- Inspect the condition of all trash racks, reverse-sloped pipes, or flashboard risers for evidence of clogging, leakage, debris accumulation, etc.
- Inspect maintenance access to ensure it is free of woody vegetation, and check to see whether valves, manholes, and locks can be opened and operated.

- Inspect internal and external side slopes of the pond for evidence of sparse vegetative cover, erosion, or slumping, and make needed repairs immediately. Based on inspection results, specific maintenance tasks will be triggered.

Maintenance is needed so stormwater ponds continue to operate as designed on a long-term basis. Wet ponds normally have fewer routine maintenance requirements than other stormwater control measures. Stormwater pond maintenance activities vary regarding the level of effort and expertise required to perform them. Routine stormwater pond maintenance, such as mowing and removing debris and trash, is needed several times each year (see Table 5.5-1). More significant maintenance (e.g., removing accumulated sediment) is needed less frequently but requires more skilled labor and special equipment. Inspection and repair of critical structural features (e.g., embankments and risers) needs to be performed by a qualified professional (e.g., a structural engineer) who has experience in the construction, inspection, and repair of these features. The maintenance plan should clearly outline how vegetation in the pond and its buffer will be managed or harvested in the future. Periodic mowing of the stormwater buffer is only required along maintenance rights-of-way and the embankment. The remaining buffer can be managed as a meadow (mowing every other year) or forest. The maintenance plan should schedule a shoreline cleanup at least once a year to remove trash and floatables.

Table 5.5-1

Typical Wet Pond Maintenance Tasks and Frequency

Maintenance Items	Frequency
Mowing – twice a year Remove debris and blockages Repair undercut, eroded, and bare soil areas	Quarterly or after major storms (>1 inch of rainfall)
Mowing	Twice a year
Shoreline cleanup to remove trash, debris, and floatables A full maintenance inspection Open up the riser to access and test the valves Repair broken mechanical components, if needed	Annually
Pond buffer and aquatic bench reinforcement plantings	One time during the second year following construction
Forebay sediment removal	Every 5 to 7 years
Repair pipes, the riser and spillway, as needed	From 5 to 25 years

6.0 POLLUTION PREVENTION PRACTICES AND PROCEDURES

The same pollution prevention practices and procedures provided in Section 6.0 of the main body of the SWPPP will be used at the M&R Station, as applicable.

7.0 ROLES AND RESPONSIBILITIES

DETI will use the same qualified personnel and Responsible Land Disturber at the M&R Station as identified in Section 7.0 in the main body of the SWPPP.

8.0 INSPECTION AND MAINTENANCE

The same inspection and maintenance requirements provided in Section 8.0 in the main body of the SWPPP are applicable to the M&R Station, with the exception of representative inspections which only apply to the pipeline right-of-way.

9.0 EMPLOYEE TRAINING

The employee training program described in Section 9.0 in the main body of the SWPPP applies to the M&R Station.

10.0 NOTIFICATION, RECORDKEEPING, AND REPORTING

Refer to Section 10.0 of the main body of the SWPPP for notification, recordkeeping, and reporting requirements.

In addition, according to DETI's Standards and Specifications for projects requiring post-construction SWM BMPs, DETI must report the following annually each year to VDEQ:

- Number and types of SWM BMPs installed;
- Geographic coordinates of each BMP;
- Drainage area or watershed size served; and
- Receiving stream or hydrologic unit.

11.0 REFERENCES

Dominion Transmission, Inc. 2017. Standards and Specification, Erosion and Sediment Control and Stormwater Management for Construction and Maintenance of Pipeline Projects in Virginia. May 2017.

LandScope America. 2014. *Mid-Atlantic Coastal Plain.* Available online at: http://www.landcope.org/explore/natural_geographies/ecoregions/Mid-Atlantic%20Coastal%20Plain/. Accessed October 2014.

Soil Survey Staff. 2015a. Web Soil Survey. Natural Resources Conservation Service, U.S. Department of Agriculture. Available online at http://websoilsurvey.nrcs.usda.gov/. Accessed June 2015.

Soil Survey Staff. 2015b. Official Soil Series Descriptions. Natural Resources Conservation Service, U.S. Department of Agriculture. Available online at https://soilseries.sc.egov.usda.gov/. Accessed June 2015.

U.S. Geological Survey. 1994. Hydrological Units Maps: United States Geological Survey Water-Supply Paper 2294. Available online at http://pubs.usgs.gov/wsp/wsp2294/pdf/wsp_2294.pdf. Accessed November 2016.

Virginia Department of Environmental Quality. 2011. *Virginia A DEQ Stormwater Design Specification No. 2* Version 1.9. Available online at Virginia Stormwater BMP Clearinghouse at http://www.vwrrc.vt.edu/swc/. Accessed December 2016

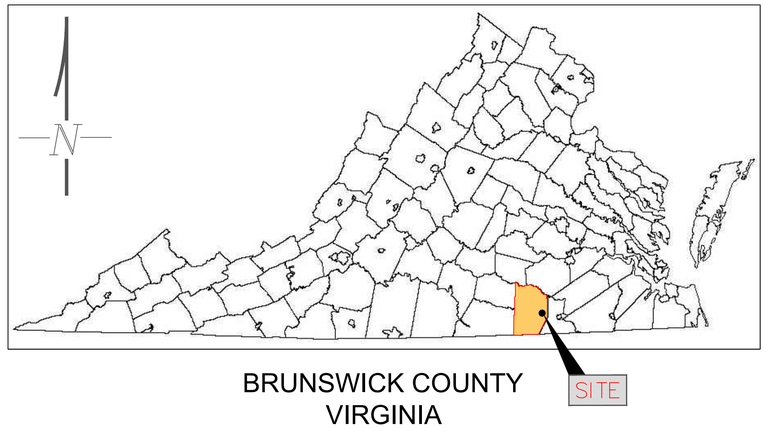
Virginia Department of Environmental Quality. 2011. *Virginia A DEQ Stormwater Design Specification No. 4* Version 1.9, Available online at Virginia Stormwater BMP Clearinghouse at http://www.vwrrc.vt.edu/swc/. Accessed December 2016

Virginia Department of Environmental Quality. 2015. Final 2014 305(b)/303(d) Water Quality Assessment Integrated Report; GIS Data. Available online at http://www.deq.virginia.gov/Programs/Water/WaterQualityInformationTMDLs/WaterQualityAssessments/2014305(b)303(d)IntegratedReport.aspx. Accessed November 2016.

ATTACHMENT 1

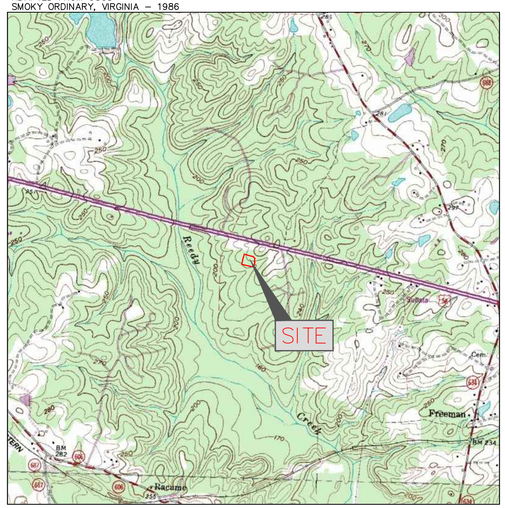
Erosion and Sediment Control and Stormwater Management Drawings and Supporting Calculations

BRUNSWICK M&R STATION
EROSION AND SEDIMENT CONTROL PLAN AND
POST-CONSTRUCTION STORMWATER MANAGEMENT PLAN



BRUNSWICK COUNTY
VIRGINIA

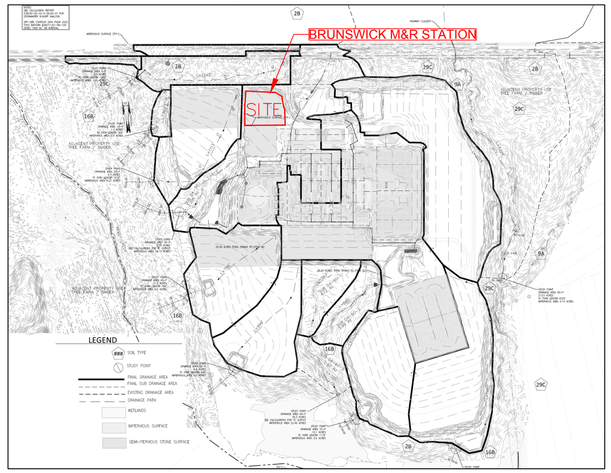
ADAPTED FROM USGS
SMOKY ORDINARY, VIRGINIA – 1986



36° 45' 58.77"N
77° 42' 51.67"W (NAD83)
BRUNSWICK COUNTY, VIRGINIA

SITE LOCATION MAP

0 2000 4000
APPROXIMATE
SCALE (IN FEET)



SITE VICINITY MAP

0 600 1200
APPROXIMATE
SCALE (IN FEET)

GENERAL NOTES

1. UNLESS OTHERWISE INDICATED, ALL VEGETATIVE AND STRUCTURAL EROSION AND SEDIMENT CONTROL PRACTICES WILL BE CONSTRUCTED AND MAINTAINED ACCORDING TO MINIMUM STANDARDS AND SPECIFICATIONS OF THE VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK AND VIRGINIA REGULATIONS 4VAC50–30 EROSION AND SEDIMENT CONTROL REGULATIONS.
2. THE PLAN APPROVING AUTHORITY MUST BE NOTIFIED ONE WEEK PRIOR TO THE PRE–CONSTRUCTION CONFERENCE, ONE WEEK PRIOR TO THE COMMENCEMENT OF LAND DISTURBING ACTIVITY, AND ONE WEEK PRIOR TO THE FINAL INSPECTION.
3. ALL EROSION AND SEDIMENT CONTROL MEASURES ARE TO BE PLACED PRIOR TO OR AS THE FIRST STEP IN CLEARING.
4. A COPY OF THE APPROVED EROSION AND SEDIMENT CONTROL PLAN SHALL BE MAINTAINED ON THE SITE AT ALL TIMES.
5. PRIOR TO COMMENCING LAND DISTURBING ACTIVITIES IN AREAS OTHER THAN INDICATED ON THESE PLANS (INCLUDING, BUT NOT LIMITED TO, OFF–SITE BORROW OR WASTE AREAS), THE CONTRACTOR SHALL SUBMIT A SUPPLEMENTARY EROSION CONTROL PLAN TO THE OWNER FOR REVIEW AND APPROVAL BY THE PLAN APPROVING AUTHORITY.
6. THE CONTRACTOR IS RESPONSIBLE FOR INSTALLATION OF ANY ADDITIONAL EROSION CONTROL MEASURES NECESSARY TO PREVENT EROSION AND SEDIMENTATION AS DETERMINED BY THE PLAN APPROVING AUTHORITY.
7. ALL DISTURBED AREAS ARE TO DRAIN TO APPROVED SEDIMENT CONTROL MEASURES AT ALL TIMES DURING LAND DISTURBING ACTIVITIES AND DURING SITE DEVELOPMENT UNTIL FINAL STABILIZATION IS ACHIEVED.
8. DURING DEWATERING OPERATIONS, WATER WILL BE PUMPED INTO AN APPROVED FILTERING DEVICE.
9. THE CONTRACTOR SHALL INSPECT ALL EROSION CONTROL MEASURES PERIODICALLY AND AFTER EACH RUNOFF–PRODUCING RAINFALL EVENT. ANY NECESSARY REPAIRS OR CLEANUP TO MAINTAIN THE EFFECTIVENESS OF THE EROSION CONTROL DEVICES SHALL BE MADE IMMEDIATELY.

LIST OF DRAWINGS

DRAWING NO.	TITLE
PD Z9949B	EROSION AND SEDIMENT CONTROL COVER SHEET
PD Z9949C	EROSION AND SEDIMENT CONTROL SITE PLAN
PD Z9949D	EROSION AND SEDIMENT CONTROL DETAILS

PROJECT NARRATIVE

PROJECT AND SITE DESCRIPTION

AS PART OF THE ATLANTIC COAST PIPELINE (ACP) PROJECT, DTI IS PROPOSING TO CONSTRUCT AN APPROXIMATELY 1.78–ACRE ABOVEGROUND METERING AND REGULATING STATION AT 20100 GOVERNOR HARRISON PARKWAY IN FREEMAN, BRUNSWICK COUNTY, VIRGINIA. THIS STATION, REFERRED TO AS THE BRUNSWICK M&R STATION (M&R STATION), WILL BE CO–LOCATED WITH THE VEP BRUNSWICK ELECTRIC POWER STATION (POWER STATION). SPECIFICALLY, THE PROPERTY IS WEST OF EMPORIA, VIRGINIA, LOCATED SOUTH OF GOVERNOR HARRISON PARKWAY (U.S. HIGHWAY 58), ABOUT ONE MILE WEST OF FREEMANS CROSS ROAD (COUNTY ROAD 634) IN FREEMAN, VIRGINIA. THE M&R STATION IS CO–LOCATED WITH THE POWER STATION (PARCEL NO.55–64D). THE M&R STATION WILL BE LOCATED ON THE NORTHERN PORTION OF THE GREATER PARCEL, SOUTH OF GOVERNOR HARRISON PARKWAY (HW 58). THE STORMWATER DRAINS SOUTHWEST TO AN EXISTING RETENTION POND CONTAINING A SHELF CONSTRUCTED AS PART OF THE LARGER EXISTING POWER STATION.

EXISTING SITE CONDITIONS

THE M&R STATION IS LOCATED ON DEVELOPED LAND, AND IS CURRENTLY A GRAVEL PARKING LOT. THE TOPOGRAPHY AT THE M&R STATION IS CHARACTERIZED BY GENTLY TO MODERATELY SLOPING TERRAIN. ELEVATION AT THE M&R STATION IS APPROXIMATELY 230 FEET ABOVE MEAN SEA LEVEL.

FULL PROJECT NARRATIVE HAS BEEN PROVIDED IN THE STORMWATER POLLUTION PREVENTION PLAN, APPENDIX G, EROSION AND SEDIMENT CONTROL AND STORMWATER MANAGEMENT PLAN FOR THE BRUNSWICK M&R STATION.

NOTE:
SITE VICINITY MAP PROVIDED BY FLUOR. MAP ENTITLED CIVIL EROSION AND SEDIMENT CONTROL FINAL CONDITIONS DRAINAGE AREA MAP WAS PROVIDED FOR THE VIRGINIA ELECTRIC AND POWER COMPANY BRUNSWICK COUNTY POWER STATION OVERALL STORMWATER MANAGEMENT AND EROSION AND SEDIMENT CONTROL PLANS.

SYM.	DATE	BY	REVISION INFORMATION	PROJECT/TASK	APP.
0	01/13/17	TS	ISSUED FOR REVIEW	0345197.011	SL

COMMONWEALTH OF VIRGINIA
DANIEL R. GOLDSTEIN
Lic. No. 047436
PROFESSIONAL ENGINEER

Environmental Resources Management
ERM

DRAWN:	YMT	01/11/17
CHECKED:	KC	01/13/17
APP. FOR BID:		
APP. FOR CONST.:		
SCALE:	AS NOTED	

Atlantic Coast Pipeline, LLC
925 White Oaks Blvd. Bridgeport, West Virginia 26330 / 681-842-8000

TITLE: BRUNSWICK M&R STATION
EROSION AND SEDIMENT CONTROL COVER SHEET

DISTRICT:	COUNTY:	STATE:	GROUP	DWG. NO.	REV.
FREEMAN	BRUNSWICK	VA	PD	Z9949B	0

DIR/FILE: ACP\Virginia\M&R Stations\Brunswick\ESC

20' 10' 0 20'

SCALE : 1" = 20'

CONTOUR INTERVAL : 1 FEET

CONTOUR INTERVAL: 2 FOOT

DATUM: UTM 17 NAD 83

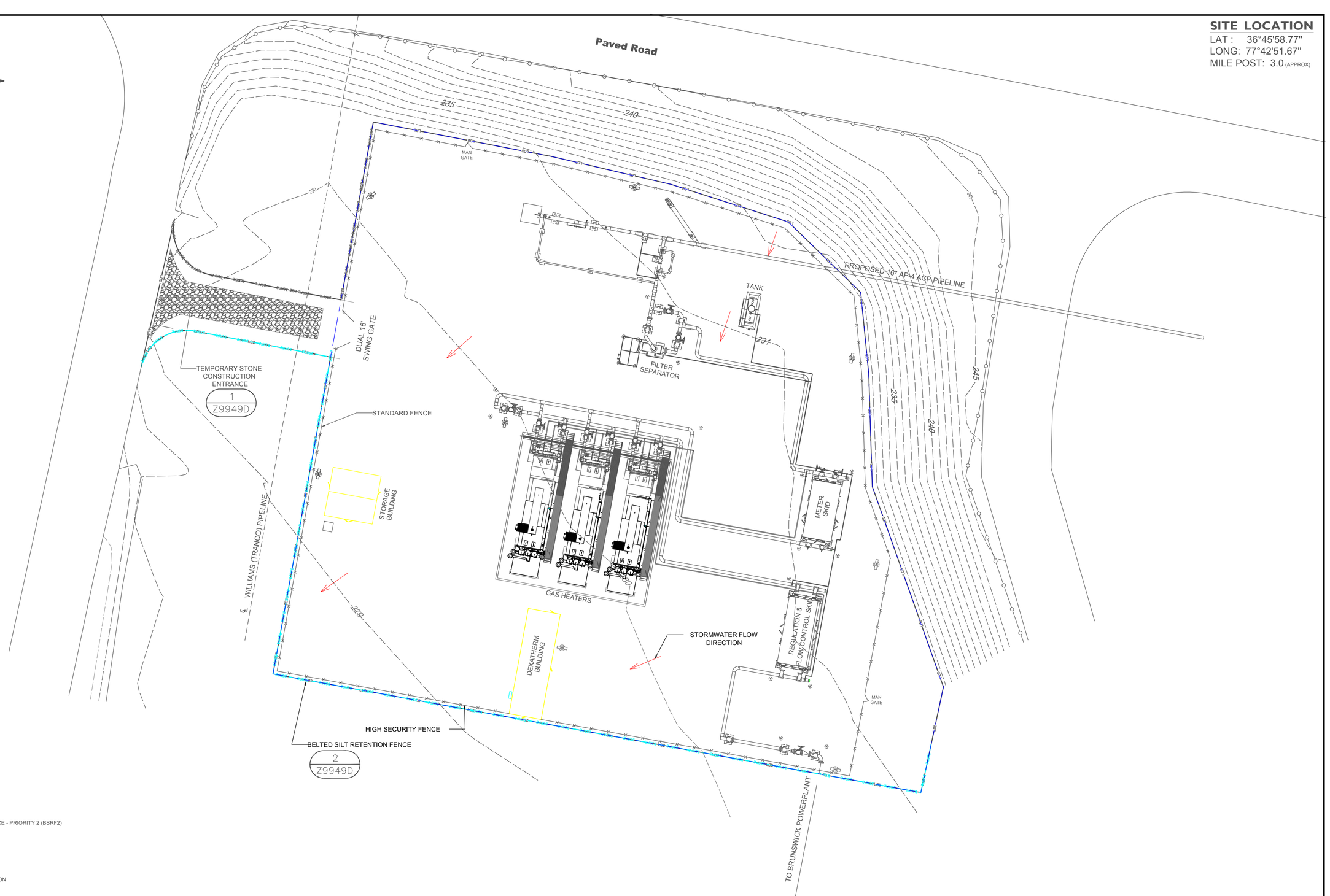
N

SITE LOCATION

LAT : 36°45'58.77"

LONG: 77°42'51.67"

MILE POST: 3.0 (APPROX)



LEGEND

- PROPERTY LINE
- LOD — LIMIT OF DISTURBANCE
- BSRF② — BELTED SILT RETENTION FENCE - PRIORITY 2 (BSRF2)
- EXISTING CONTOURS
- EXISTING PIPELINE
- PROPOSED PIPELINE
- STANDARD FENCE
- HIGH SECURITY FENCE
- STORMWATER FLOW DIRECTION

GENERAL NOTES AND COMMENTS:

1. BASE MAP PROVIDED BY I3 ENGINEERING AND CONSULTING, LLC.
2. LIMITS OF CLEARING AND GRADING IS APPROXIMATELY 1.78 ACRES WITHIN THE LIMIT OF DISTURBANCE SHOWN.
3. THE M&R STATION IS CO-LOCATED IN THE BRUNSWICK COUNTY POWER STATION WHICH IS DIVIDED INTO 10 DRAINAGE AREAS. AS APART OF DRAINAGE AREA 30 (DA-30, APPROXIMATELY 20.58 ACRES IN TOTAL), STORMWATER DRAINS SOUTHWEST TO AN EXISTING RETENTION POND CONTAINING A SHELF CONSTRUCTED AS PART OF THE LARGER EXISTING POWER STATION.
4. SOIL TYPES THAT ARE PRESENT AT THE M&R STATION INCLUDE 2B APPLING-MATTAPONI AND 29C WEDOWEE.
5. THE M&R STATION IS LOCATED WITHIN THE REEDY CREEK WATERSHED. NO CRITICAL OR SENSITIVE AREAS WILL BE IMPACTED BY THE CONSTRUCTION OF THIS SITE.
6. CHANGES IN EXISTING CONTOURS ARE NOT EXPECTED. PROPOSED DEVELOPMENT MAY REQUIRE MINOR GRADING TO ACHIEVE PROPER DRAINAGE.
7. THE M&R STATION IS LOCATED ON DEVELOPED LAND, AND IS CURRENTLY A GRAVEL PARKING LOT. THEREFORE, THERE WILL BE NO NET INCREASE IN IMPERVIOUS AREA AS A RESULT OF CONSTRUCTION.

SYM.	DATE	BY	REVISION INFORMATION	PROJECT/TASK	APP.
0	01/13/17	TS	ISSUED FOR REVIEW	0345197.011	SL

COMMONWEALTH OF VIRGINIA
DANIEL R. GOLDSTEIN
Lic. No. 047436
PROFESSIONAL ENGINEER

Environmental Resources Management

DRAWN:	YMT	01/11/17
CHECKED:	KC	01/13/17
APP. FOR BID:		
APP. FOR CONST.:		
SCALE:	AS NOTED	

Atlantic Coast Pipeline, LLC

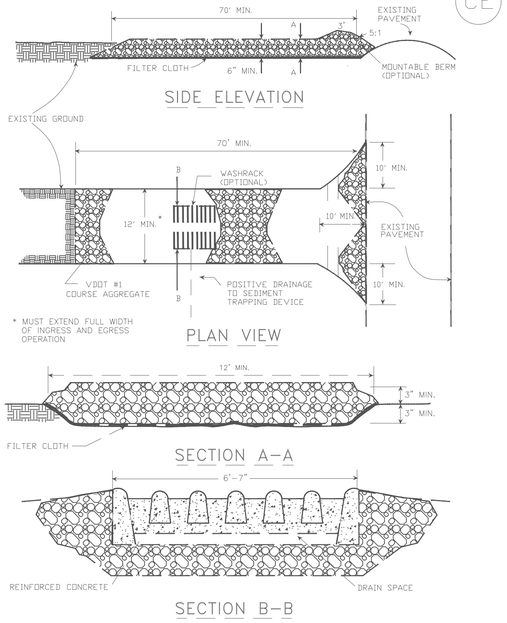
925 White Oaks Blvd. Bridgeport, West Virginia 26330 / 681-842-8000

TITLE:

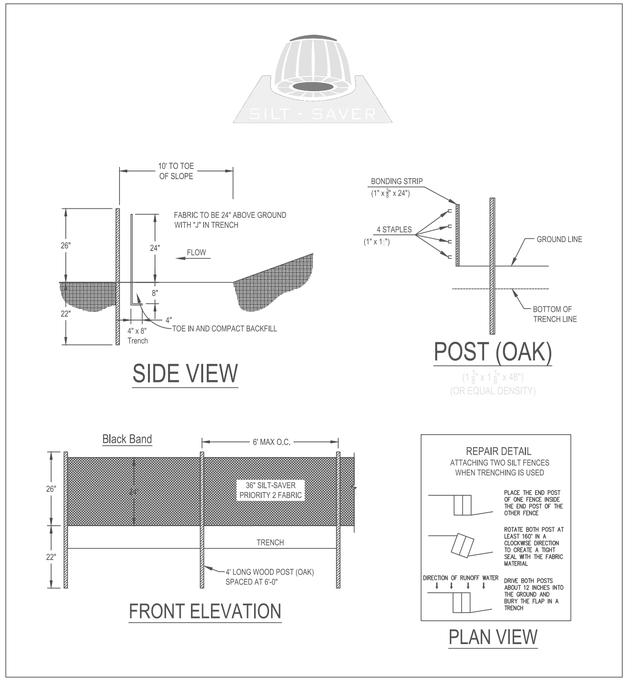
BRUNSWICK M&R STATION
EROSION AND SEDIMENT CONTROL SITE PLAN

DISTRICT:	COUNTY:	STATE:	GROUP	DWG. NO.	REV.
FREEMAN	BRUNSWICK	VA	PD	Z9949C	0

DIR/FILE: ACP\Virginia\M&R Stations\Brunswick\ESC



1 Z9949C **TEMPORARY STONE CONSTRUCTION ENTRANCE**
NOT TO SCALE



2 Z9949C **BELTED SILT RETENTION FENCE PRIORITY 2 (BSRF2)**
NOT TO SCALE

SEQUENCE OF CONSTRUCTION:

1. A PRE–CONSTRUCTION MEETING SHALL TAKE PLACE PRIOR TO START OF CONSTRUCTION ACTIVITIES.
2. INSTALL BELTED SILT RETENTION FENCE AS SHOWN ON PLANS. ALL EROSION AND SEDIMENT CONTROL MEASURES ARE TO BE PLACED PRIOR TO OR AS THE FIRST STEP IN CLEARING.
3. BEGIN CLEARING AND GRUBBING SITE AS NEEDED.
4. GRADE SITE ACCORDING TO THE CONTRACT DOCUMENTS. MAINTAIN EROSION CONTROL DEVICES AS NEEDED.
5. GRASS OR OTHERWISE STABILIZE ALL AREAS AS THEY ARE BROUGHT TO FINAL GRADES.
6. THE CONTRACTOR SHALL DILIGENTLY AND CONTINUOUSLY MAINTAIN ALL EROSION CONTROL DEVICES AND STRUCTURES TO MINIMIZE EROSION. INSPECT AND REPAIR MEASURES AFTER EACH RAINFALL AND AS NEEDED THROUGHOUT THE PROJECT.
7. CONTRACTOR TO LEAVE ALL EROSION CONTROL DEVICES IN PLACE AT THE CONCLUSION OF THIS CONTRACT. CONTRACTOR IS TO CLEAN–OUT, REPAIR AND GRASS STABILIZE ALL DENUDED AREAS. ALL AREAS WILL BE RETURNED TO THE STATE OF EXISTING CONDITIONS PRIOR TO CONTRACT AS A MINIMUM.
8. IT IS THE CONTRACTOR'S RESPONSIBILITY TO CONTAIN SEDIMENT ONSITE. ADDITIONAL EROSION CONTROL MEASURES MAY BE REQUIRED BY THE ENGINEER.
9. ALL EROSION CONTROL MEASURES SHALL BE IN ACCORDANCE WITH THE VIRGINIA EROSION AND SEDIMENTATION CONTROL HANDBOOK (VESCH) (1992, 3RD EDITION) STANDARDS AND SPECIFICATIONS.

TEMPORARY STONE CONSTRUCTION ENTRANCE NOTES

1. VDOT #1 COARSE AGGREGATE (2– TO 3–INCH STONE) SHOULD BE USED.
2. AGGREGATE LAYER SHALL BE AT LEAST 6 INCHES THICK; A MINIMUM THREE INCHES OF AGGREGATE SHALL BE PLACED IN A CUT SECTION TO GIVE THE ENTRANCE ADDED STABILITY AND TO HELP SECURE FILTER CLOTH SEPARATOR. AGGREGATE LAYER MUST EXTEND THE FULL WIDTH OF THE VEHICULAR INGRESS AND EGRESS AREA AND HAVE A MINIMUM 12–FOOT WIDTH.
3. LENGTH OF THE ENTRANCE SHALL BE AT LEAST 70 FEET.
4. ENTRANCE SHALL BE EXCAVATED A MINIMUM OF 3 INCHES AND MUST BE CLEARED OF ALL VEGETATION, ROOTS, AND OTHER OBJECTIONABLE MATERIAL BEFORE FILTER FABRIC UNDERLINER IS PLACED.
5. FILTER FABRIC UTILIZED SHALL BE A WOVEN OR NONWOVEN FABRIC CONSISTING ONLY OF CONTINUOUS CHAIN POLYMERIC FILAMENTS OR YARNS OF POLYESTER. FABRIC SHALL BE INERT TO COMMONLY ENCOUNTERED CHEMICALS AND HYDROCARBONS, BE MILDEW AND ROT RESISTANT, AND CONFORM TO THE PHYSICAL PROPERTIES NOTED IN TABLE 3.02–A OF THE VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK (VESCH) (1992, 3RD EDITION) STANDARDS AND SPECIFICATIONS.

TEMPORARY STONE CONSTRUCTION ENTRANCE MAINTENANCE NOTES

1. ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOW OF MUD ONTO PUBLIC RIGHTS–OF–WAY.
2. IF ANY INADVERTENT SEDIMENT TRACKING OCCURS ON THE PUBLIC ROADWAY, THE ROAD SHALL BE CLEANED THOROUGHLY BY THE END OF EACH DAY.
3. ENTRANCE MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE OR THE WASHING AND REWORKING OF EXISTING STONE AS CONDITIONS DEMAND AND REPAIR AND/OR CLEANOUT OF ANY STRUCTURES USED TO TRAP SEDIMENT.
4. ALL MATERIALS SPILLED, DROPPED, WASHED, OR TRACKED FROM VEHICLES ONTO ROADWAYS OR INTO STORM DRAINS MUST BE REMOVED IMMEDIATELY.
5. THE USE OF WATER TRUCKS TO REMOVE MATERIALS DROPPED, WASHED, OR TRACKED ONTO ROADWAYS WILL NOT BE PERMITTED UNDER ANY CIRCUMSTANCES.

BELTED SILT RETENTION FENCE – PRIORITY 2 NOTES

1. CONTRACTOR WILL UTILIZE THE BSRF2 MEDIUM–DUTY SILT FENCE CONSTRUCTED WITH A 36–INCH, NON–WOVEN, SPUN–BOND FABRIC THAT IS CALENDARED ON ONE SIDE.
2. BSRF2 SHALL BE INSTALLED IN ACCORDANCE WITH THE SPECIFICATIONS AND INSTALLATION INSTRUCTIONS PROVIDED IN THE STORMWATER POLLUTION PREVENTION PLAN, APPENDIX F, EROSION AND SEDIMENT CONTROL AND STORMWATER MANAGEMENT PLAN FOR BRUNSWICK M&R STATION, APPENDIX A.

BELTED SILT RETENTION FENCE – PRIORITY 2 MAINTENANCE NOTES

1. BSRF2 SHALL BE INSPECTED AT THE END OF EACH WORK DAY AND IMMEDIATELY AFTER EACH RAINFALL EVENT. ANY REQUIRED REPAIRS SHALL BE MADE IMMEDIATELY IN ACCORDANCE WITH THE DESIGN DETAILS AND SPECIFICATIONS.
2. ACCUMULATED SEDIMENT SHOULD BE REMOVED AFTER EACH STORM EVENT AND WHEN DEPOSITS REACH APPROXIMATELY ONE–HALF THE HEIGHT OF THE FENCE TO PREVENT FAILURES.
3. ANY DEPOSITS REMAINING IN PLACE AFTER THE FENCE IS NO LONGER REQUIRED SHALL BE DRESSED TO CONFORM WITH THE EXISTING GRADE, PREPARED AND SEEDED.

GENERAL NOTES AND COMMENTS:

SYM.	DATE	BY	REVISION INFORMATION	PROJECT/TASK	APP.
0	01/13/17	TS	ISSUED FOR REVIEW	0345197.011	SL

COMMONWEALTH OF VIRGINIA
DANIEL R. GOLDSTEIN
Lic. No. 047436
PROFESSIONAL ENGINEER

Environmental Resources Management

DRAWN:	YMT	01/11/17
CHECKED:	KC	01/13/17
APP. FOR BID:		
APP. FOR CONST.:		
SCALE:	AS NOTED	

Atlantic Coast Pipeline, LLC
925 White Oaks Blvd. Bridgeport, West Virginia 26330 / 681-842-8000

TITLE: **BRUNSWICK M&R STATION**
EROSION AND SEDIMENT CONTROL DETAILS

DISTRICT:	COUNTY:	STATE:	GROUP	DWG. NO.	REV.
FREEMAN	BRUNSWICK	VA	PD	Z9949D	0

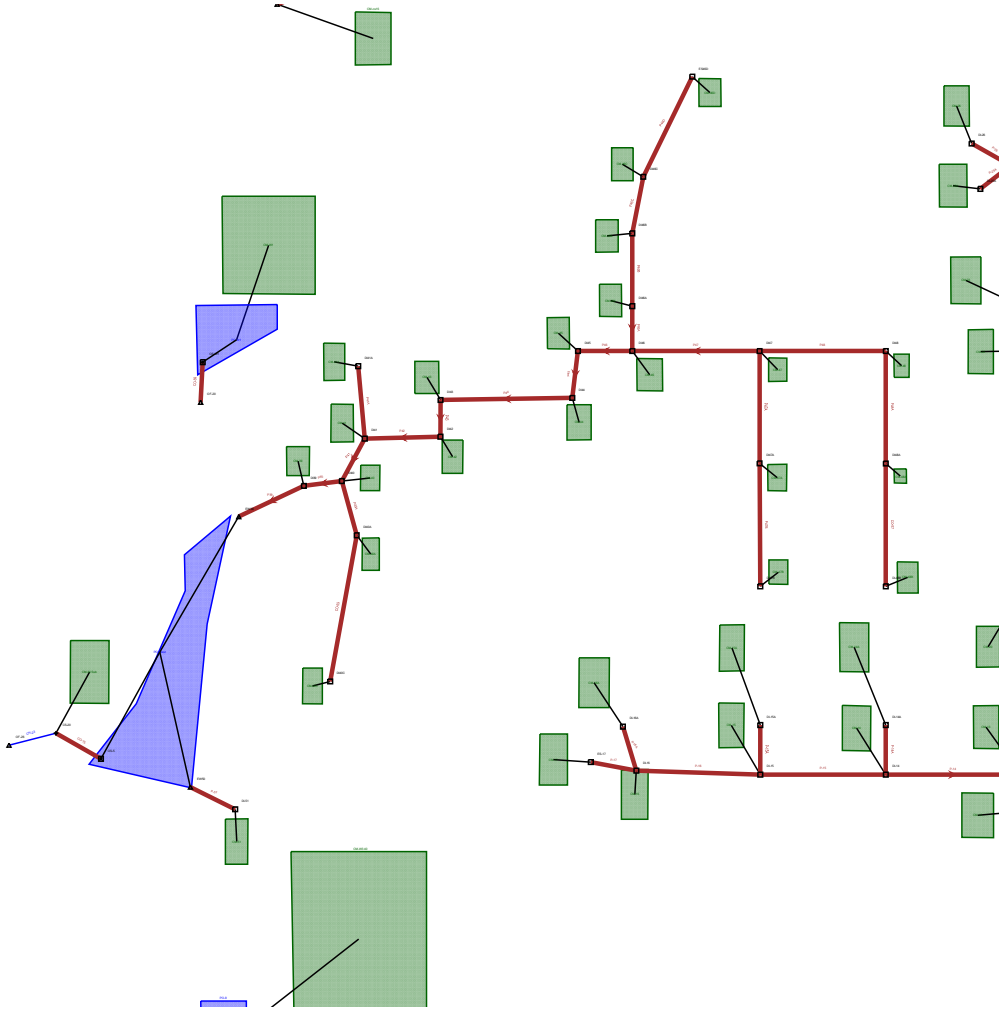
DIR/FILE: ACP\Virginia\M&R Stations\Brunswick\ESC

FLUOR®

STORM WATER SYSTEM AND EROSION CONTROL CALCULATIONS

ATTACHMENT 06: DRAINAGE AREA 30 (DA-30) CALCULATIONS

Scenario: Base



DRAINAGE AREA 30 (DA-30)

Description:

Drainage Area 30 consist of wooded/grass mix in the existing conditions. The area is being used for facilities and laydown use in the intermediate conditions.

In the final condition, the area will be permanent facilities and will be controlled with a permanent retention pond designed to meet water quality as well as quantity regulations.

Compliance:

Virginia DWQ requires the 10-year flow to not exceed existing conditions. The proposed improvements will be controlled through a permanent retention pond and will not increase the flow.

MS-19 requirements are also meet in that the existing channel was studied and found to be adequate to handle the increased flow of the 2-year storm. The net increase is only 0.09 cfs in the 2-year event.

Calculations for existing conditions flow:

The existing drainage pattern is homogeneous and will not require routing calculations. Win TR-55 output files are provided in the calculations section of the report (see TR-55 tab) and the results are summarized in the following pages of this short report.

Calculations for final conditions flow:

The proposed conditions will require routing through the drainage system, pond and to include contributing flows between the outlet and study point. Bently Civil Storm software is being used in TR-55/TR-20 mode.

The output files are provided in the calculations section of the report (see Calc Tab) and are summarized in the following pages of this short report.

Calculations for Channel Adequacy:

The existing channel from DA-30 ends at the floodplain of Reedy Creek. The final conditions results are nearly identical to the existing conditions and are adequate for channel velocity and shear.

The channel crosses a vehicle access trail about 200' from the floodplain and does not have active erosion across the bare earth crossing.

The channel has a gravel and silty-clay bottom and grassy sides with willows and undergrowth. There are a few areas of wetlands along the channel as shown on the plans.

The channel has been protected with a 50' tree buffer which is twice the regulated buffer distance of 25'.

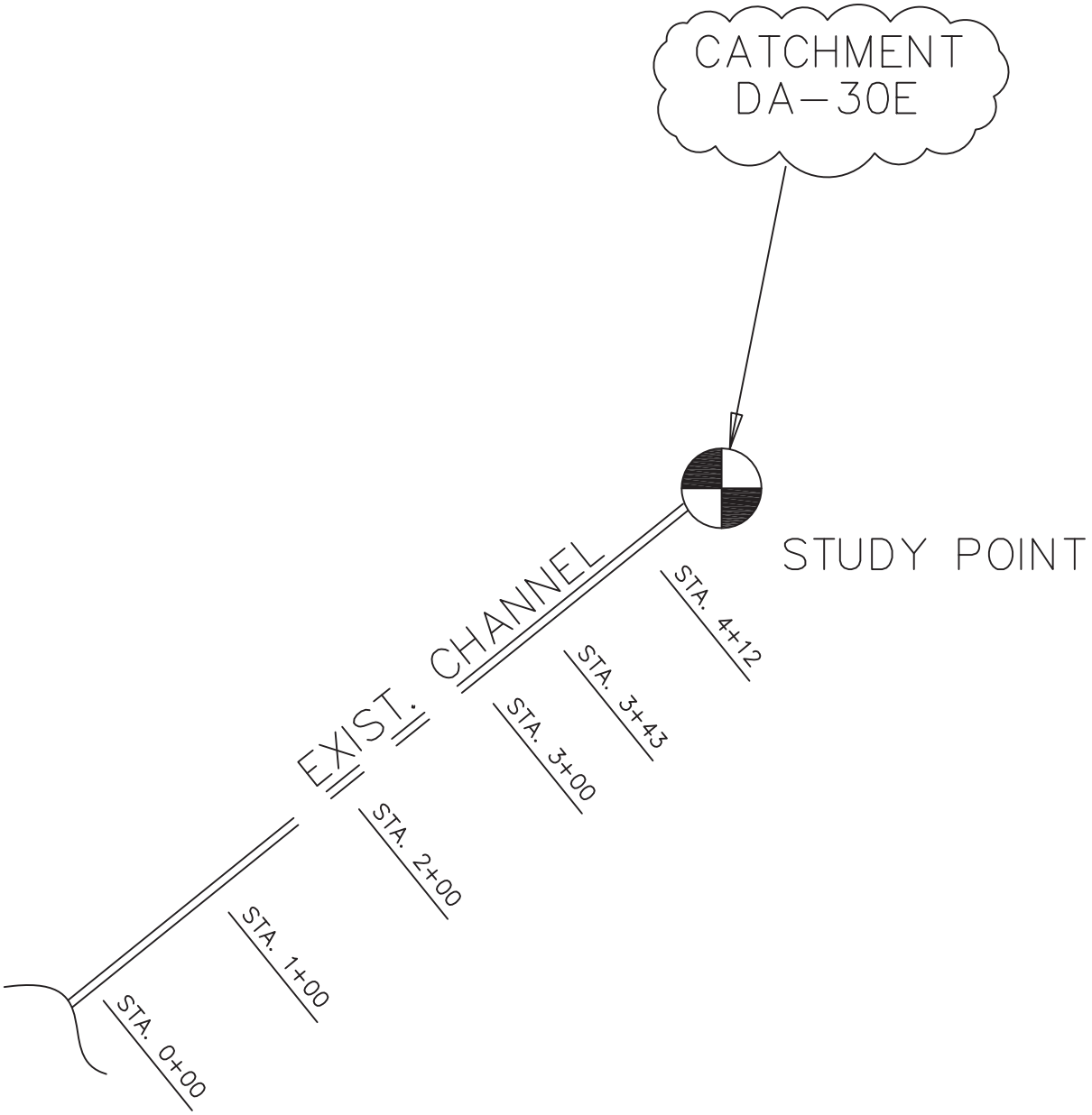
DA-30 Flow Summary			
	2-Yr	**10-Yr**	**100-Yr**
Existing Conditions Flow (cfs)	8.73	31.06	62.95
Proposed Conditions Flow (cfs)	8.82	19.03	70.33

Summary of Channel Velocity in Final Conditions			
Stattion	**Velocity (fps)**	**Flow (cfs)**	**Max. V Allowed (fps)**
0+00	1.68	8.82	2.5
1+00	1.97	8.82	2.5
2+00	2.39	8.82	2.5
3+00	1.44	8.82	2.5
3+43	1.3	8.82	2.5
4+12	1.51	8.82	2.5

Max. Permissible Velocity from Table 5-22 or the Virginia Erosion Control Handbook

WATERSHED MODEL SCHEMATIC

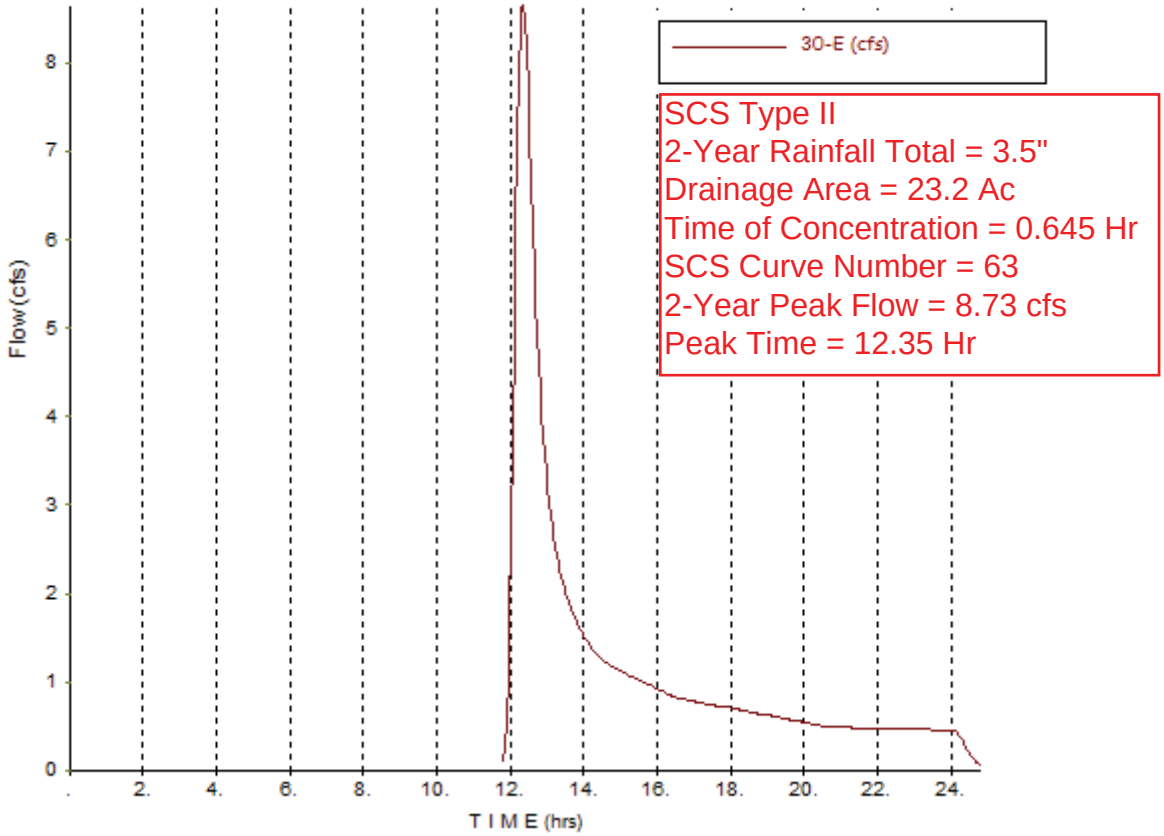
DRAINAGE AREA 30 (DA-30)
EXISTING CONDITIONS



WinTR-55 Output Hydrograph **Project: Brunswick Co Power Sta** 10/24/2013

Subarea: (30-E) Storm: 2-Yr

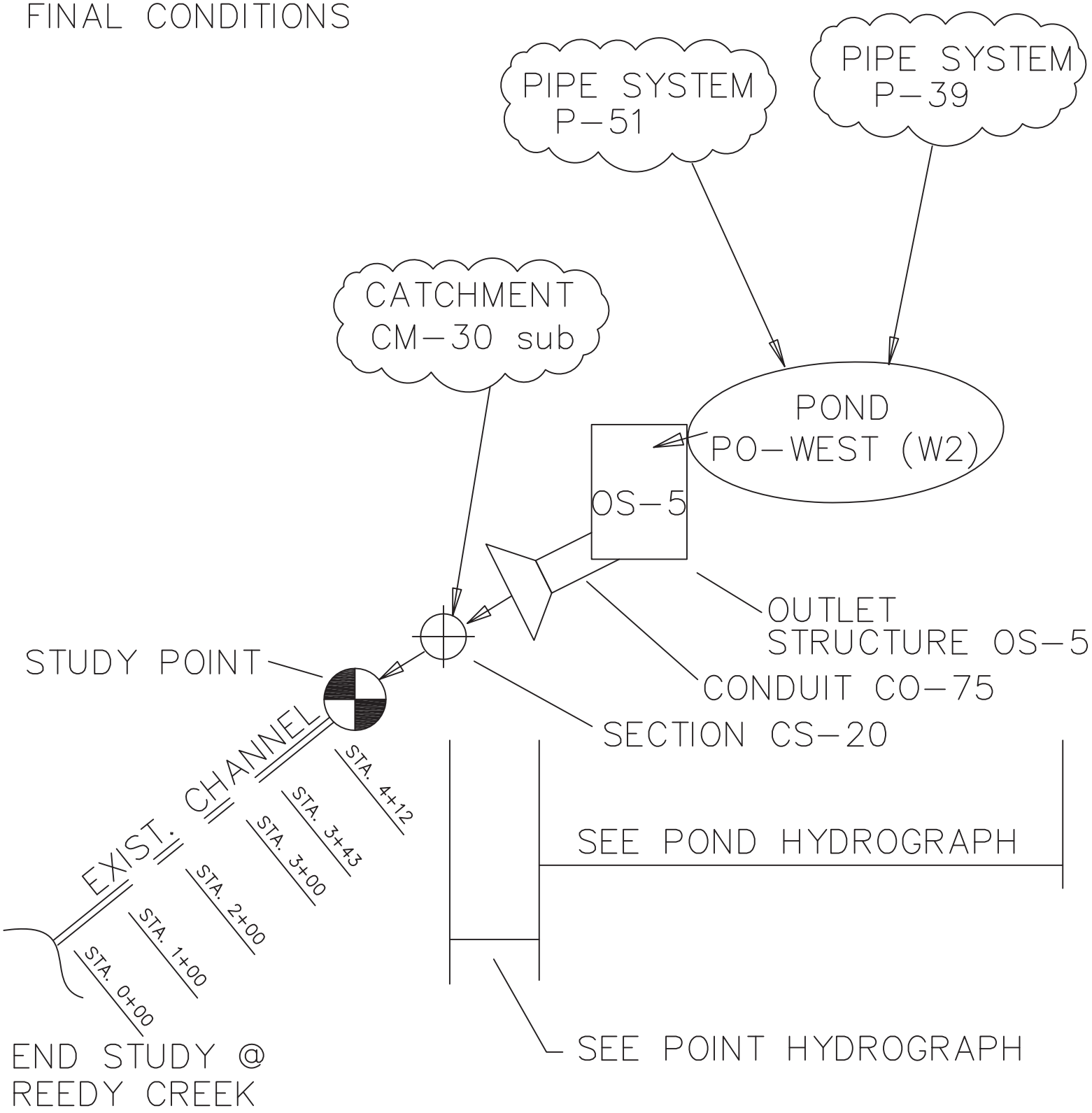
E:\Brunswick Co GAS\Brunswick ESC\Win TR55 Brunswick Existing.w55



SCS Type II
2-Year Rainfall Total = 3.5"
Drainage Area = 23.2 Ac
Time of Concentration = 0.645 Hr
SCS Curve Number = 63
2-Year Peak Flow = 8.73 cfs
Peak Time = 12.35 Hr

WATERSHED MODEL SCHEMATIC

DRAINAGE AREA 30 (DA-30)
FINAL CONDITIONS



DA-30, Pond W2 (PO-West) Spillway Rating Table

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)	Contributing Structures
198.00	0.00	198.00	0	None Contributing
199.00	0.00	198.00	0	None Contributing
200.00	0.00	198.00	0	None Contributing
201.00	0.00	198.00	0	None Contributing
202.00	0.00	198.00	0	None Contributing
203.00	0.00	198.00	0	None Contributing
204.00	0.00	198.00	0	None Contributing
204.50	0.00	198.00	0	2-yr Orifice
205.00	7.66	198.00	0	2-yr Orifice
205.76	12.16	198.00	0	2-yr Orifice + 10yr Weir
206.00	15.03	198.00	0	2-yr Orifice + 10yr Weir
206.90	35.03	198.00	0	2-yr Orifice + 10yr Weir + ESPWY
207.00	39.35	198.00	0	2-yr Orifice + 10yr Weir + ESPWY
208.00	125.92	198.00	0	2-yr Orifice + 10yr Weir + ESPWY

2-Yr Max. WSE = 205.16
2-Yr Outflow = 8.61 cfs

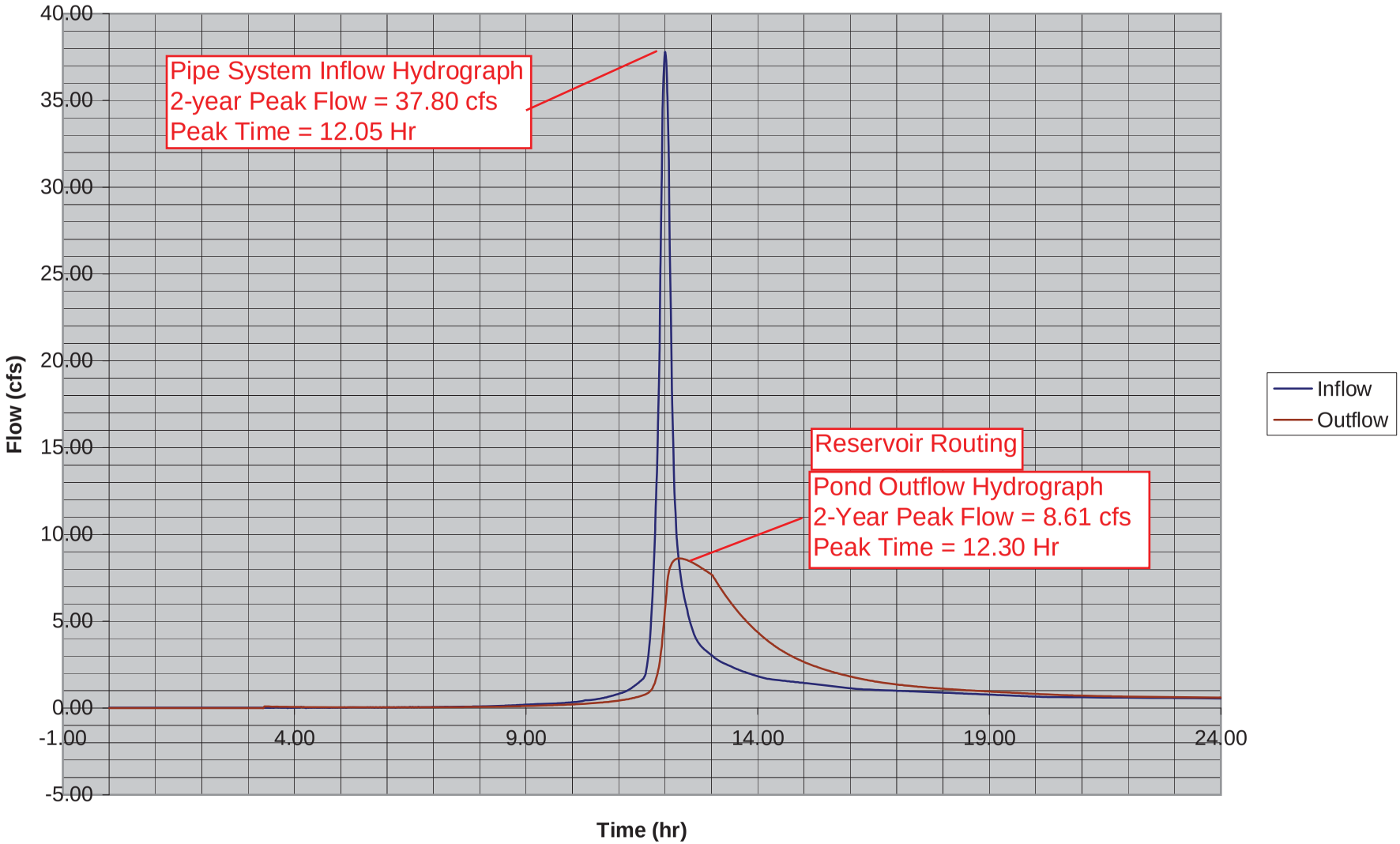
10-Yr Max. WSE = 206.14
10-Yr Outflow = 18.05 cfs

25-Yr Max. WSE = 206.45
25-Yr Outflow = 24.98 cfs

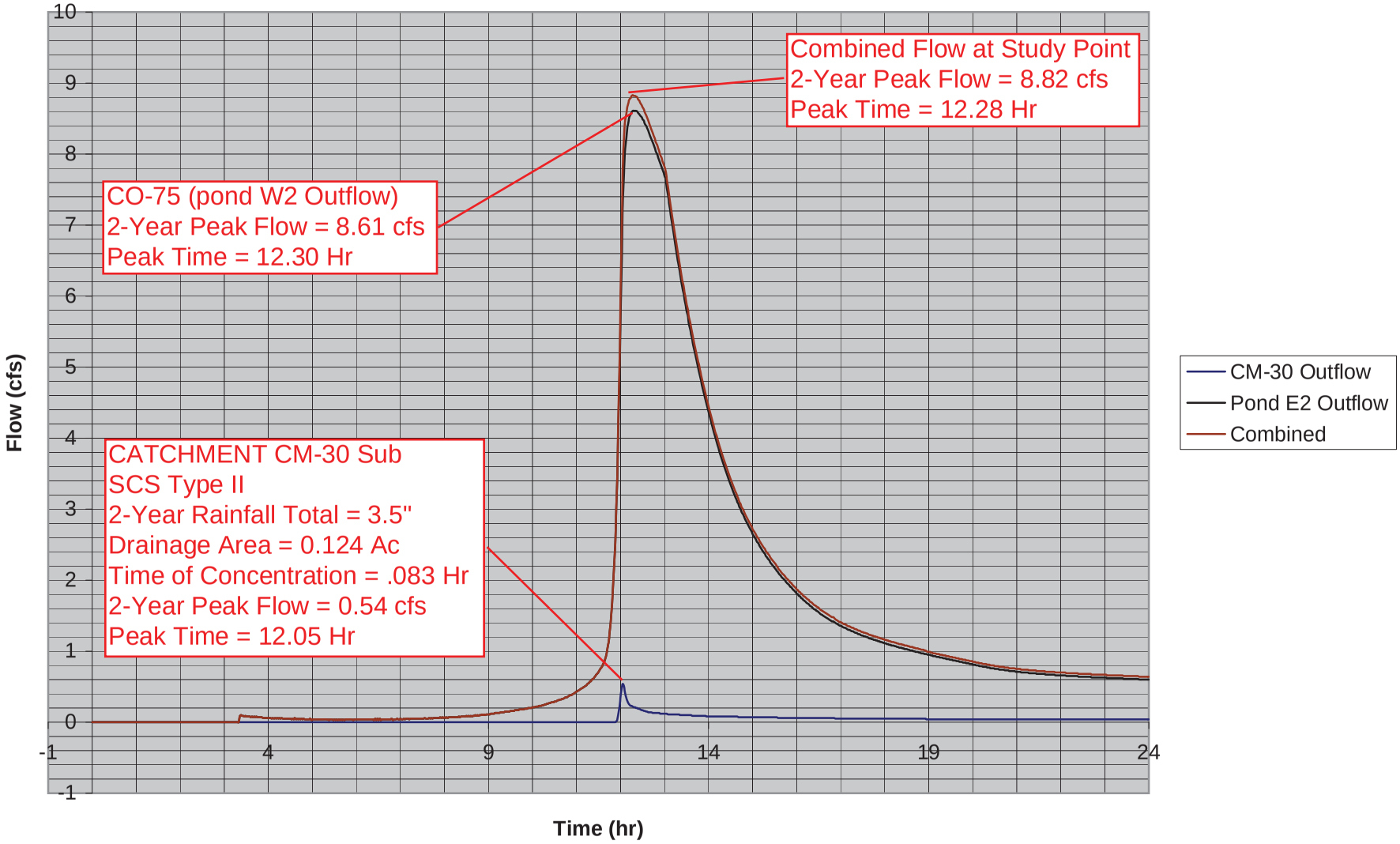
100-Yr Max. WSE = 207.20
100-Yr Outflow = 56.41 cfs

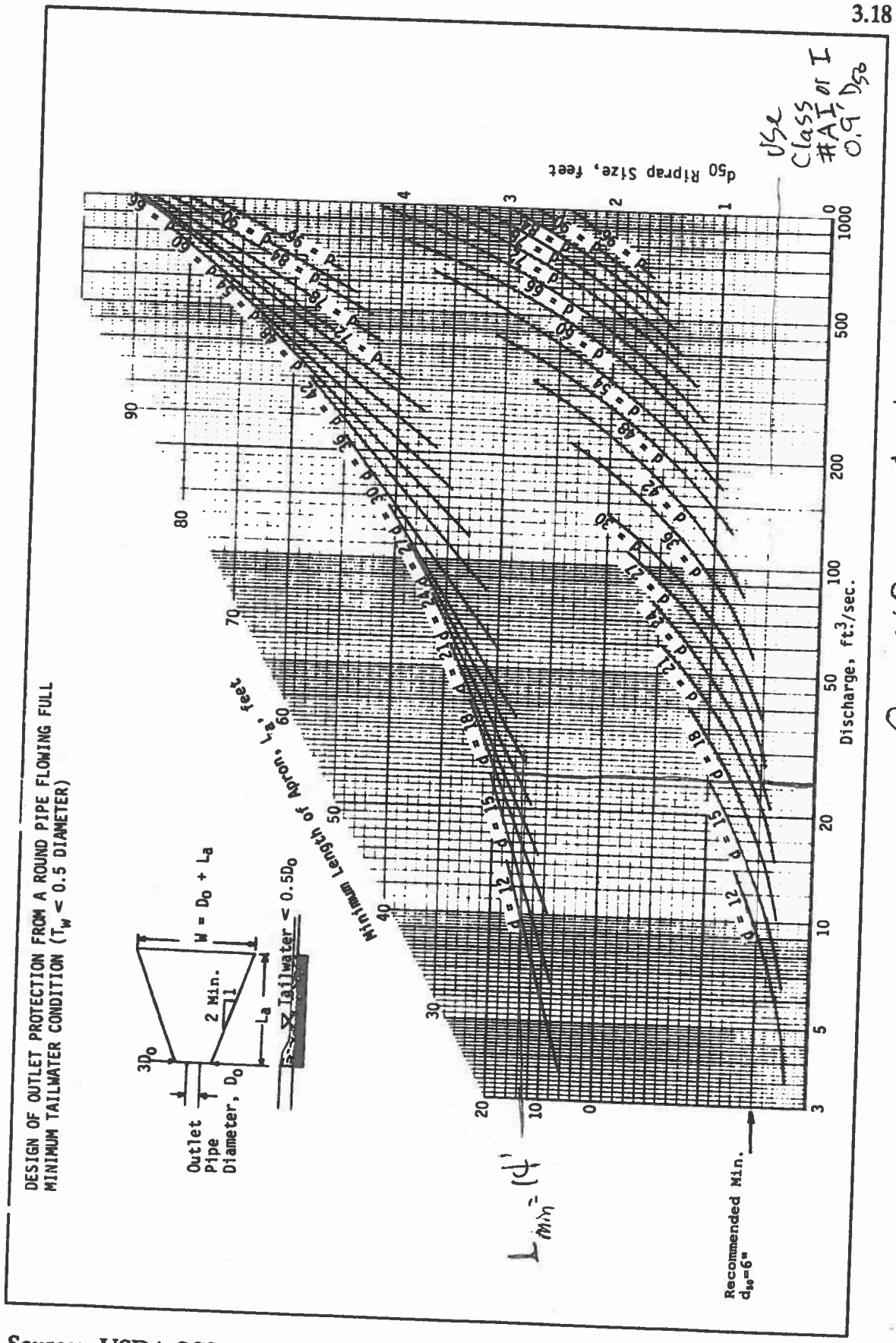
2 Year Orifice: 2.3 sf area at Elev. 204.50
10 year Weir: 5 lf at Elev. 205.76
ESPWY: 16 lf at Elev. 206.90

DA-30 Pond E2 Inflow/Outflow 2-Year Storm



DA-30 Study Point Hydrograph

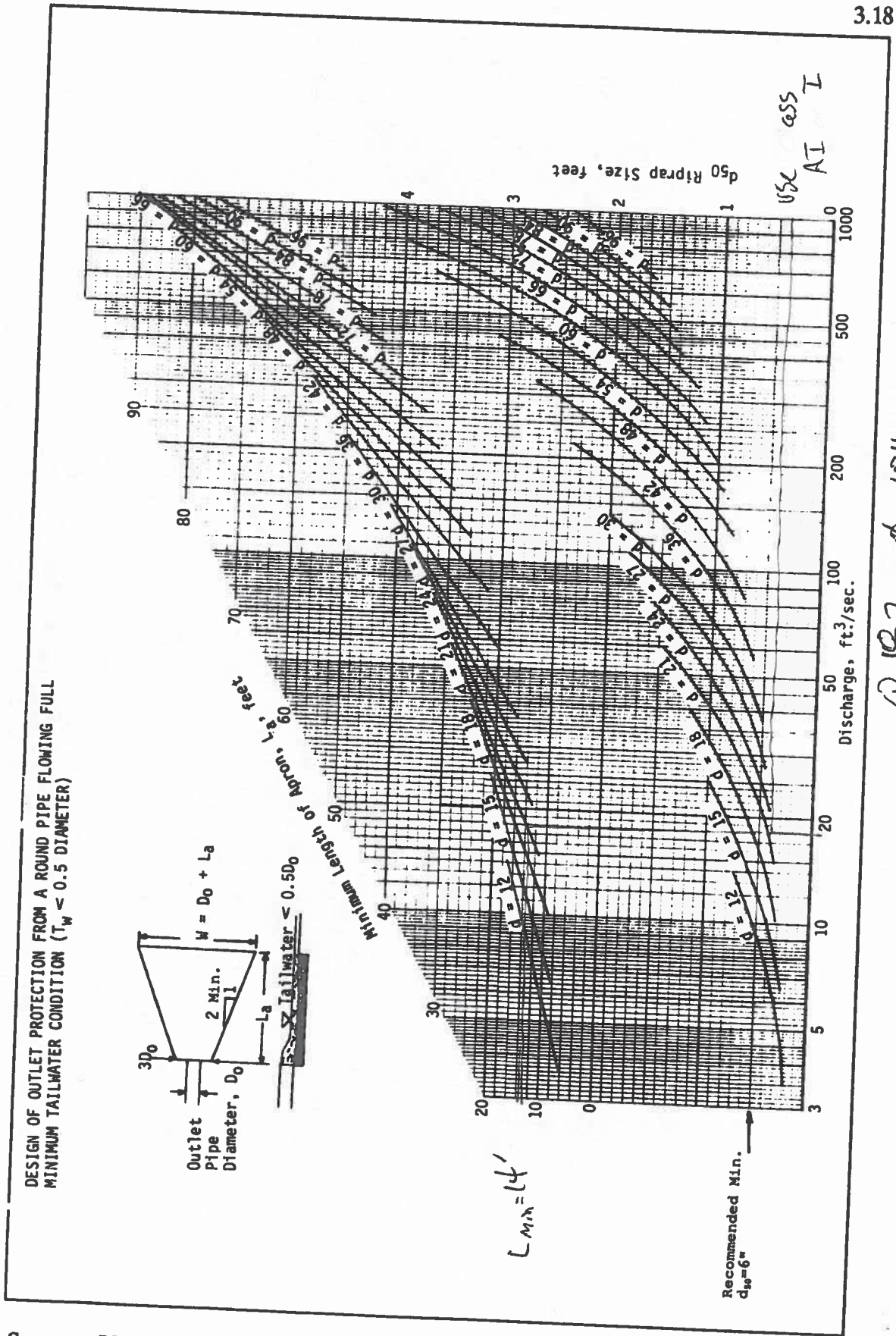




Source: USDA-SCS

Plate 3.18-3

Access Rd Pipe #2



Source: USDA-SCS

Plate 3.18-3

Brunswick County Station
30-P Sta. 0+00

Input Parameters- English Units

Manning's N Value	0.04000	
Manning Method	Horton	
Channel Slope	0.01800	ft/ft
Normal Depth	0.34	ft
Channel Discharge	8.82	cfs
Solve For	Normal Depth	

Channel Section- English Units

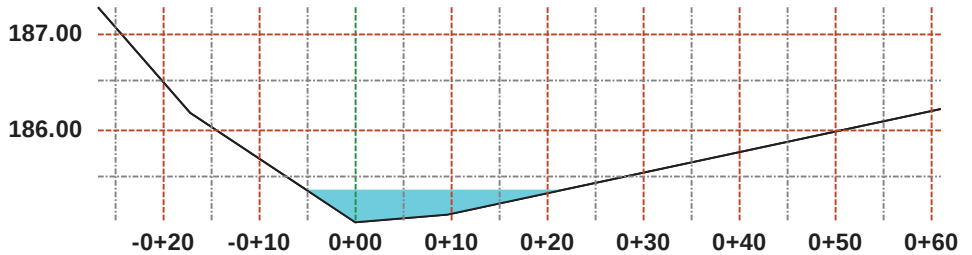
Station (ft)	Elevation (ft)	Start N-Value
-0+26.80	187.28	0.04500
-0+17.10	186.17	0.04000
0+00.00	185.03	0.04000
0+09.60	185.11	0.04000
0+61.00	186.21	0.04500

Output Parameters- English Units

Water Surface Elevation	185.37	ft
Flow Area	5.24	sq.ft.
Wetted Perimeter	26.66	ft
Top Width	26.64	ft
Hydraulic Depth	0.197	ft
Hydraulic Radius	0.196	ft
Critical Depth	0.28	ft
Critical Slope	0.04251	ft/ft
Velocity	1.68	ft/s
Velocity Head	0.04	ft
Specific Energy	0.38	ft
Froude Number	0.670	
Velocity x Depth Product	0.57	sq.ft./s
Flow Type	Sub-Critical	
Turbulent Flow	Yes	

Channel Notes

2yr Flow



Horizontal Scale 1"=20 ft Vertical Scale: 1"=2 ft

Brunswick County Station
30-P Sta. 1+00

Input Parameters- English Units

Manning's N Value	0.04000	
Manning Method	Horton	
Channel Slope	0.01940	ft/ft
Normal Depth	0.46	ft
Channel Discharge	8.82	cfs
Solve For	Normal Depth	

Channel Section- English Units

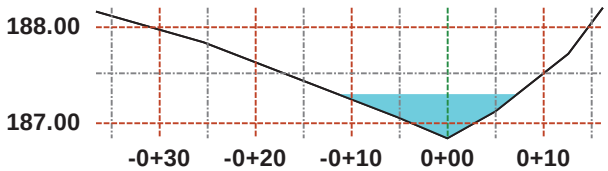
Station (ft)	Elevation (ft)	Start N-Value
-0+36.60	188.16	0.04500
-0+25.30	187.82	0.04000
-0+05.20	187.05	0.04000
0+00.00	186.83	0.04000
0+05.00	187.10	0.04000
0+12.70	187.71	0.04500
0+16.30	188.20	0.04500

Output Parameters- English Units

Water Surface Elevation	187.29	ft
Flow Area	4.47	sq.ft.
Wetted Perimeter	18.98	ft
Top Width	18.96	ft
Hydraulic Depth	0.236	ft
Hydraulic Radius	0.236	ft
Critical Depth	0.40	ft
Critical Slope	0.03958	ft/ft
Velocity	1.97	ft/s
Velocity Head	0.06	ft
Specific Energy	0.52	ft
Froude Number	0.716	
Velocity x Depth Product	0.91	sq.ft./s
Flow Type	Sub-Critical	
Turbulent Flow	Yes	

Channel Notes

2yr Flow



Horizontal Scale 1"=20 ft Vertical Scale: 1"=2 ft

Brunswick County Station
30P Station 2+00

Input Parameters- English Units

Manning's N Value	0.04012	
Manning Method	Horton	
Channel Slope	0.03600	ft/ft
Normal Depth	0.34	ft
Channel Discharge	8.82	cfs
Solve For	Normal Depth	

Channel Section- English Units

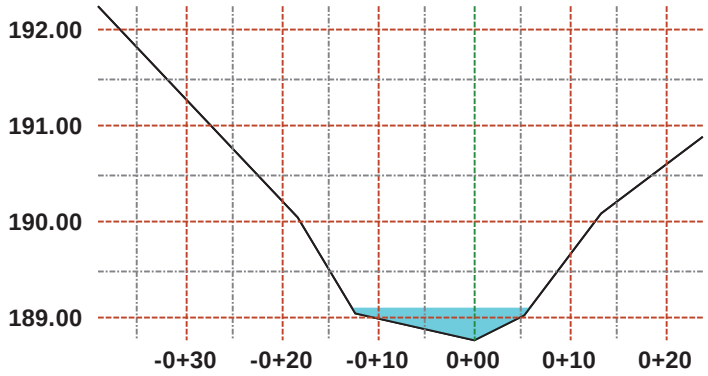
Station (ft)	Elevation (ft)	Start N-Value
-0+39.10	192.24	0.04500
-0+18.30	190.04	0.04500
-0+12.20	189.04	0.04000
0+00.00	188.77	0.04000
0+05.40	189.03	0.04000
0+13.40	190.10	0.04000
0+23.90	190.88	0.04500

Output Parameters- English Units

Water Surface Elevation	189.11	ft
Flow Area	3.69	sq.ft.
Wetted Perimeter	18.66	ft
Top Width	18.64	ft
Hydraulic Depth	0.198	ft
Hydraulic Radius	0.198	ft
Critical Depth	0.33	ft
Critical Slope	0.04072	ft/ft
Velocity	2.39	ft/s
Velocity Head	0.09	ft
Specific Energy	0.43	ft
Froude Number	0.945	
Velocity x Depth Product	0.81	sq.ft./s
Flow Type	Sub-Critical	
Turbulent Flow	Yes	

Channel Notes

2Yr Flow



Horizontal Scale 1"=20 ft Vertical Scale: 1"=2 ft

Brunswick County Station
30P Station 3+00

Input Parameters- English Units

Manning's N Value	0.04000	
Manning Method	Horton	
Channel Slope	0.01100	ft/ft
Normal Depth	0.45	ft
Channel Discharge	8.82	cfs
Solve For	Normal Depth	

Channel Section- English Units

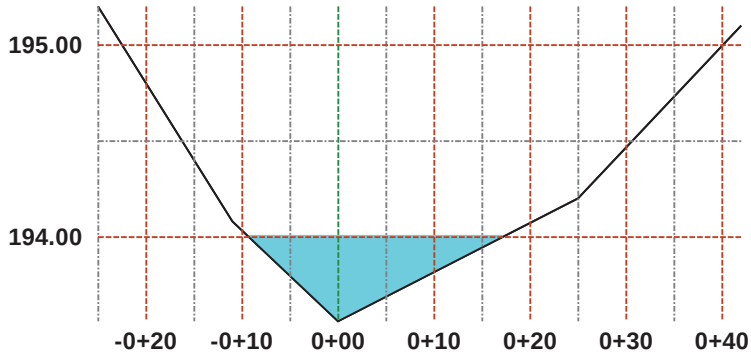
Station (ft)	Elevation (ft)	Start N-Value
-0+25.00	195.20	0.04500
-0+11.00	194.08	0.04000
0+00.00	193.56	0.04000
0+25.00	194.20	0.04000
0+42.00	195.10	0.04500

Output Parameters- English Units

Water Surface Elevation	194.01	ft
Flow Area	6.12	sq.ft.
Wetted Perimeter	27.16	ft
Top Width	27.14	ft
Hydraulic Depth	0.225	ft
Hydraulic Radius	0.225	ft
Critical Depth	0.35	ft
Critical Slope	0.04167	ft/ft
Velocity	1.44	ft/s
Velocity Head	0.03	ft
Specific Energy	0.48	ft
Froude Number	0.536	
Velocity x Depth Product	0.65	sq.ft./s
Flow Type	Sub-Critical	
Turbulent Flow	Yes	

Channel Notes

2-Yr Flow



Horizontal Scale 1"=20 ft Vertical Scale: 1"=1 ft

Brunswick County Station
30P Station 3+43

Input Parameters- English Units

Manning's N Value	0.04070	
Manning Method	Horton	
Channel Slope	0.01100	ft/ft
Normal Depth	0.34	ft
Channel Discharge	8.82	cfs
Solve For	Normal Depth	

Channel Section- English Units

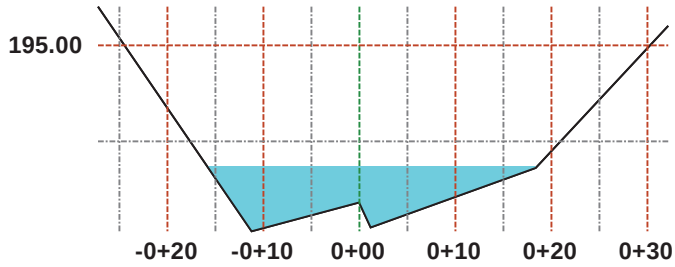
Station (ft)	Elevation (ft)	Start N-Value
-0+27.11	195.20	0.04500
-0+11.20	194.03	0.04000
0+00.00	194.18	0.04000
0+01.25	194.05	0.04000
0+18.41	194.36	0.04500
0+32.21	195.10	0.04500

Output Parameters- English Units

Water Surface Elevation	194.37	ft
Flow Area	6.79	sq.ft.
Wetted Perimeter	34.33	ft
Top Width	34.31	ft
Hydraulic Depth	0.198	ft
Hydraulic Radius	0.198	ft
Critical Depth	0.25	ft
Critical Slope	0.04599	ft/ft
Velocity	1.30	ft/s
Velocity Head	0.03	ft
Specific Energy	0.36	ft
Froude Number	0.515	
Velocity x Depth Product	0.44	sq.ft./s
Flow Type	Sub-Critical	
Turbulent Flow	Yes	

Channel Notes

2-Yr Flow



Horizontal Scale 1"=20 ft Vertical Scale: 1"=1 ft

Brunswick County Station
30P Station 4+12

Input Parameters- English Units

Manning's N Value	0.04228	
Manning Method	Horton	
Channel Slope	0.01100	ft/ft
Normal Depth	0.70	ft
Channel Discharge	8.82	cfs
Solve For	Normal Depth	

Channel Section- English Units

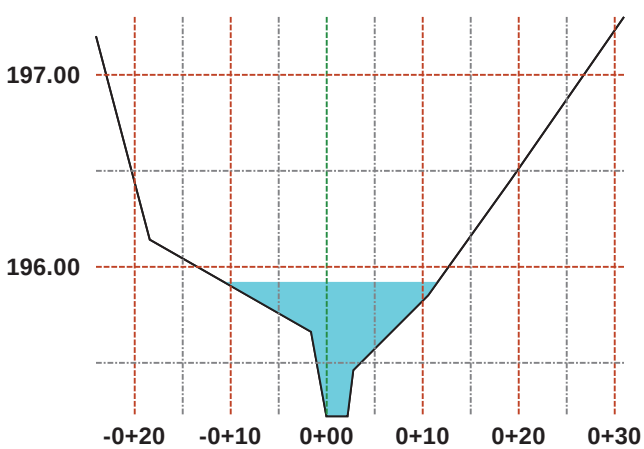
Station (ft)	Elevation (ft)	Start N-Value
-0+24.00	197.20	0.04500
-0+18.30	196.14	0.04500
-0+01.54	195.66	0.04000
0+00.00	195.22	0.04000
0+02.20	195.22	0.04000
0+02.80	195.46	0.04000
0+10.55	195.85	0.04500
0+19.20	196.45	0.04500
0+31.00	197.30	0.04500

Output Parameters- English Units

Water Surface Elevation	195.92	ft
Flow Area	5.83	sq.ft.
Wetted Perimeter	22.15	ft
Top Width	22.02	ft
Hydraulic Depth	0.265	ft
Hydraulic Radius	0.263	ft
Critical Depth	0.56	ft
Critical Slope	0.04181	ft/ft
Velocity	1.51	ft/s
Velocity Head	0.04	ft
Specific Energy	0.73	ft
Froude Number	0.519	
Velocity x Depth Product	1.05	sq.ft./s
Flow Type	Sub-Critical	
Turbulent Flow	Yes	

Channel Notes

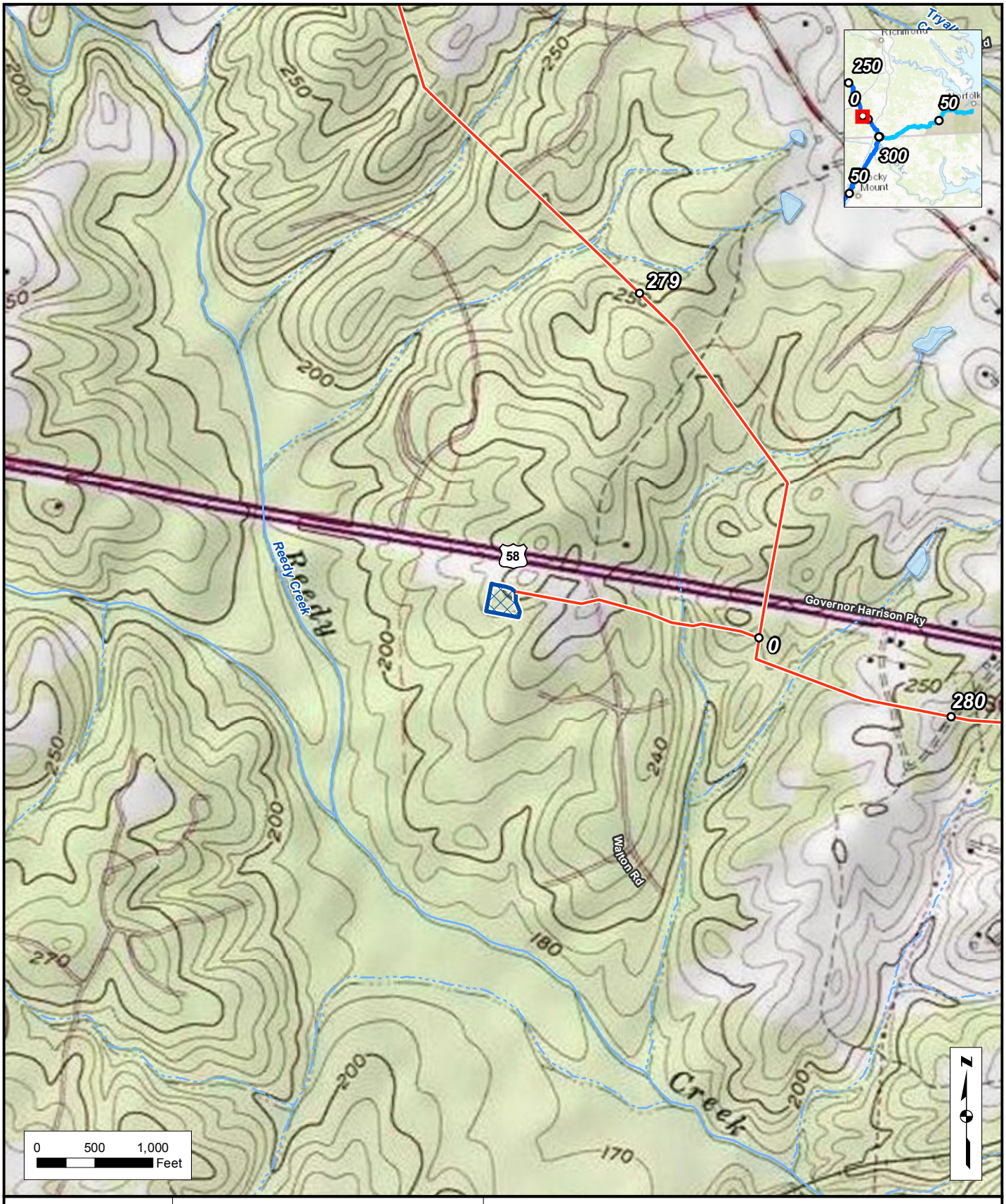
2-Yr Flow



Horizontal Scale 1"=20 ft Vertical Scale: 1"=1 ft

ATTACHMENT 2

Topo Map



Milepost
Proposed Route
M and R Site
NHD Waterbodies

Atlantic Coast Pipeline

Brunswick M and R Site
USGS Topo Overview

FILE: \\usminfs01\Data\Team\DMMV\GIS\Clients\D-F\DOM\SRPP_ArcGIS\SWPPP\Figures_ACP_MandR_Stations_Topo.mxd, REVISED: 12/22/2016, SCALE: 1:14,000 DRAWN BY: EKP

ATTACHMENT 3

Letter of Availability for Nutrient Credits

[Will Be Provided Prior to Land Disturbance]