ATLANTIC COAST PIPELINE, LLC
ATLANTIC COAST PIPELINE

Stormwater Pollution Prevention Plan

APPENDIX E

Erosion and Sediment Control and Stormwater Management Plan

for

Buckingham Compressor Station and

Woods Corner M&R Station

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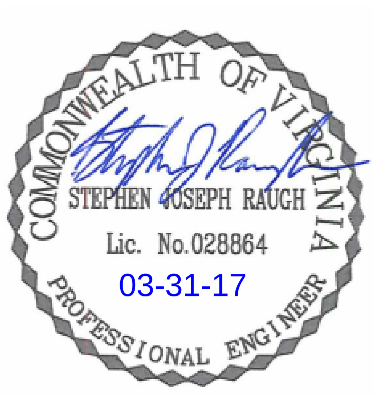
LIST OF ACRONYMS AND ABBREVIATIONS

ACP	Atlantic Coast Pipeline
BMP	best management practice
BSRF	Belted Silt Retention Fence
DTI	Dominion 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	Woods Corner M&R Station
NRCS	U.S. Department of Agriculture, Natural Resources Conservation Service
NWI	National Wetlands Inventory
NWP	Nationwide Permit
SWM	stormwater management
SWM Plan	Stormwater Management Plan
SWPPP	Stormwater Pollution Prevention Plan
TMDL	Total Maximum Daily Load
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VDEQ	Virginia Department of Environmental Quality
VESCH	Virginia Erosion and Sediment Control Handbook
VESCP	Virginia Erosion and Sedimentation Control Program
VRRM	Virginia Runoff Reduction Method
VSMP	Virginia Stormwater Management

Professional Engineer Certification

In accordance with Article 1 (§ 54.1-400 et seq.) of Chapter 4 of Title 54.1 of the Code of Virginia, Virginia Erosion and Sediment Control Regulations (9 Virginia Administrative Code [VAC] 25-840 et seq., as amended) and Virginia Stormwater Management Program Regulations (9 VAC 25-870 et seq., as amended), I hereby certify that I have reviewed, and being familiar with the provisions of the above regulations, attest that the Erosion and Sediment Controls (ESC) and Stormwater Management (SWM) requirements in this plan have been prepared in accordance with good engineering practices, including consideration of applicable industry standards, and with the requirements of Article 1 (§ 54.1-400 et seq.) of Chapter 4 of Title 54.1 of the Code of Virginia, 9 VAC 25-840 et seq., as amended and 9 VAC 25-870 et seq., as amended.

Seal:



Stephen J. Raugh
Printed Name of Registered Professional Engineer

Signature of Registered Professional Engineer

Date 03-31-17

0402028864 Virginia
Registration No. State

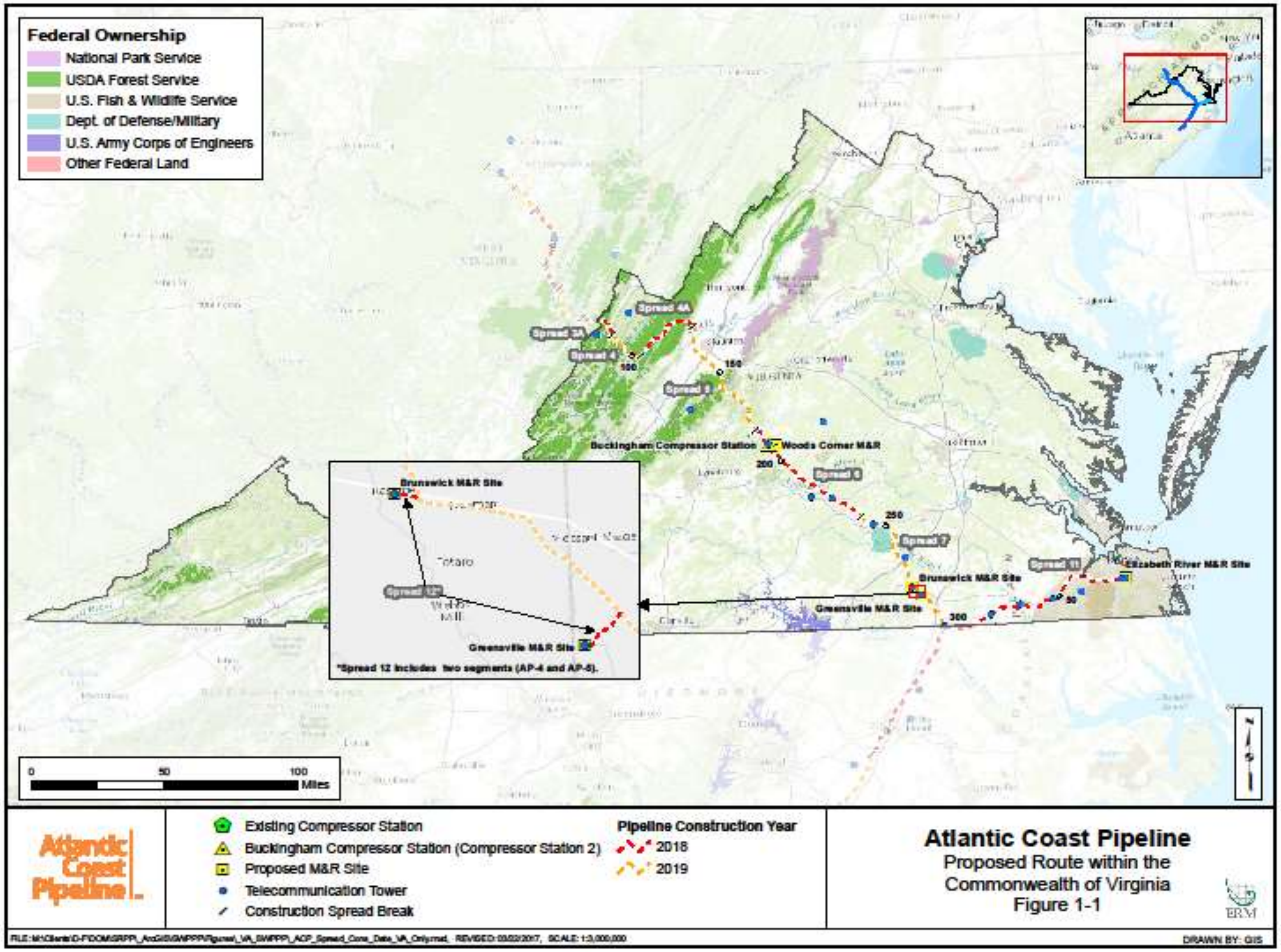
1.0 INTRODUCTION

As part of the Atlantic Coast Pipeline (ACP), Dominion Transmission Inc. (DTI) is proposing to construct an approximately 12-acre compressor station with a co-located metering and regulating station approximately six miles west of the town of Buckingham, Virginia. The compressor station, referred to as the Buckingham Compressor Station (Compressor Station 2), will be co-located with the Woods Corner Metering and Regulating Station (M&R Station). Both units will hereafter be referred to as the Compressor Station.

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 Compressor 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 Compressor Station, as applicable to the aboveground facility. Land-disturbing activities will conform, at a minimum, to the same regulations and guidelines listed in Section 2.0 of the SWPPP, as appropriate and applicable. In circumstances where multiple overlapping regulatory requirements and guidelines apply, DTI 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 Compressor Station is provided in the following sections. A Site Plan is provided in Attachment 1. Figure 1-1 below shows the location of the Compressor Station in relation to the ACP Project.

BUCKINGHAM COMPRESSOR STATION LOCATION



2.0 LOCATION AND DESCRIPTION

The Compressor Station will be located at milepost 191.6 in Buckingham County, VA where the AP-1 mainline will intersect existing Transco transmission pipelines. The Compressor Station will impact 27 acres during construction and 12 acres during operation and is located in the northern portion of a larger parcel. The larger parcel is identified in Buckingham County records as Parcel Number 91-60 with a lot description of six miles west of Buckingham on Route 56. The general vicinity around the Compressor Station is a mix of agricultural/undeveloped forestland, with Route 56 forming a portion of the southern boundary of the project area.

2.1 EXISTING SITE CONDITIONS

The Compressor Station is currently undeveloped wooded land. An existing natural gas pipeline right-of-way crosses the proposed Compressor Station along the eastern boundary.

A roadside drainage ditch is located adjacent to the southern boundary of the Compressor Station alongside Route 56 that runs southeast to northwest. Wetlands are located along the northern and southern portions of the Compressor Station as described in Section 2.11 below.

2.2 EXISTING AND PROPOSED TOPOGRAPHY

The topography at the Compressor Station is characterized by flat to gently sloping terrain with an elevation of approximately 585 feet above mean sea level. The proposed development will retain the existing topography of flat to gently sloping terrain with grading to direct stormwater toward drainage basins planned along the northeastern sides of the property.

Existing topography of the Compressor Station can be found on the topographical map, Attachment 1. In addition, the proposed grading plan for the Compressor Station is also provided in Attachment 1.

2.3 PROMINENT VEGETATION

The current Compressor Station site location is undeveloped wooded land. The Compressor 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, a tank, and regulators will be present. Existing forested areas will be preserved on the northern portion of the property and along the southern portion of the Compressor Station along Route 56. Trees will be planted as a buffer between the existing Transco Pipelines and the Compressor Station. Vehicles will enter the Compressor Station using new impervious access roads from Route 56. If existing roads are damaged during construction, DTI 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 Compressor Station will affect approximately 27 acres of land. Of that, 12 acres of land affected will be retained for operation of the new Compressor Station. The Site Plan included 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 November 2017. DTI anticipates that the Compressor Station construction will be completed in the four quarter of 2019.

2.6 ADJACENT PROPERTIES

The proposed Compressor Station will be located in an undeveloped forested area with limited residential. DTI will use a combination of management practices and control measures to limit the erosion and transport of soil to adjacent properties and waterbodies.

Multiple landowners maintain private residences in the parcels immediately adjacent to the Compressor Station. There is a timbering stand owned by Plum Creek Timberlands, LP situated on Parcels 91-21 and 106-35 situated to the south of the Compressor Station.

2.7 OFF-SITE AREAS

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

2.8 SOILS

Based on a review of the Virginia Division of Mineral Resources Geologic Map of Virginia (1993), the surficial geologic unit at the site is Metagraywacke, Quartzrose Schist, and Melange. According to the U.S. Geological Survey (USGS), Mategraywakes are quartzose chlorite or biotite schists that contain very fine to coarse granules of blue quarters. In Buckingham County, rocks in the unit are progressively more tectonized from east to west across the outcrop belt; in the western portion, the dominant lithology is a polydeformed, mylonitic mica schist with abundant quartz-rich boudins where transposed pinstriped lamination or segregation layers at a high angle to mylonitic schistosity is characteristic.

According to the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS), soils beneath the Compressor Station are mapped as well drained (Bentley-Penhook complex) with depth to water table ranging from 30 to 39 inches. These soils consist of sandy clay loam overlain by a 3 to 3.5 foot layer of clay to a sandy loam. These soils are the primary soils underlying the central and southern portions of the Compressor Station, with Delanco loam to the north. Delanco loam is moderately well drained with depth to water table ranging from 12 to 30 inches. These soils consist of silt loam overlain by a 3-foot layer of clay loam. The remaining portion of the Compressor Station is mapped in the Codorus-Hatboro complex and Littlejoe-Bentley complex. The Codorus-Hatboro complex is somewhat poorly drained with a depth to water table between 6-18 inches. The Littlejoe-Bentley complex is well-drained with a depth to water table at more than 80 inches.

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.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter applies to drained areas and the second applies to undrained areas.

The hydrologic soil groups assigned by NRCS for the soils mapped at the Compressor Station are as follows: Bentley-Penhook (Group C); Delanco (Group C/D); Codorus-Hatboro (Group B/D); and Littlejoe-Bentley (Group B).

2.9 RECEIVING WATERS

The Compressor Station drains to the northeast to the wetlands on the property, which then drains east to Ripley Creek. Ripley Creek flows east to Walton Fork and then into the Slate River. The Compressor Station is located within the Walton Fork-Ripley Creek watershed, identified by the USGS as hydrological unit code 020802031304. DTI does not intend to connect to and/or discharge into a municipal separate storm sewer system (MS4).

2.10 EXCEPTIONAL AND IMPAIRED WATERS

The proposed Compressor Station does not impact Tier 3 exceptional waters identified in 9 Virginia Administrative Code (VAC) 25-260-30 A.

DTI 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 (TMDL) 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 Compressor Station drains to Ripley Creek, Walton Fork, and then the Slate River (a tributary of the James River), none of which have been designated as impaired for any sediment, nutrient, or related parameter. Portions of the Slate River have been designated as impaired for Escherichia coli; an approved TMDL plan has been published for the affected portion of the Slate River. However, the Compressor Station will be located within the Chesapeake Bay watershed which has a wasteload allocation to reduce nitrogen, phosphorus and sediment discharges into the Bay. The location of the Chesapeake Bay TMDL watershed is shown in **Figure 2.18-1** of the main body of the SWPPP.

In accordance with the Virginia Stormwater Management Act, the Virginia Erosion and Sediment Control Law and associated regulations, where applicable, the following will be implemented for construction activities within the Chesapeake Bay TMDL Watershed:

- Permanent or temporary soil stabilization will be applied to denuded areas within 7 days after final grade is reached on any portion of the site;
- Nutrients will be applied in accordance with manufacture's recommendations or an approved nutrient management plan and will not be applied during rainfall events,
- Inspection requirements are as follows:
  - Inspections will be conducted at a frequency of (i) at least once every five business days or (ii) at least once every ten business days and no later than 48 hours following a measurable storm event (a measurable storm event is defined as a rainfall event producing 0.25 inches of rain or greater over 24 hours). In the event a measurable storm event occurs when there are more than 48 hours between business days, the inspection will be conducted on the next business day; (see Section 8.1 of the SWPPP),
  - Representative inspections used by linear construction projects will include all outfalls discharging to surface waters identified as impaired or for which a TMDL wasteload allocation has been established. **Note that inspections of the Compressor Station will include all disturbed areas (i.e. representative inspections are only applicable to the linear portion of the Project – not to aboveground facilities).**

2.11 CRITICAL/SENSITIVE AREAS

Pre-construction assessments and field surveys were completed by DTI to delineate the location of critical or sensitive environmental areas within the areas of land disturbance proposed by the Compressor Station.

2.11.1 Wetlands and Waterbodies

The Compressor Station has been sited such that impacts to wetlands will be avoided and minimized to the maximum extent practicable. During the routing phase of the ACP Project, Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) data, was used to provide a preliminary analysis of wetland resources and to assess where wetland impacts could be avoided or minimized. NWI data was also used to estimate the number, size, and locations of wetlands within the construction areas prior to conducting wetland delineations in the field.

DTI conducted field surveys during the 2015 field season to identify and delineate wetlands at the proposed Buckingham Compressor Station. Temporary construction and operational activities at the Compressor Station will not impact any acres of wetland, which will remain northeast and south of the station, as shown on the Site Plan in Attachment 1. The wetlands, which on-site exist beyond the area of land disturbance and continue onto the adjacent property, will be protected during construction with a belted silt retention fence, as discussed in Section 3.1.4 below.

2.11.2 Threatened and Endangered Species

DTI consulted with the USFWS 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 USFWS regarding these species are on-going. Virginia has separate acts protecting threatened and endangered species. DTI requested and received data on known occurrences of Commonwealth-listed species in Virginia from the Virginia Department of Conservation and Recreation's Natural Heritage Program. DTI 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 Buckingham Compressor 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 DTI 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 Sediment Control Regulations (9VAC25-840-40), by the design, construction and maintenance of the Erosion and Sedimentation Controls in accordance with the Virginia Erosion and Sedimentation Control Handbook (VESCH) (1992, 3rd Edition), and the application of environmental site design principles.

3.1 GENERAL BUCKINGHAM COMPRESSOR STATION CONSTRUCTION

Compressor Station construction stages and the ESC measures to be installed for each of these stages are described below. The ESC drawings for the Compressor Station, including typical drawings of general ESC measures, are provided in Attachment 1.

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

Site Preparation

- Survey and flag the construction site and mark environmentally-sensitive areas (i.e. boundary of wetland and vegetated filter strip).
- Only vehicular traffic used for diversion dike construction should be allowed within 10 feet of the limits of disturbance boundary.
- Install temporary construction entrance.
- Install safety fences prior to ESC installation.
- Conduct initial clearing, limited to that necessary to install temporary sediment barriers.
- Install all perimeter ESCs prior to any bulk earth-moving activity (road grading, log skidding, grubbing, etc.). ESC measures will be inspected and maintained throughout construction.
- Construction runoff should be directed towards the sediment basin and sediment trap with diversion dikes.
- Clear and grub site.
- Segregate topsoil where necessary.

Compressor 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 metering and regulation facilities.
- Spread topsoil on disturbed areas, as needed.

- Complete finish grading.
- Install impervious base around buildings and Compressor Station 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.

Stormwater Management Treatment Swale Construction

- Grading of the dry swale will not commence until the contributing drainage area has been stabilized by vegetation and perimeter erosion and sediment controls have been removed and cleaned out.
- Pre-treatment cells should be excavated to trap sediments before reaching planned filter beds.
- Minimize soil compaction by excavating from the sides of the dry swale area to achieve design depth and dimensions.
- Dry swale bottom should be scarified to promote infiltration.
- A filter fabric with minimum 6-inch overlap should be placed on underground of the dry swale. Stone that provides the storage layer is placed over the filter bed. Before placing the remaining stone jacket, the underdrain pipe is perforated and its slope checked. After placing the remaining stone jacket, #57 stone is placed to 3 inches above the top of the underdrain, then pea gravel is added as a filter layer.
- Soil media is added in 12-inch lifts to meet top elevation of the dry swale.
- Erosion control fabric is installed where needed, and preparations for landscaping features (planting holes for trees and shrubs, spreading seed, etc.) are completed.
- Landscaping is watered weekly during the first 2 months for proper establishment and growth.

Dry Detention Pond Construction

- Installation of the permanent riser should be started during the construction phase of the sediment basin, and all appropriate procedures should be followed to prevent turbid water discharge during the conversion of the pond from a sediment basin to an ext detention pond.
- Grading of the pond will not commence until the contributing drainage area has been stabilized.
- Install E&S controls, and clear and strip the project area.
- Excavate the core trench and install the spillway pipe and outflow structure.
- Embankments are constructed in 8 to 12-inch lifts following appropriate compaction requirements.
- The elevation and contours are achieved with excavation/grading techniques.
- Outlet protection is installed and exposed soils are stabilized with temporary seed mixtures.
- The pond buffer area is planted.

3.1.1 Survey and Flagging

- The limits of the approved work areas, boundaries of the delineated wetland, boundaries of the treatment swales, 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 should 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.
- Flagging or marking will be maintained throughout construction.
- Trees to be protected will be flagged by the EIs and if determined necessary, protected with fencing or armoring prior to clearing.
- Per VESCH **Std. & Spec. 3.38 (Tree Preservation and Protection)**, at a minimum the limits of clearing will be located outside the drip line of any tree to be retained and, in no case, closer than 5 feet to the trunk of any tree to be retained. In addition, heavy equipment, vehicular traffic, or stockpiles will not be permitted within the drip line of any tree to be retained.

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 6 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 3 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 as 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 not permitted.

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. If inadvertent 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 vegetative-stabilized surface will reduce dust emissions.
- Mulch will be used in areas without heavy traffic pathways.
- Tillage should 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),** DTI 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, DTI 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 1 acre and flow is no greater than 1 cubic feet per second. In ditches or swales where higher velocity flow is expected, rock check dams should 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 2 inches when oak is used and 4 inches when pine is used. Wooden stakes must have a minimum length of 5 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 5 feet. Posts will be placed a maximum of 6 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 6 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 10 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 3-foot spacing of posts.

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

Belted Silt Retention Fence (BSRF)

The primary silt fence product planned for use on the ACP, including the Compressor 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, including wetlands and waterbodies.

- 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 BSRF are provided in Attachment 1.

3.1.5 Temporary Diversion Dike

A temporary ridge of compacted soil constructed at the top of a sloping disturbed area will be used to divert stormwater runoff from upslope drainage areas away from the unprotected slope. Temporary diversion dikes can also be constructed at the base of a slope to protect adjacent and downstream areas by diverting sediment-laden runoff from a disturbed area to a sediment-trapping control measure. A temporary diversion dike is effective when the control limits of a silt fence are exceeded. The temporary diversion dike must be installed as a first step in the land-disturbing activity at locations shown on the construction alignment sheets and must be functional prior to upslope land disturbance. In accordance with VESCH **Std. & Spec 3.09** (Temporary Diversion Dike), DTI will adhere to the following general construction and maintenance specifications:

- The maximum allowable drainage area is 5 acres.
- The minimum height measured on the upslope side of the dike is 18 inches.
- The dike should be compacted to prevent failure and have side slopes 1.5:1 or flatter with a minimum base width of 4.5 feet.
- The channel behind the dike will have a parabolic or trapezoidal cross-section shape to avoid high velocity flow which could arise in a v-shaped ditch. The channel will have a positive grade to a stabilized outlet.
- The diversion dike and channel will be stabilized immediately following installation with temporary or permanent vegetation. Where channel slope is greater than 2%, Rolled Erosion Control Product (RECP), or equivalent, will be used to stabilize soil until vegetation is established.

The temporary diversion dike will be inspected and repairs made to the dike, flow channel, outlet or sediment trapping area, as necessary. Once every day in active construction areas, whether a storm event has occurred or not, the measure will be inspected and repairs made if needed. Damages caused by construction traffic or other activity must be repaired before the end of each working day.

3.1.6 Temporary Sediment Trap

A temporary ponding area formed by constructing an earthen embankment with a stone outlet may be used to detain sediment-laden runoff from small disturbed areas (where total drainage area is less than three acres) to allow sediment to settle out prior to discharge. The sediment trap may be constructed either independently or in conjunction with a temporary diversion dike as a suitable option for outlet control. The temporary sediment trap must be installed as a first step in the land-disturbing activity at locations shown on the construction alignment sheets and must be functional prior to upslope land disturbance. In accordance with VESCH **Std. & Spec 3.13** (Temporary Sediment Trap), DTI will adhere to the following general construction and maintenance specifications:

- The maximum useful life of a temporary sediment trap is 18 months. Traps will be replaced should the construction period exceed 18-months. Sediment traps may need to be replaced sooner than 18 months (on an as needed basis) if at any time they cease to be effective. This will be determined based on the regularly scheduled inspections of these traps. Erosional control inspection and maintenance will continue on all parts of the project at all times until the landscape is deemed stable.
- The total contributing drainage area to a sediment trap is less than 3 acres.

- The sediment trap must be designed to have an initial storage volume of 134 cubic yards per acre of drainage area with a minimum 2:1 length to width ratio, if possible. Half of the 134 cubic yards per acre of storage volume must be in the form of a permanent pool or wet storage.

- Side slopes of the excavated area should be no steeper than 1:1 and the maximum depth of excavation within the wet storage area should be 4 feet.

- Outlet requirements include a combined coarse aggregate/riprap stone section of the embankment (VDOT #3, #357 or #5 Coarse Aggregate and Class I riprap).

- Filter cloth will be placed at the stone-soil interface. The length of the stone outlet will be detailed on the construction alignment sheets and will be designed at 6 feet times the total drainage area in acres. The crest of the stone outlet must be at least 1.0 foot below the top of the embankment.

- The maximum height of the embankment will be 5 feet measured to the base of the stone outlet. Side slopes of the embankment will be 2:1 or flatter.

- Fill material will be free of roots or other woody vegetation, large stones, or organic matter and compacted in 6-inch lifts.

- The temporary sediment trap will be stabilized immediately following installation with temporary or permanent vegetation.

- Remove accumulated sediments when sediment reaches ½ the design storage volume. Sediment removed will be deposited in a disturbed area in a manner that it will not erode and cause sedimentation problems.

- Stone will be replaced if it becomes choked with sediment.

3.1.7 Temporary Sediment Basin

A temporary sediment basin follows the information set forth in 3.1.6 above, but whose total drainage area is greater than three acres.

3.1.8 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.

Geotextile Bag/Dewatering Filter Bag

DTI 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, wetland, 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.

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.

3.2 SPECIAL CONSTRUCTION PROCEDURES

Sensitive areas (e.g., wetland) will be treated as separate construction entities. Sensitive areas require additional ESC procedures. Additional controls will be shown on the drawings in Attachment 1.

3.2.1 Winter Construction

DTI 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 continuously 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.

3.2.2 Wetlands

Construction procedures are to comply with the U.S. Army Corps of Engineers (USACE), or its delegated agency, permit terms and conditions.

The Buckingham Compression Station will not impact any wetlands and as such, no permit terms or conditions apply. However, DTI will employ belted silt fence at the Compressor Station to ensure the protection of the wetlands located in the northeastern portion of the site.

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. DTI will construct the Compressor 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 ESC 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 stormwater management 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 POST-CONSTRUCTION STORMWATER MANAGEMENT

Where pre-development land cover conditions are changed significantly, triggering requirements for post-construction stormwater quality and quantity, post-construction BMPs may be required to comply with water quality and water quantity criteria of the Stormwater Management Regulations and Minimum Standard 19 of the Erosion and Sediment Control Regulations.

The post-construction land cover at the Compressor Station will be comprised of a combination of managed turf, forest/open space, and impervious surfaces, potentially resulting in increases in nutrient loading, runoff volume, and peak flow rate. At this location, the need for post-construction SWM BMPs was evaluated as discussed below.

5.1 PRE-DEVELOPMENT AND POST-DEVELOPMENT DRAINAGE AREAS

As noted in Sections 2.1 and 2.2, the pre-development conditions at the Compressor Station are primarily characterized as undeveloped woodlands. The topography at the Compressor Station is characterized by flat to gently sloping terrain with an elevation of approximately 585 feet above mean sea level. The proposed development will retain the existing topography of flat to gently sloping terrain with grading to direct stormwater toward drainage basins planned along the northeastern sides of the property.

In the post-development condition, approximately 8.71 acres of the M&R Station site will be surfaced with impervious material to create a suitable foundation for the required structures and equipment. Additionally, minor grading will occur to direct stormwater runoff toward a stormwater management treatment swale that will be constructed to convey stormwater from the site towards the two stormwater management areas in the northeastern portion of the site.

Delineation of the drainage watersheds and proposed management practices are shown on the SWM drawings and supporting calculations in Attachment 1. The drawings depict the proposed land uses at the 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 drawings also show 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. The Compressor Station is located within a 500-year Federal Emergency Management Agency floodplain.

Stormwater quality and quantity calculations were performed for pre- and post-development conditions and are described 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, identifying 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 VAC25-870-66, 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 VAC25-840-40 (Minimum standards; Virginia Erosion and Sediment Control Regulations, Section 4.0).

Channel Protection

Runoff from the site sheet flows towards the rear of the site, aided by diversion dikes in Phase I and stormwater management (SWM) Treatment Swales in Phase II that exist along the perimeter of the Compressor Station. Along the main and northern portion of the site where the Compressor Station is to be located, SWM Treatment Swales direct stormwater from the southern and highest topographic position of the site, northwest around the site, and then downgradient towards the east into two stormwater management basins. In this area, a diversion dike along the southeast and northeastern portions of the site similarly move into the stormwater management basins. Additional sheet flow from the main portion site will flow towards a belted silt retention fence towards the wetlands beyond the Compressor Station. Within the portion of the site located south of the Transco Pipeline easement, runoff flows via a southern stormwater diversion dike and eastern treatment swale to a dry pond located in a topographic low. From the dry pond, which is located in the most southern portion of the site, runoff may sheet flow towards wetlands located south of the Compressor Station.

Since stormwater flow from the Compressor Station will be released into a natural stormwater conveyance system, the maximum peak flow rate from the one-year, 24-hour storm following the land-disturbing activity was calculated. The supporting calculations are provided in Attachment 1.

Flood Protection

Concentrated stormwater flow will be released into a stormwater conveyance system and will meet one of the following criteria as demonstrated by use of acceptable hydrologic and hydraulic methodologies:

1. Concentrated stormwater flow to stormwater conveyance systems that currently do not experience localized flooding during the 10-year, 24-hour storm event: The point of discharge releases stormwater into a stormwater conveyance system that, following the land-disturbing activity, confines the post-development peak flow rate from the 10-year, 24-hour storm event within the stormwater conveyance system. Detention of stormwater or downstream improvements may be incorporated into the approved land-disturbing activity to meet this criterion, at the discretion of the VSMP authority.

2. Concentrated stormwater flow to stormwater conveyance systems that currently experience localized flooding during the 10-year, 24-hour storm event: The point of discharge either:

a. Confines the post-development peak flow rate from the 10-year, 24-hour storm event within the stormwater conveyance system to avoid the localized flooding. Detention of stormwater or downstream improvements may be incorporated into the approved land disturbing activity to meet this criterion, at the discretion of the VSMP authority; or

b. Releases a post-development peak flow rate for the 10-year 24-hour storm event that is less than the predevelopment peak flow rate from the 10-year, 24-hour storm event. Downstream stormwater conveyance systems do not require any additional analysis to show compliance with flood protection criteria if this option is utilized.

3. Limits of analysis. Unless the methodology identified in 2 b above is utilized to comply with the flood protection criteria, stormwater conveyance systems will be analyzed for compliance with flood protection criteria to a point where:

   a. The site's contributing drainage area is less than or equal to 1.0 percent of the total watershed area draining to a point of analysis in the downstream stormwater conveyance system;

   b. Based on peak flow rate, the site's peak flow rate from the 10-year, 24-hour storm event is less than or equal to 1.0 percent of the existing peak flow rate from the 10-year, 24-hour storm event prior to the implementation of any stormwater quantity control measures; or

   c. The stormwater conveyance system enters a mapped floodplain or other flood-prone area, adopted by ordinance, of any locality.

The supporting calculations 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.

1. New development. The total phosphorus load of new development projects will not exceed 0.41 pounds per acre per year (lb/ac/yr), as calculated pursuant to 9 VAC25-870-65.

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 New Development spreadsheet was utilized to calculate the runoff reduction and pollutant removal capabilities of the selected post-construction stormwater BMPs based on the proposed land cover characteristics.

The approximate 12-acre Compressor Station will have the following land cover characteristics:

- 26.29 acres of Forest/Open Space – This total is inclusive of the preserved wetland and conserved open space on the eastern side of the site, and the proposed diversion dikes/treatment swales around the perimeter of the property.

- 22.28 acres of Managed Turf – This is inclusive of the disturbed and graded side slopes of the Compressor station pad.

- 8.71 acres of Impervious Cover – This is inclusive of the Compressor Station pad, the equipment areas, and the paved access road.

Based on the land cover characteristics, the post-development treatment volume for the Compressor Station was calculated to be 50,632 cubic feet (ft^3) and the total phosphorus produced from the site was 31.81 lb/yr. With a required phosphorus load of 0.41 lb/ac/yr for new development, the phosphorus load is required to be reduced by 8.33 lb/ac/yr.

Post-Development Project (Treatment Volume and Loads)

Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals
Forest/Open Space (acres) -- undisturbed, protected forest/open space or reforested land		7.86	16.00	2.43	26.29 *
Managed Turf (acres) -- disturbed, graded for yards or other turf to be mowed/managed		14.24	6.05	1.99	22.28
Impervious Cover (acres)		4.79	3.61	0.31	8.71
					57.28

** Forest/Open Space areas must be protected in accordance with the Virginia Runoff Reduction Method*

Constants

Annual Rainfall (inches)	43
Target Rainfall Event (inches)	1.00
Total Phosphorus (TP) EMC (mg/L)	0.26
Total Nitrogen (TN) EMC (mg/L)	1.86
Target TP Load (lb/acre/yr)	0.41
Pj (unitless correction factor)	0.90

Runoff Coefficients (Rv)

	A Soils	B Soils	C Soils	D Soils
Forest/Open Space	0.02	0.03	0.04	0.05
Managed Turf	0.15	0.20	0.22	0.25
Impervious Cover	0.95	0.95	0.95	0.95

Post-Development Requirement for Site Area

TP Load Reduction Required (lb/yr)	8.33

The site is proposed to be graded in a way that the site and the access road sheet flows to the SWM treatment swale on the southwest and northwest sides of the Compressor Station site. Based on the grading and location of the BMPs, the contributing drainage areas in acres were entered into the appropriate rows in the VRRM spreadsheet for the selected BMPs. The selected BMPs were able to reduce the phosphorus load by 11.54 lb/yr, an excess of the target total phosphorus reduction by 3.66 lb/yr remaining after applying BMP load reductions.

Total Phosphorus

FINAL POST-DEVELOPMENT TP LOAD (lb/yr)	31.81
TP LOAD REDUCTION REQUIRED (lb/yr)	8.33
TP LOAD REDUCTION ACHIEVED (lb/yr)	11.54
TP LOAD REMAINING (lb/yr):	20.27
REMAINING TP LOAD REDUCTION REQUIRED (lb/yr):	0.00 **

** TARGET TP REDUCTION EXCEEDED BY 3.22 LB/YEAR **

The supporting calculations are provided in Attachment 1.

5.3 POST-CONSTRUCTION/PERMANENT STORMWATER BMPS

Post-construction/permanent stormwater BMPs will be addressed through the construction and use of three stormwater management ponds that will serve as dry retention basins and through the use of stormwater management treatment swales and diversion dikes.

5.3.1 Dry Retention Basins

Three stormwater management ponds will be used at the Compressor Station, which will receive water drained from the site via stormwater management treatment swales, stormwater management diversion dikes, and sheet flow. All three ponds are considered dry ponds and are used for water quantity.

Two stormwater management ponds will be constructed in the northeast portion of the site, and one additional stormwater management pond will be constructed in the southern portion of the site. Along the main and northern portion of the Compressor Station, SWM Treatment Swales direct stormwater from the highest topographic position in the south in a northwestern movement towards the downgradient stormwater management basins in the east. A diversion dike along the southeast and northeastern portion of the main portion site (north of the Transco Pipeline easement) similarly moves runoff into the stormwater management basins.

Within the portion of the site located south of the Transco Pipeline easement, runoff flows via a southern stormwater diversion dike and eastern treatment swale to a dry pond located in a topographic low. From the dry pond, which is located in the most southern portion of the site, runoff may sheet flow towards wetlands located south of the Compressor Station.

5.3.2 SWM Treatment Swales

Stormwater management treatment swales will direct runoff along the northwest, northern, and northeast portions of the site into two stormwater management dry ponds. A treatment swale located along the southern portion of the site will direct runoff to a stormwater management dry pond located in the southern portion of the Compressor Station.

5.4 LONG-TERM MAINTENANCE

In accordance with DTI'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 DTI 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. DTI 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

- And, be enforceable by all appropriate governmental parties.

According to VDEQ Stormwater Design Specification No. 10 (**Dry Swales**), dry swales must be covered by a drainage easement to allow inspection and maintenance. Conserved open space areas must be protected by a perpetual easement or deed restriction that assigns the responsible party to ensure that no future development, disturbance or clearing may occur within the area.

5.5 MAINTENANCE INSPECTIONS

Annual inspections are used to trigger maintenance operations such as sediment removal and spot revegetation. Ideally, inspections should be conducted in the spring of each year.

Inspectors should check for:

- 95% turf cover or vegetation density has been achieved in the bed and banks of the dry swale.

- Sediment buildup at curb cuts, gravel diaphragms or pavement edges that prevents flow from getting into the dry swale, and check for other signs of bypassing.

- Any winter- or salt-killed vegetation.

- Clogging or accumulated sand, sediment, and trash in inflow points, and removal if necessary.

- Evidence of any rill or gully erosion in the dry swale side slopes and grass filter strips, and associated repair.

- Evidence of excessive ponding or concentrated flows, and take appropriate remedial action.

- Bare soil or sediment sources in the contributing drainage area if sediment accumulation is noted, and immediately stabilize.

- Clogged or slow-draining soil media, a crust formed on the top layer, inappropriate soil media, or other causes of insufficient filtering time, and restore proper filtration characteristics.

- Evidence of undercutting or erosion at upstream and downstream check dams, and removal of trash or blockages at weepholes.

Corrective measures must be carried out as soon as practicably feasible when needed.

5.6 ONGOING MAINTENANCE

Once established, dry swales have minimal maintenance needs outside of the spring clean-up, regular mowing, and pruning and management of trees and shrubs. Adjustments may need to be made to the dry swale if water remains on the surface for more than 48 hours after a storm, including changes to the grading, rehabilitation of the surface infiltration, or underdrain repairs.

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 Compressor Station, as applicable.

7.0 ROLES AND RESPONSIBILITIES

DTI will use the same qualified personnel and Responsible Land Disturber at the Compressor 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 Compressor Station, with the exception of representative inspections which only apply to the pipeline ROW.

9.0 EMPLOYEE TRAINING

The employee training program described in Section 9.0 in the main body of the SWPPP applies to the Compressor 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 DTI’s Standards and Specifications for projects requiring post-construction SWM BMPs, DTI 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. 2017 Standards and Specification, Erosion and Sediment Control and Stormwater Management for Construction and Maintenance of Pipeline Projects in Virginia. March 2017.

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ATTACHMENT 1

Erosion and Sediment Control and Stormwater Management Drawings and Supporting Calculations

[ESC Plans Provided Seperately]

Project Description

File Name .... 38333 Buckingham Compressor-POA1.SPF

Project Options

Flow Units .... CFS
Elevation Type .... Elevation
Hydrology Method .... SCS TR-20
Time of Concentration (TOC) Method .... SCS TR-55
Link Routing Method .... Kinematic Wave
Enable Overflow Ponding at Nodes .... NO
Skip Steady State Analysis Time Periods .... NO

Analysis Options

Start Analysis On	Jun 03, 2016	00:06:00
End Analysis On	Jun 04, 2016	00:06:00
Start Reporting On	Jun 03, 2016	00:06:00
Antecedent Dry Days	0	days
Runoff (Dry Weather) Time Step	0 01:00:00	days hh:mm:ss
Runoff (Wet Weather) Time Step	0 00:05:00	days hh:mm:ss
Reporting Time Step	0 00:06:00	days hh:mm:ss
Routing Time Step	30	seconds

Number of Elements

	Qty
Rain Gages	1
Subbasins...	4
Nodes...	6
Junctions	2
Outfalls	3
Flow Diversions	0
Inlets	0
Storage Nodes	1
Links...	4
Channels	1
Pipes	1
Pumps	0
Orifices	1
Weirs	1
Outlets	0
Pollutants	0
Land Uses	0

Rainfall Details

SN	Rain Gage ID	Data Source	Data Source ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)	Rainfall Distribution
1	Rain Gage-01	Time Series	TS-10	Cumulative	inches	Virginia	Buckingham	10	5.09	SCS Type II 24-hr

Subbasin Summary

SN	Subbasin ID	Area (ac)	Weighted Curve Number	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	Sub-bypass	21.68	60.00	5.09	1.35	29.35	29.57	0 00:20:00
2	Sub-ExPOA1	40.60	64.00	5.09	1.64	66.54	47.81	0 00:37:04
3	Sub-POA1	41.48	70.00	5.09	2.10	87.23	84.01	0 00:25:00
4	Sub-POND	19.80	74.43	5.09	2.47	48.97	33.37	0 00:44:07

Node Summary

SN	Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft²)	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	Jun-01	Junction	565.00	572.00	565.00	572.00	0.00	30.47	573.00	0.00	0.00	0 12:34	16.65	112.00
2	Jun-02	Junction	564.80	564.80	564.80	564.80	0.00	4.33	566.30	0.00	0.50	0 00:00	0.00	0.00
3	Out-ExPOA1	Outfall	562.00					47.47	562.00					
4	Out-POA1	Outfall	562.00					81.11	562.00					
5	Out-POA1_managed	Outfall	0.00					30.16	558.54					
6	Stor-01	Storage Node	566.00	574.00	570.00		0.00	33.15	572.57				0.00	0.00

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length (ft)	Inlet Invert Elevation (ft)	Outlet Invert Elevation (ft)	Average Slope (%)	Diameter or Height (in)	Manning's Roughness	Peak Flow (cfs)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Reported Condition
1	Link-01	Pipe	Jun-01	Jun-02	100.00	565.00	564.80	0.2000	18.000	0.0150	4.33	4.07	1.06	2.68	1.50	1.00	107.00	SURCHARGED
2	Link-02	Channel	Jun-02	Out-POA1_managed	843.00	564.80	558.00	0.8100	24.000	0.0320	4.19	70.77	0.06	2.15	0.54	0.27	0.00	
3	Orifice-01	Orifice	Stor-01	Jun-01		566.00	565.00		6.000		1.48							
4	Weir-01	Weir	Stor-01	Jun-01		566.00	565.00				29.00							

Subbasin Hydrology

Subbasin : Sub-bypass

Input Data

Area (ac) 21.68
Weighted Curve Number 60.00
Rain Gage ID .... Rain Gage-01

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
-	24.50	-	60.00
Composite Area & Weighted CN	24.50		60.00

Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

Tc = (0.007 * ((n * Lf)^0.8)) / ((P^0.5) * (Sf^0.4))

Where :

Tc = Time of Concentration (hr)
n = Manning's roughness
Lf = Flow Length (ft)
P = 2 yr, 24 hr Rainfall (inches)
Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation :

V = 16.1345 * (Sf^0.5) (unpaved surface)
V = 20.3282 * (Sf^0.5) (paved surface)
V = 15.0 * (Sf^0.5) (grassed waterway surface)
V = 10.0 * (Sf^0.5) (nearly bare & untilled surface)
V = 9.0 * (Sf^0.5) (cultivated straight rows surface)
V = 7.0 * (Sf^0.5) (short grass pasture surface)
V = 5.0 * (Sf^0.5) (woodland surface)
V = 2.5 * (Sf^0.5) (forest w/heavy litter surface)
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)

Channel Flow Equation :

V = (1.49 * (R^(2/3)) * (Sf^0.5)) / n
R = Aq / Wp
Tc = (Lf / V) / (3600 sec/hr)

Where :

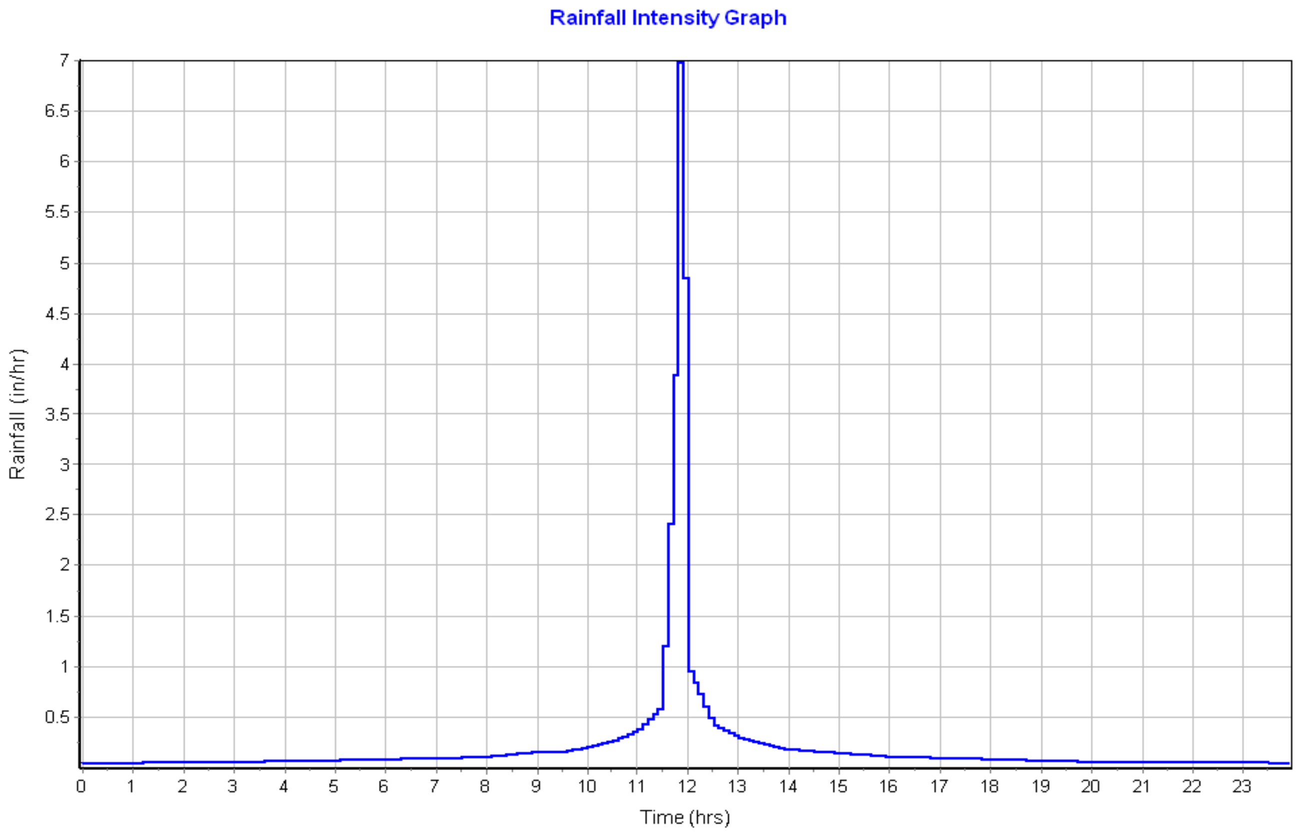
Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
R = Hydraulic Radius (ft)
Aq = Flow Area (ft²)
Wp = Wetted Perimeter (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)
n = Manning's roughness

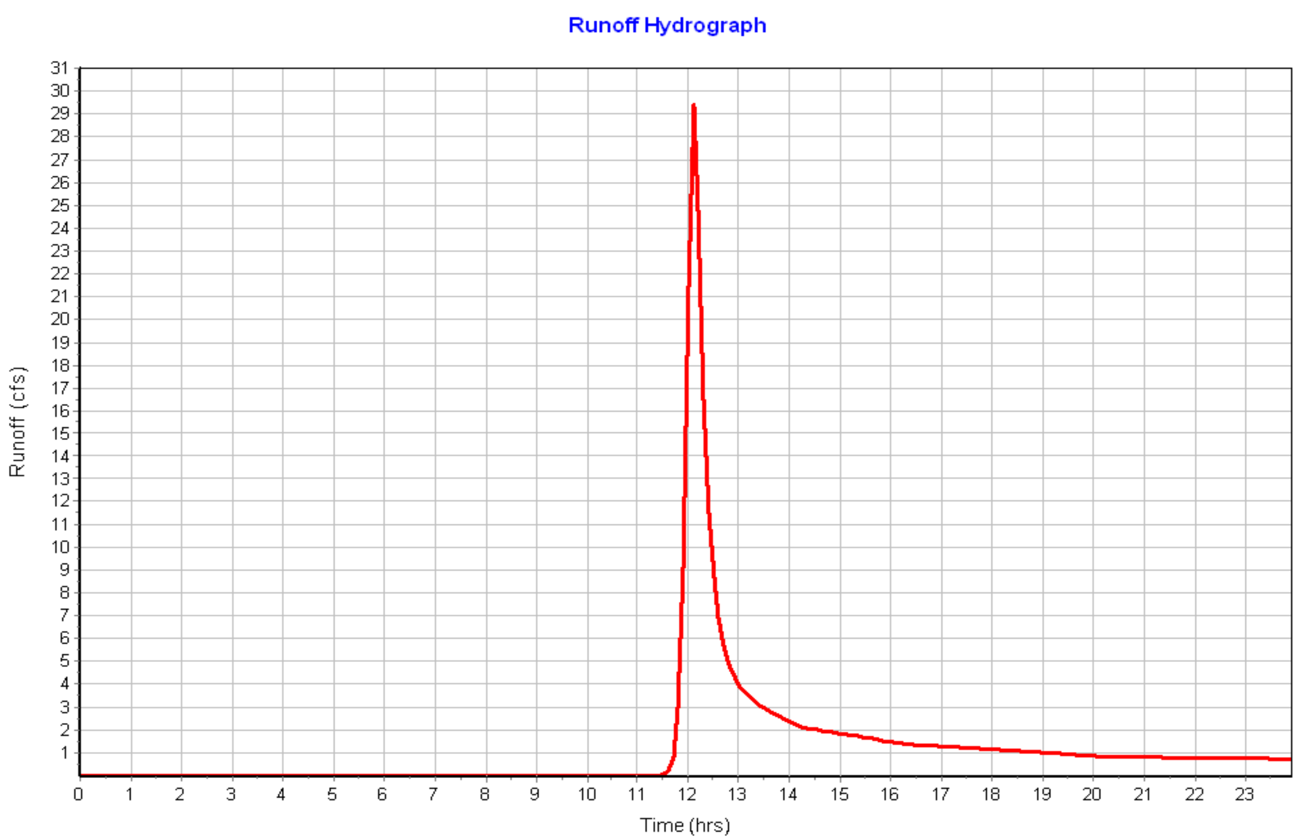
User-Defined TOC override (minutes): 20

Subbasin Runoff Results

Total Rainfall (in) 5.09
Total Runoff (in) 1.35
Peak Runoff (cfs) 29.57
Weighted Curve Number 60.00
Time of Concentration (days hh:mm:ss) 0 00:20:00

Subbasin : Sub-bypass





Subbasin : Sub-ExPOA1

Input Data

Area (ac) 40.60
Weighted Curve Number 64.00
Rain Gage ID .... Rain Gage-01

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
-	20.00	-	64.00
Composite Area & Weighted CN	20.00		64.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	.8	0.00	0.00
Flow Length (ft) :	100	0.00	0.00
Slope (%) :	3	0.00	0.00
2 yr, 24 hr Rainfall (in) :	3.37	0.00	0.00
Velocity (ft/sec) :	0.05	0.00	0.00
Computed Flow Time (min) :	30.98	0.00	0.00

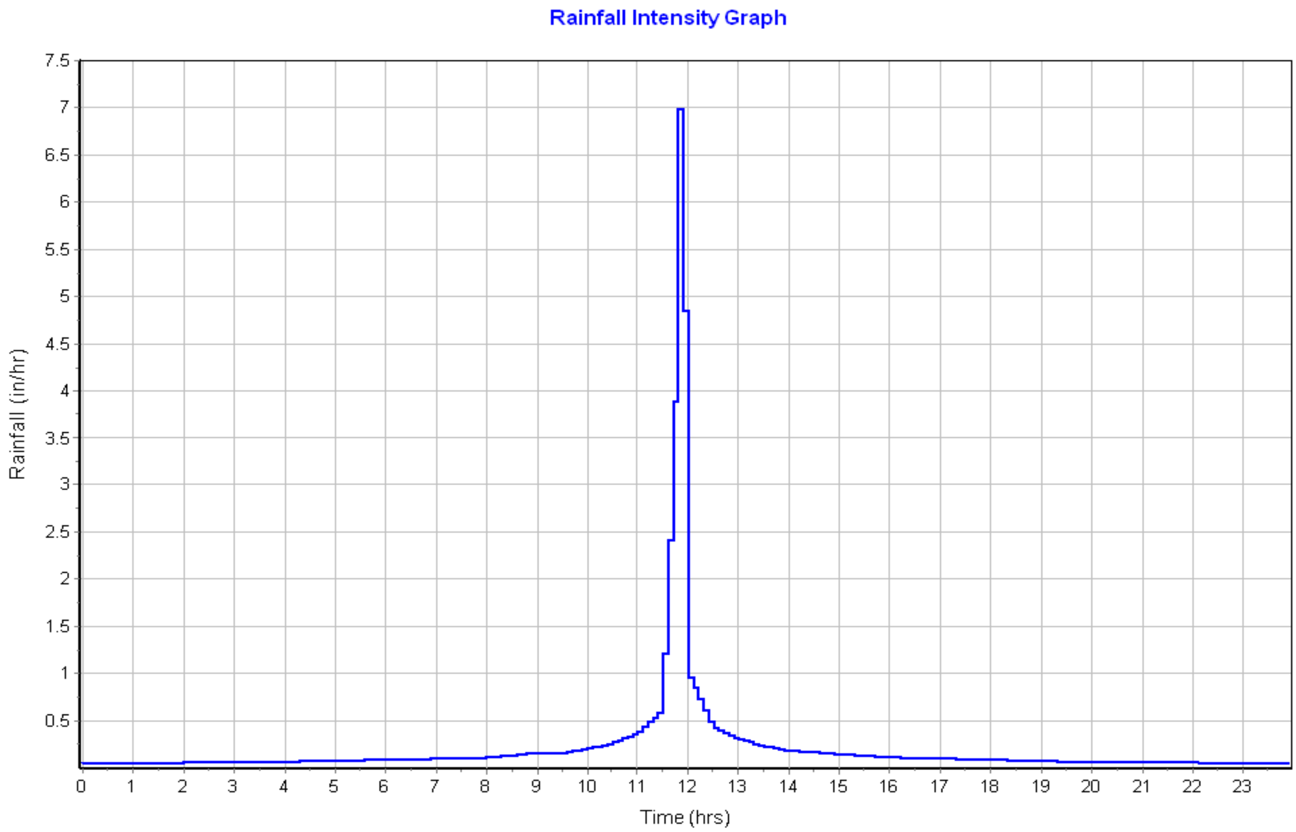
Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	885	0.00	0.00
Slope (%) :	2.25	0.00	0.00
Surface Type :	Unpaved	Unpaved	Unpaved
Velocity (ft/sec) :	2.42	0.00	0.00
Computed Flow Time (min) :	6.10	0.00	0.00

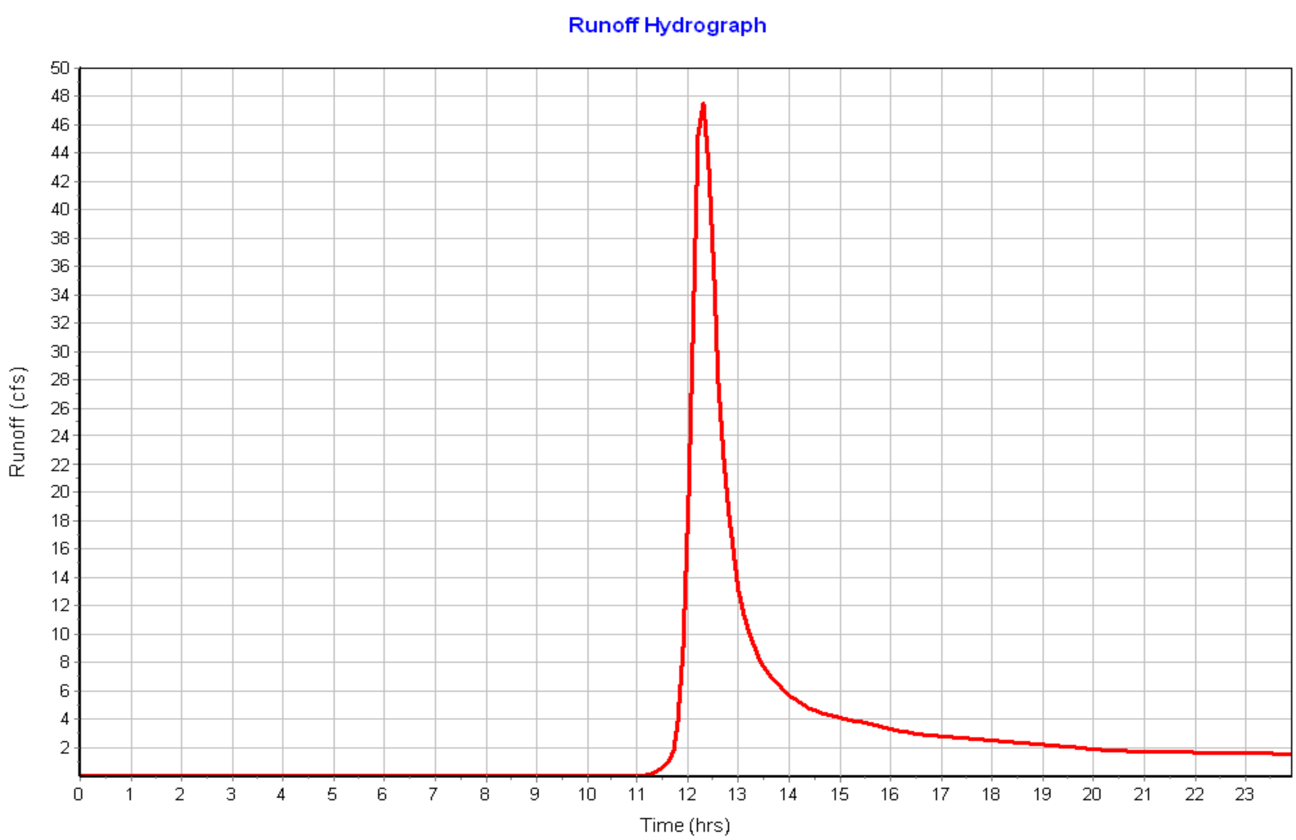
Total TOC (min) 37.07

Subbasin Runoff Results

Total Rainfall (in) 5.09
Total Runoff (in) 1.64
Peak Runoff (cfs) 47.81
Weighted Curve Number 64.00
Time of Concentration (days hh:mm:ss) 0 00:37:04

Subbasin : Sub-ExPOA1





Subbasin : Sub-POA1

Input Data

Area (ac) 41.48
Weighted Curve Number 70.00
Rain Gage ID .... Rain Gage-01

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
-	22.00	-	70.00
Composite Area & Weighted CN	22.00		70.00

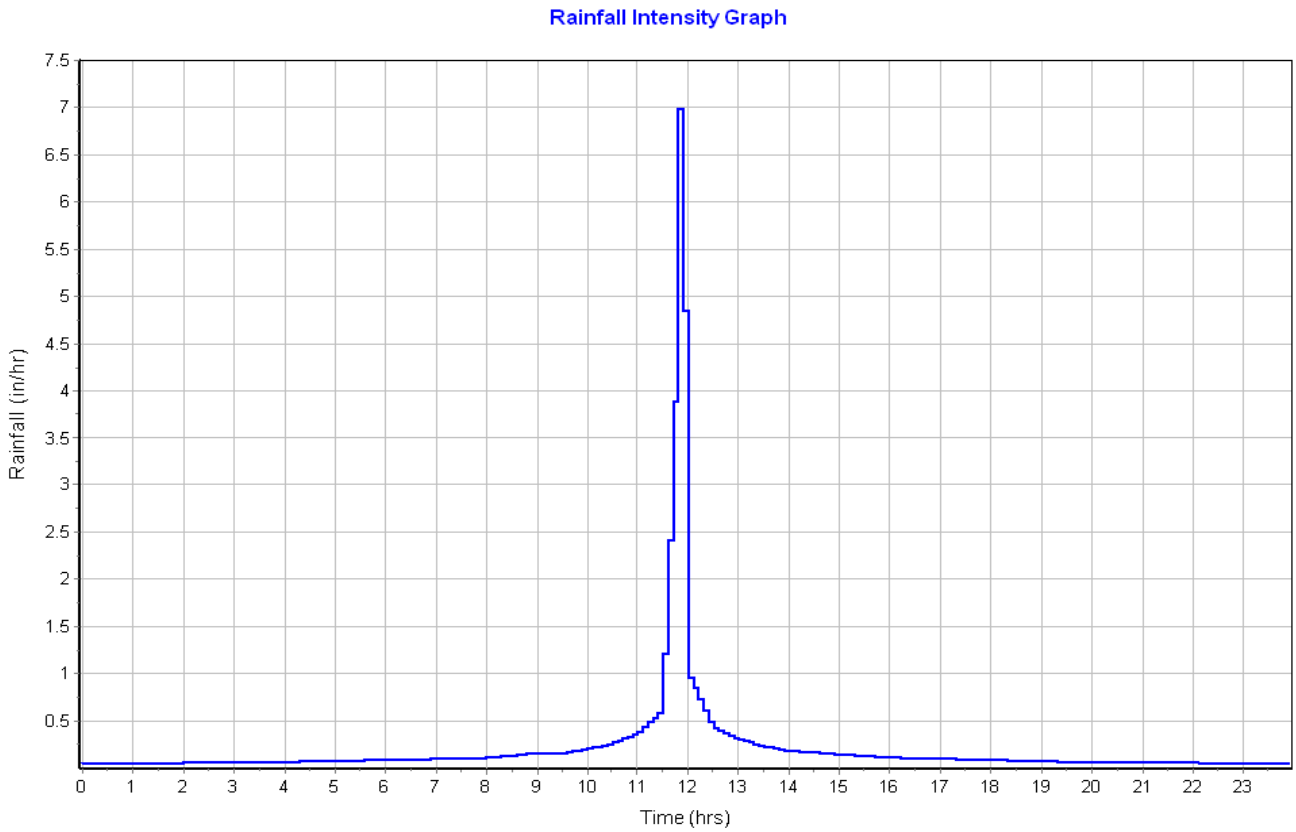
Time of Concentration

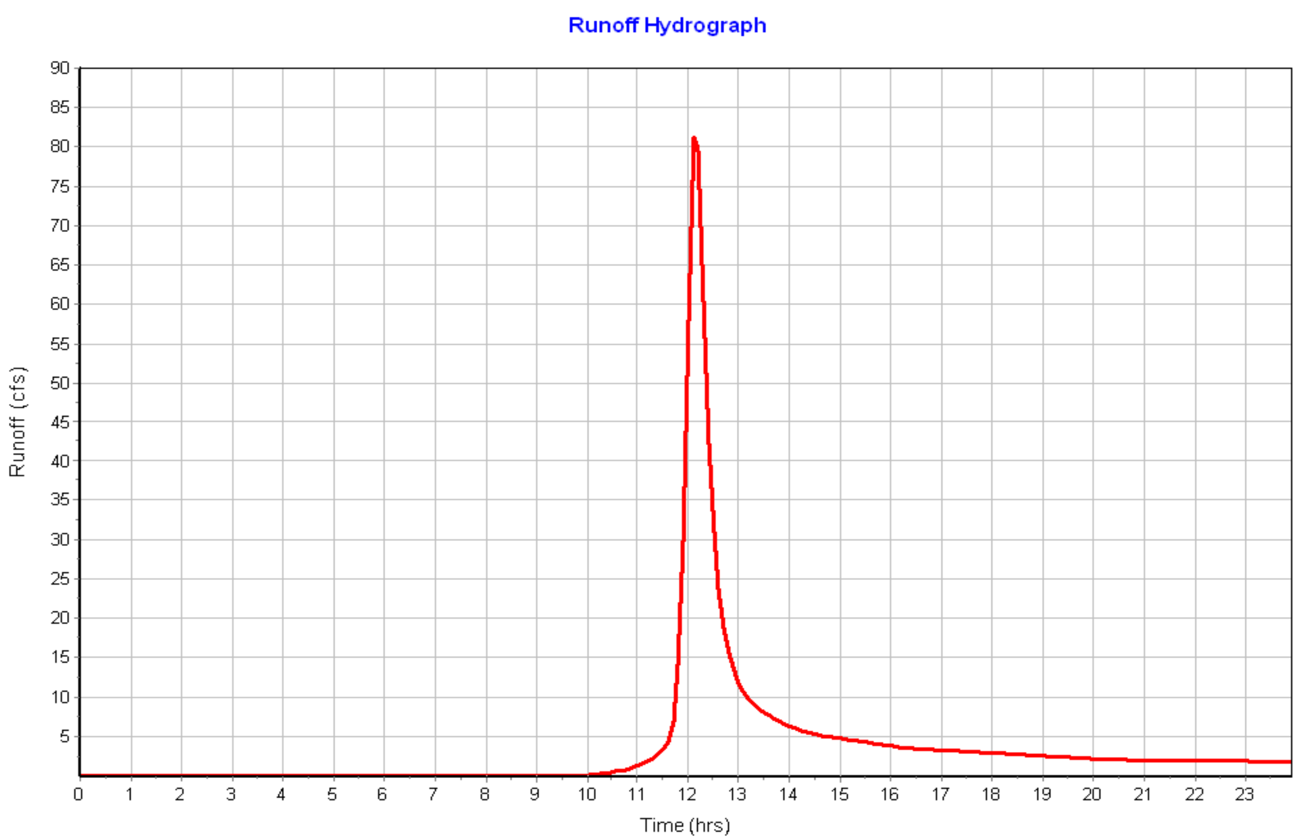
User-Defined TOC override (minutes): 25.00

Subbasin Runoff Results

Total Rainfall (in) 5.09
Total Runoff (in) 2.10
Peak Runoff (cfs) 84.01
Weighted Curve Number 70.00
Time of Concentration (days hh:mm:ss) 0 00:25:00

Subbasin : Sub-POA1





Subbasin : Sub-POND

Input Data

Area (ac) 19.80
Weighted Curve Number 74.43
Rain Gage ID .... Rain Gage-01

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
> 75% grass cover, Good	10.30	B	61.00
Gravel roads	9.50	C	89.00
Composite Area & Weighted CN	19.80		74.43

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	.8	0.00	0.00
Flow Length (ft) :	100	0.00	0.00
Slope (%) :	1.58	0.00	0.00
2 yr, 24 hr Rainfall (in) :	3.50	0.00	0.00
Velocity (ft/sec) :	0.04	0.00	0.00
Computed Flow Time (min) :	39.28	0.00	0.00

Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	650	0.00	0.00
Slope (%) :	2.07	0.00	0.00
Surface Type :	Unpaved	Unpaved	Unpaved
Velocity (ft/sec) :	2.32	0.00	0.00
Computed Flow Time (min) :	4.67	0.00	0.00

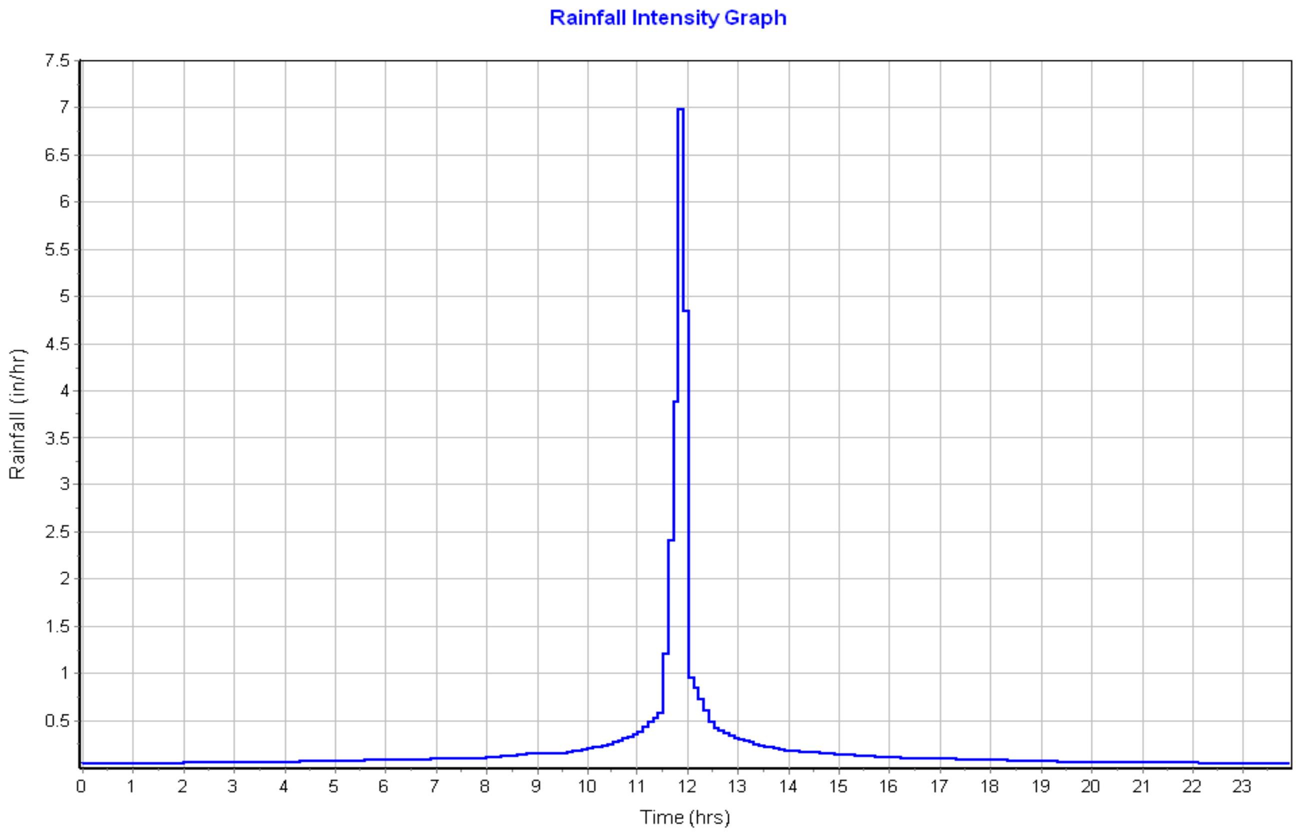
Channel Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	.018	0.00	0.00
Flow Length (ft) :	129	0.00	0.00
Channel Slope (%) :	2	0.00	0.00
Cross Section Area (ft^2) :	20	0.00	0.00
Wetted Perimeter (ft) :	16.65	0.00	0.00
Velocity (ft/sec) :	13.23	0.00	0.00
Computed Flow Time (min) :	0.16	0.00	0.00

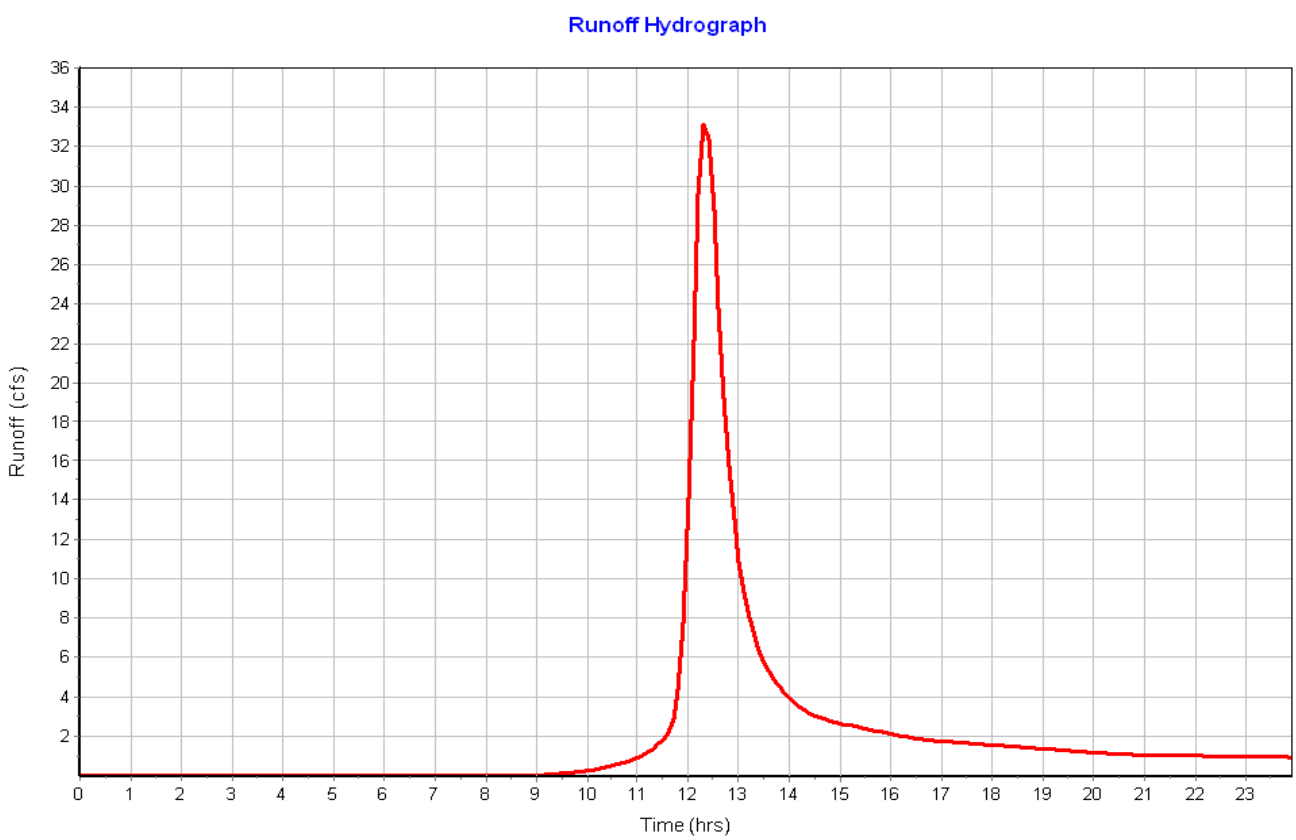
Total TOC (min) 44.12

Subbasin Runoff Results

Total Rainfall (in) 5.09
Total Runoff (in) 2.47
Peak Runoff (cfs) 33.37
Weighted Curve Number 74.43
Time of Concentration (days hh:mm:ss) 0 00:44:07

Subbasin : Sub-POND





Junction Input

SN	Element ID	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Ground/Rim (Max) Offset (ft)	Initial Water Elevation (ft)	Initial Water Depth (ft)	Surcharge Elevation (ft)	Surcharge Depth (ft)	Ponded Area (ft²)	Minimum Pipe Cover (in)
1	Jun-01	565.00	572.00	7.00	565.00	0.00	572.00	0.00	0.00	0.00
2	Jun-02	564.80	564.80	0.00	564.80	0.00	564.80	0.00	0.00	0.00

Junction Results

SN	Element ID	Peak Inflow (cfs)	Peak Lateral Inflow (cfs)	Max HGL Elevation Attained (ft)	Max HGL Depth Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Average HGL Elevation Attained (ft)	Average HGL Depth Attained (ft)	Time of Max HGL Occurrence (days hh:mm)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	Jun-01	30.47	0.00	573.00	8.00	0.00	0.00	565.92	0.92	0 12:20	0 12:34	16.65	112.00
2	Jun-02	4.33	0.00	566.30	1.50	0.00	0.50	565.21	0.41	0 12:20	0 00:00	0.00	0.00

Channel Input

SN	Element ID	Length (ft)	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Total Drop (ft)	Average Slope (%)	Shape	Height (ft)	Width (ft)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)	Flap Gate
1	Link-02	843.00	564.80	0.00	558.00	558.00	6.80	0.8100	Trapezoidal	2.000	14.000	0.0320	0.5000	0.5000	0.0000	0.00	No

Channel Results

SN	Element ID	Peak Flow	Time of Peak Flow Occurrence	Design Flow Capacity	Peak Flow/ Design Flow Ratio	Peak Flow Velocity	Travel Time	Peak Flow Depth	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged	Froude Number	Reported Condition
		(cfs)	(days hh:mm)	(cfs)		(ft/sec)	(min)	(ft)		(min)		
1	Link-02	4.19	0 14:12	70.77	0.06	2.15	6.53	0.54	0.27	0.00		

Pipe Input

SN	Element ID	Length (ft)	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Total Drop (ft)	Average Slope (%)	Pipe Shape	Pipe Diameter or Height (in)	Pipe Width (in)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)	Flap Gate	No. of Barrels
1	Link-01	100.00	565.00	0.00	564.80	0.00	0.20	0.2000	CIRCULAR	18.000	18.000	0.0150	0.5000	0.5000	0.0000	0.00	No	1

Pipe Results

SN	Element ID	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Travel Time (min)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Froude Number	Reported Condition
1	Link-01	4.33	0 14:07	4.07	1.06	2.68	0.62	1.50	1.00	107.00		SURCHARGED

Storage Nodes

Storage Node : Stor-01

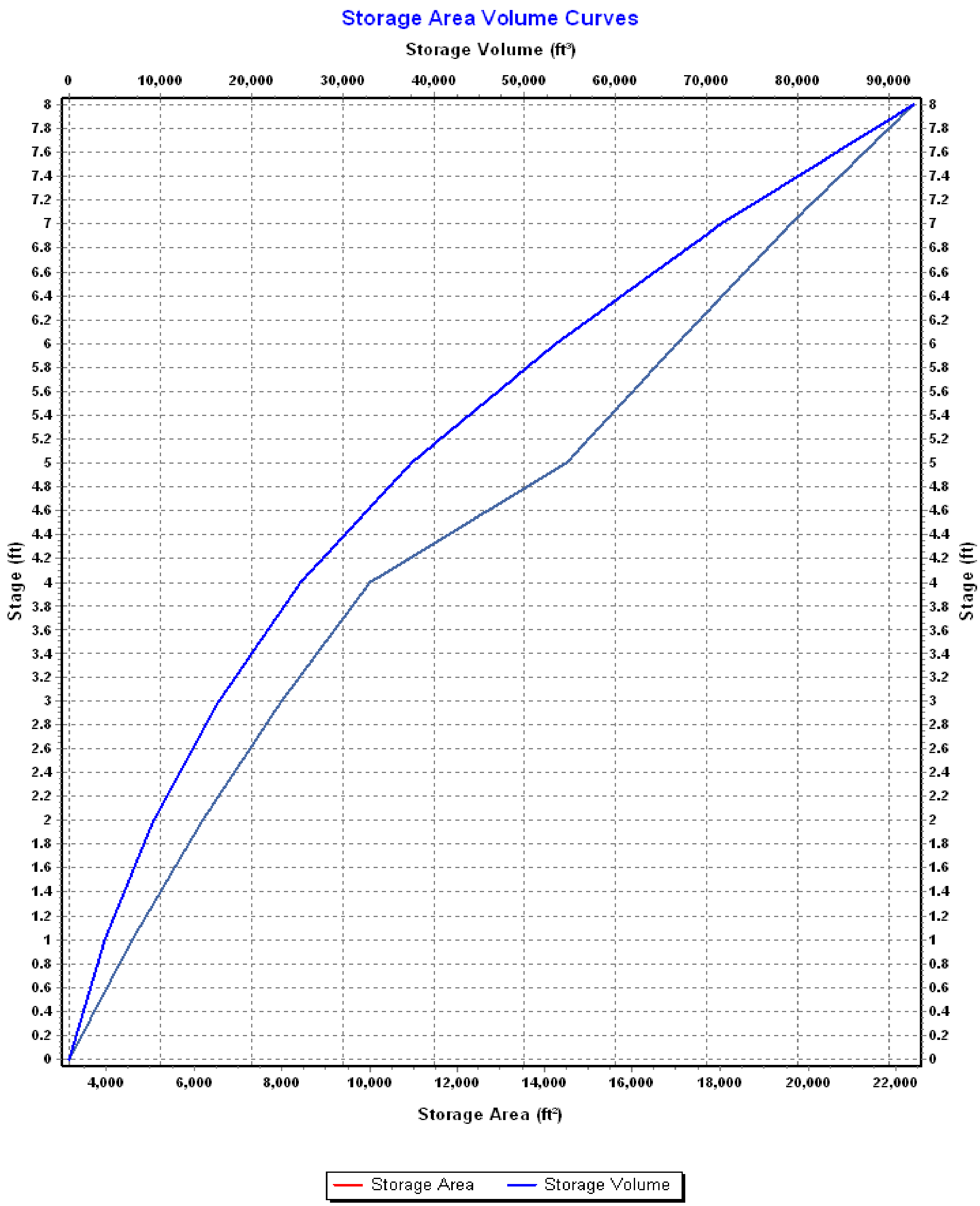
Input Data

Invert Elevation (ft) 566.00
Max (Rim) Elevation (ft) 574.00
Max (Rim) Offset (ft) 8.00
Initial Water Elevation (ft) 570.00
Initial Water Depth (ft) 4.00
Ponded Area (ft^2) 0.00
Evaporation Loss 0.00

Storage Area Volume Curves

Storage Curve : Storage-01

Stage (ft)	Storage Area (ft^2)	Storage Volume (ft^3)
0	3155	0.000
1	4581	3868.00
2	6200	9258.50
3	8000	16358.50
4	10000	25358.50
5	14500	37608.50
6	16994	53355.50
7	19600	71652.50
8	22400	92652.50


Storage Area Volume Curves
Storage Volume (ft³)
0
10,000
20,000
30,000
40,000
50,000
60,000
70,000
80,000
90,000
Stage (ft)
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
2.2
2.4
2.6
2.8
3
3.2
3.4
3.6
3.8
4
4.2
4.4
4.6
4.8
5
5.2
5.4
5.6
5.8
6
6.2
6.4
6.6
6.8
7
7.2
7.4
7.6
7.8
8
4,000
6,000
8,000
10,000
12,000
14,000
16,000
18,000
20,000
22,000
Storage Area (ft²)
Storage Area
Storage Volume

Storage Node : Stor-01 (continued)

Outflow Weirs

SN	Element ID	Weir Type	Flap Gate	Crest Elevation (ft)	Crest Offset (ft)	Length (ft)	Weir Total Height (ft)	Discharge Coefficient
1	Weir-01	Rectangular	No	572.00	6.00	20.00	2.00	3.33

Outflow Orifices

SN	Element ID	Orifice Type	Orifice Shape	Flap Gate	Circular Orifice Diameter (in)	Rectangular Orifice Height (in)	Rectangular Orifice Width (in)	Orifice Invert Elevation (ft)	Orifice Coefficient
1	Orifice-01	Side	CIRCULAR	No	6.00			570.00	0.61

Output Summary Results

Peak Inflow (cfs) 33.15
Peak Lateral Inflow (cfs) 33.15
Peak Outflow (cfs) 30.47
Peak Exfiltration Flow Rate (cfm) 0.00
Max HGL Elevation Attained (ft) 572.57
Max HGL Depth Attained (ft) 6.57
Average HGL Elevation Attained (ft) 571.03
Average HGL Depth Attained (ft) 5.03
Time of Max HGL Occurrence (days hh:mm) 0 12:33
Total Exfiltration Volume (1000-ft³) 0.000
Total Flooded Volume (ac-in) 0
Total Time Flooded (min) 0
Total Retention Time (sec) 0.00

Project Description

File Name .... 38333 Buckingham Compressor-POA2.SPF

Project Options

Flow Units	CFS
Elevation Type	Elevation
Hydrology Method	SCS TR-20
Time of Concentration (TOC) Method	SCS TR-55
Link Routing Method	Kinematic Wave
Enable Overflow Ponding at Nodes	NO
Skip Steady State Analysis Time Periods	NO

Analysis Options

Start Analysis On	Jun 03, 2016	00:06:00
End Analysis On	Jun 04, 2016	00:06:00
Start Reporting On	Jun 03, 2016	00:06:00
Antecedent Dry Days	0	days
Runoff (Dry Weather) Time Step	0 01:00:00	days hh:mm:ss
Runoff (Wet Weather) Time Step	0 00:05:00	days hh:mm:ss
Reporting Time Step	0 00:06:00	days hh:mm:ss
Routing Time Step	30	seconds

Number of Elements

	Qty
Rain Gages	1
Subbasins...	2
Nodes..	5
Junctions	2
Outfalls	2
Flow Diversions	0
Inlets	0
Storage Nodes	1
Links..	4
Channels	1
Pipes	1
Pumps	0
Orifices	1
Weirs	1
Outlets	0
Pollutants	0
Land Uses	0

Rainfall Details

SN	Rain Gage ID	Data Source	Data Source ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)	Rainfall Distribution
1	Rain Gage-01	Time Series	TS-10	Cumulative	inches	Virginia	Buckingham	10	5.09	SCS Type II 24-hr

Subbasin Summary

SN	Subbasin ID	Area (ac)	Weighted Curve Number	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	Sub-ExPOA2	13.52	70.00	5.09	2.10	28.43	16.47	0 00:54:03
2	Sub-POA2	13.52	74.00	5.09	2.44	32.93	28.87	0 00:29:55

Node Summary

SN	Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft²)	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	Jun-02	Junction	568.00	574.00	568.00	574.00	0.00	12.51	568.86	0.00	6.14	0 00:00	0.00	0.00
2	Jun-03	Junction	566.80	566.80	566.80	566.80	0.00	12.51	567.66	0.00	1.14	0 00:00	0.00	0.00
3	Out-ExPOA2	Outfall	562.00					16.29	562.00					
4	Out-POA2	Outfall	562.00					12.49	562.80					
5	Stor-02	Storage Node	568.00	574.00	568.00		0.00	28.84	573.28				0.00	0.00

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length (ft)	Inlet Invert Elevation (ft)	Outlet Invert Elevation (ft)	Average Slope (%)	Diameter or Height (in)	Manning's Roughness	Peak Flow (cfs)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Reported Condition
1	Link-03	Pipe	Jun-02	Jun-03	25.00	567.00	566.80	0.8000	18.000	0.0150	12.51	19.95	0.63	11.91	0.85	0.57	0.00	Calculated
2	Link-04	Channel	Jun-03	Out-POA2	320.00	566.80	562.00	1.5000	24.000	0.0320	12.49	96.51	0.13	3.58	0.79	0.40	0.00	
3	Orifice-02	Orifice	Stor-02	Jun-02		568.00	568.00		9.000		4.82							
4	Weir-02	Weir	Stor-02	Jun-02		568.00	568.00				7.69							

Subbasin Hydrology

Subbasin : Sub-ExPOA2

Input Data

Area (ac) 13.52
Weighted Curve Number 70.00
Rain Gage ID .... Rain Gage-01

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
-	13.52	-	70.00
Composite Area & Weighted CN	13.52		70.00

Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

Tc = (0.007 * ((n * Lf)^0.8)) / ((P^0.5) * (Sf^0.4))

Where :

Tc = Time of Concentration (hr)
n = Manning's roughness
Lf = Flow Length (ft)
P = 2 yr, 24 hr Rainfall (inches)
Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation :

V = 16.1345 * (Sf^0.5) (unpaved surface)
V = 20.3282 * (Sf^0.5) (paved surface)
V = 15.0 * (Sf^0.5) (grassed waterway surface)
V = 10.0 * (Sf^0.5) (nearly bare & untilled surface)
V = 9.0 * (Sf^0.5) (cultivated straight rows surface)
V = 7.0 * (Sf^0.5) (short grass pasture surface)
V = 5.0 * (Sf^0.5) (woodland surface)
V = 2.5 * (Sf^0.5) (forest w/heavy litter surface)
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)

Channel Flow Equation :

V = (1.49 * (R^(2/3)) * (Sf^0.5)) / n
R = Aq / Wp
Tc = (Lf / V) / (3600 sec/hr)

Where :

Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
R = Hydraulic Radius (ft)
Aq = Flow Area (ft²)
Wp = Wetted Perimeter (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)
n = Manning's roughness

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	.8	0.00	0.00
Flow Length (ft) :	100	0.00	0.00
Slope (%) :	.92	0.00	0.00
2 yr, 24 hr Rainfall (in) :	3.37	0.00	0.00
Velocity (ft/sec) :	0.03	0.00	0.00
Computed Flow Time (min) :	49.70	0.00	0.00

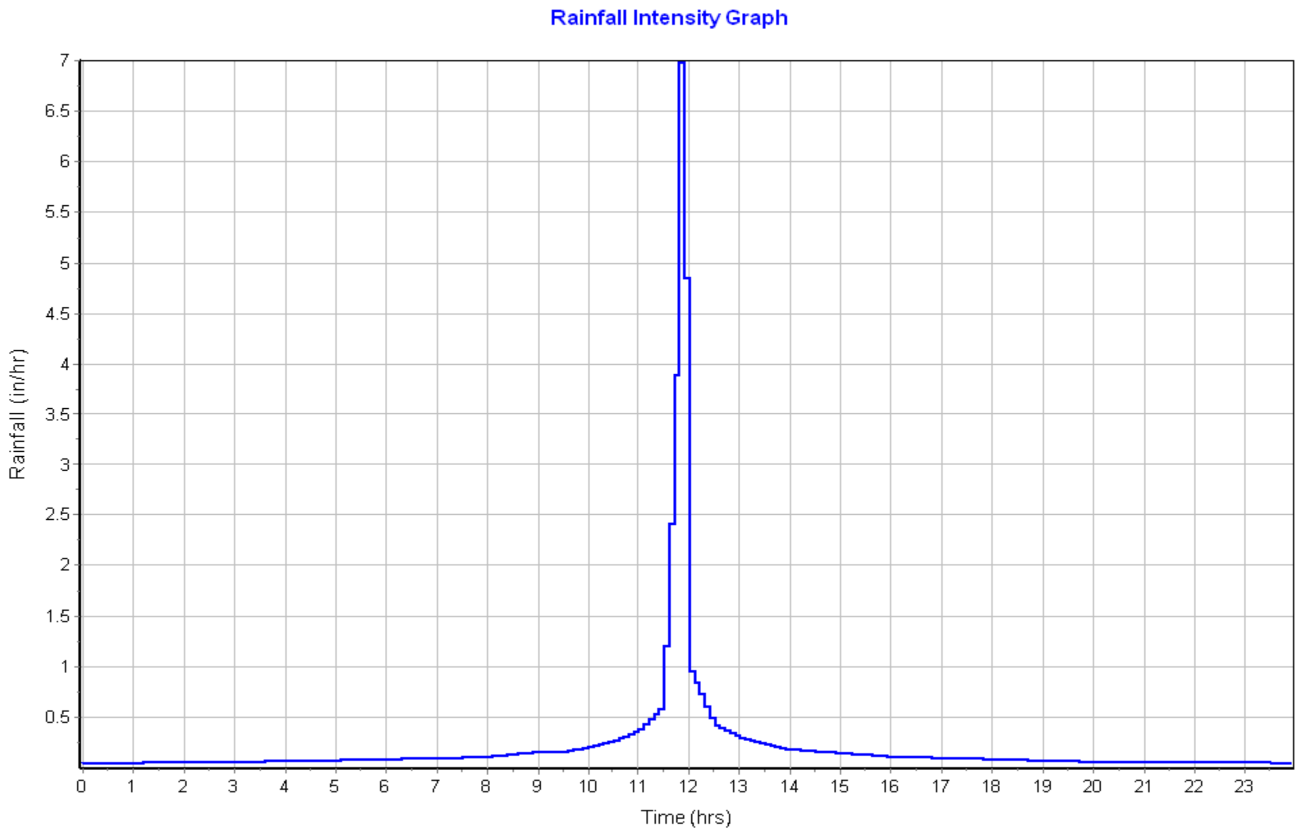
Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	830	0.00	0.00
Slope (%) :	3.88	0.00	0.00
Surface Type :	Unpaved	Unpaved	Unpaved
Velocity (ft/sec) :	3.18	0.00	0.00
Computed Flow Time (min) :	4.35	0.00	0.00

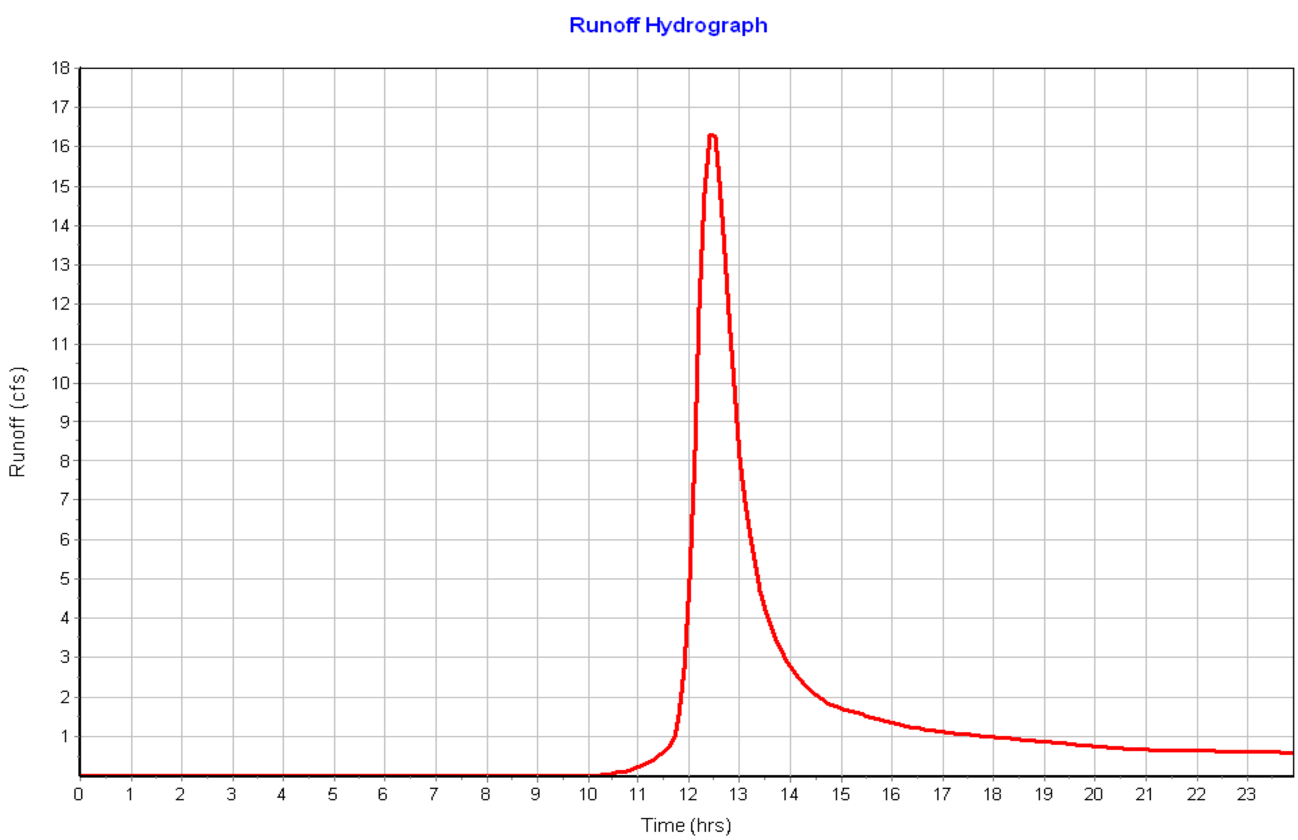
Total TOC (min) 54.05

Subbasin Runoff Results

Total Rainfall (in) 5.09
Total Runoff (in) 2.10
Peak Runoff (cfs) 16.47
Weighted Curve Number 70.00
Time of Concentration (days hh:mm:ss) 0 00:54:03

Subbasin : Sub-ExPOA2





Subbasin : Sub-POA2

Input Data

Area (ac) 13.52
Weighted Curve Number 74.00
Rain Gage ID .... Rain Gage-01

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
50 - 75% grass cover, Fair	6.76	B	69.00
50 - 75% grass cover, Fair	6.76	C	79.00
Composite Area & Weighted CN	13.52		74.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	.4	0.00	0.00
Flow Length (ft) :	100	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	3.37	0.00	0.00
Velocity (ft/sec) :	0.06	0.00	0.00
Computed Flow Time (min) :	27.61	0.00	0.00

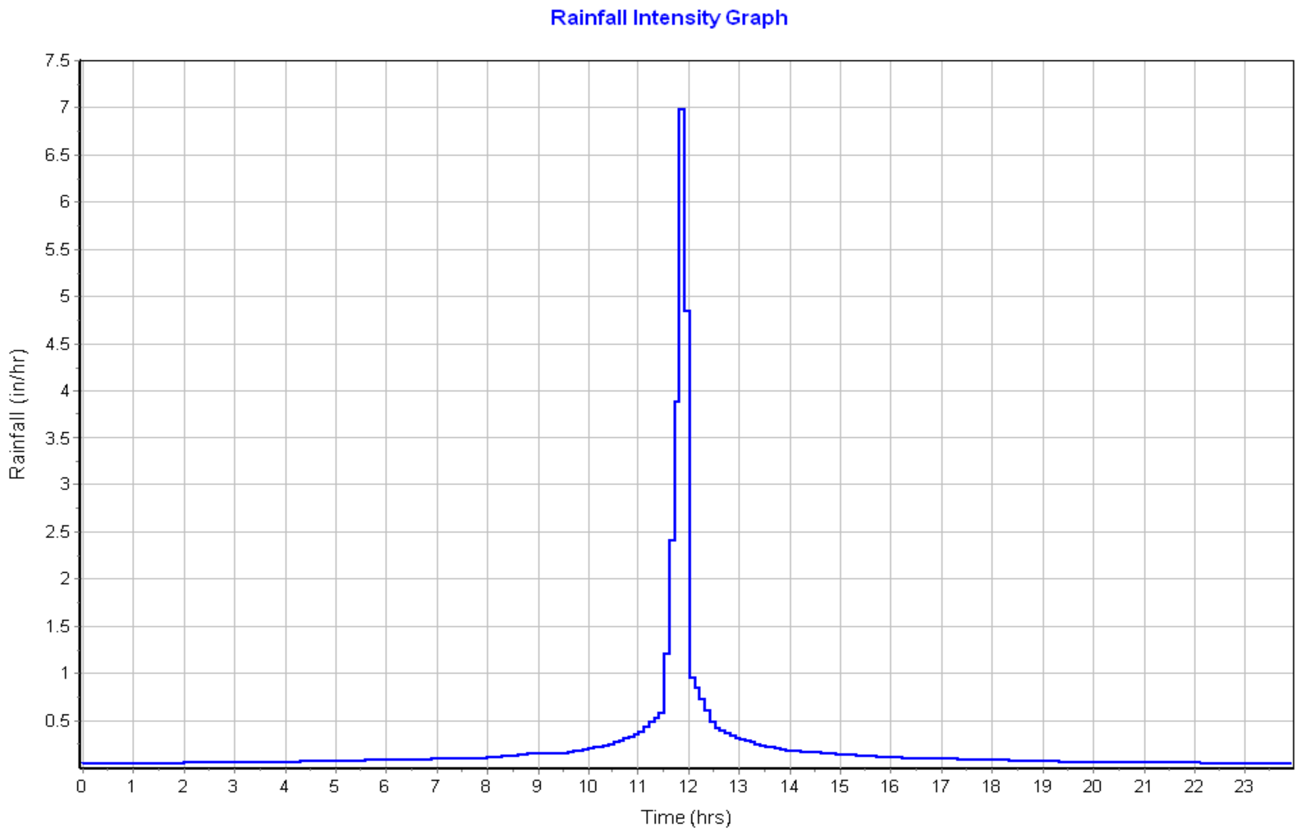
Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	443	0.00	0.00
Slope (%) :	3.88	0.00	0.00
Surface Type :	Unpaved	Paved	Unpaved
Velocity (ft/sec) :	3.18	0.00	0.00
Computed Flow Time (min) :	2.32	0.00	0.00

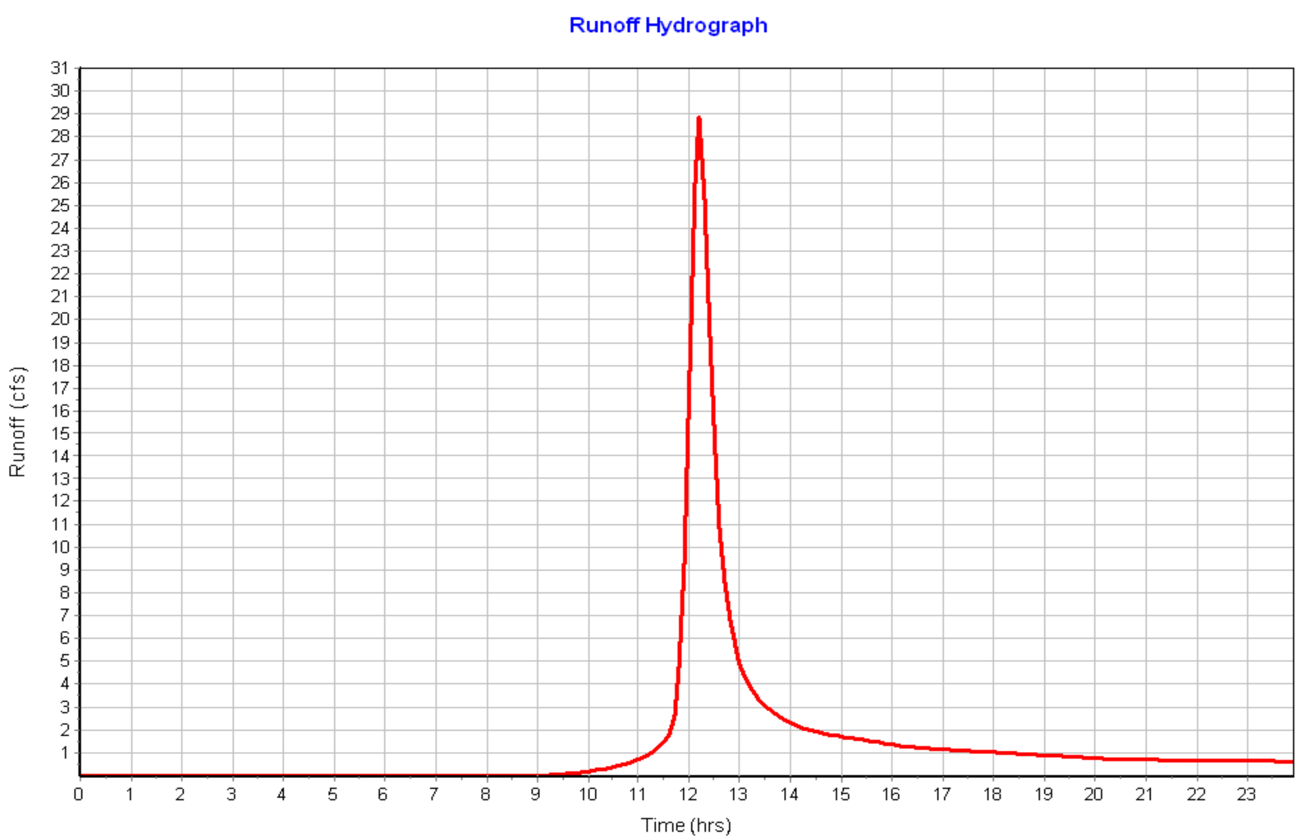
Total TOC (min) 29.93

Subbasin Runoff Results

Total Rainfall (in) 5.09
Total Runoff (in) 2.44
Peak Runoff (cfs) 28.87
Weighted Curve Number 74.00
Time of Concentration (days hh:mm:ss) 0 00:29:56

Subbasin : Sub-POA2





Junction Input

SN	Element ID	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Ground/Rim (Max) Offset (ft)	Initial Water Elevation (ft)	Initial Water Depth (ft)	Surcharge Elevation (ft)	Surcharge Depth (ft)	Ponded Area (ft²)	Minimum Pipe Cover (in)
1	Jun-02	568.00	574.00	6.00	568.00	0.00	574.00	0.00	0.00	0.00
2	Jun-03	566.80	566.80	0.00	566.80	0.00	566.80	0.00	0.00	0.00

Junction Results

SN	Element ID	Peak Inflow (cfs)	Peak Lateral Inflow (cfs)	Max HGL Elevation Attained (ft)	Max HGL Depth Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Average HGL Elevation Attained (ft)	Average HGL Depth Attained (ft)	Time of Max HGL Occurrence (days hh:mm)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	Jun-02	12.51	0.00	568.86	0.86	0.00	6.14	568.18	0.18	0 12:39	0 00:00	0.00	0.00
2	Jun-03	12.51	0.00	567.66	0.86	0.00	1.14	566.98	0.18	0 12:39	0 00:00	0.00	0.00

Channel Input

SN	Element ID	Length (ft)	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Total Drop (ft)	Average Slope (%)	Shape	Height (ft)	Width (ft)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)	Flap Gate
1	Link-04	320.00	566.80	0.00	562.00	0.00	4.80	1.5000	Trapezoidal	2.000	14.000	0.0320	0.5000	0.5000	0.0000	0.00	No

Channel Results

SN	Element ID	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Travel Time (min)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Froude Number	Reported Condition
1	Link-04	12.49	0 12:40	96.51	0.13	3.58	1.49	0.79	0.40	0.00		

Pipe Input

SN	Element ID	Length (ft)	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Total Drop (ft)	Average Slope (%)	Pipe Shape	Pipe Diameter or Height (in)	Pipe Width (in)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)	Flap Gate	No. of Barrels
1	Link-03	25.00	567.00	-1.00	566.80	0.00	0.20	0.8000	CIRCULAR	18.000	18.000	0.0150	0.5000	0.5000	0.0000	0.00	No	1

Pipe Results

SN	Element ID	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Travel Time (min)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Froude Number	Reported Condition
1	Link-03	12.51	0 12:39	19.95	0.63	11.91	0.03	0.85	0.57	0.00		Calculated

Storage Nodes

Storage Node : Stor-02

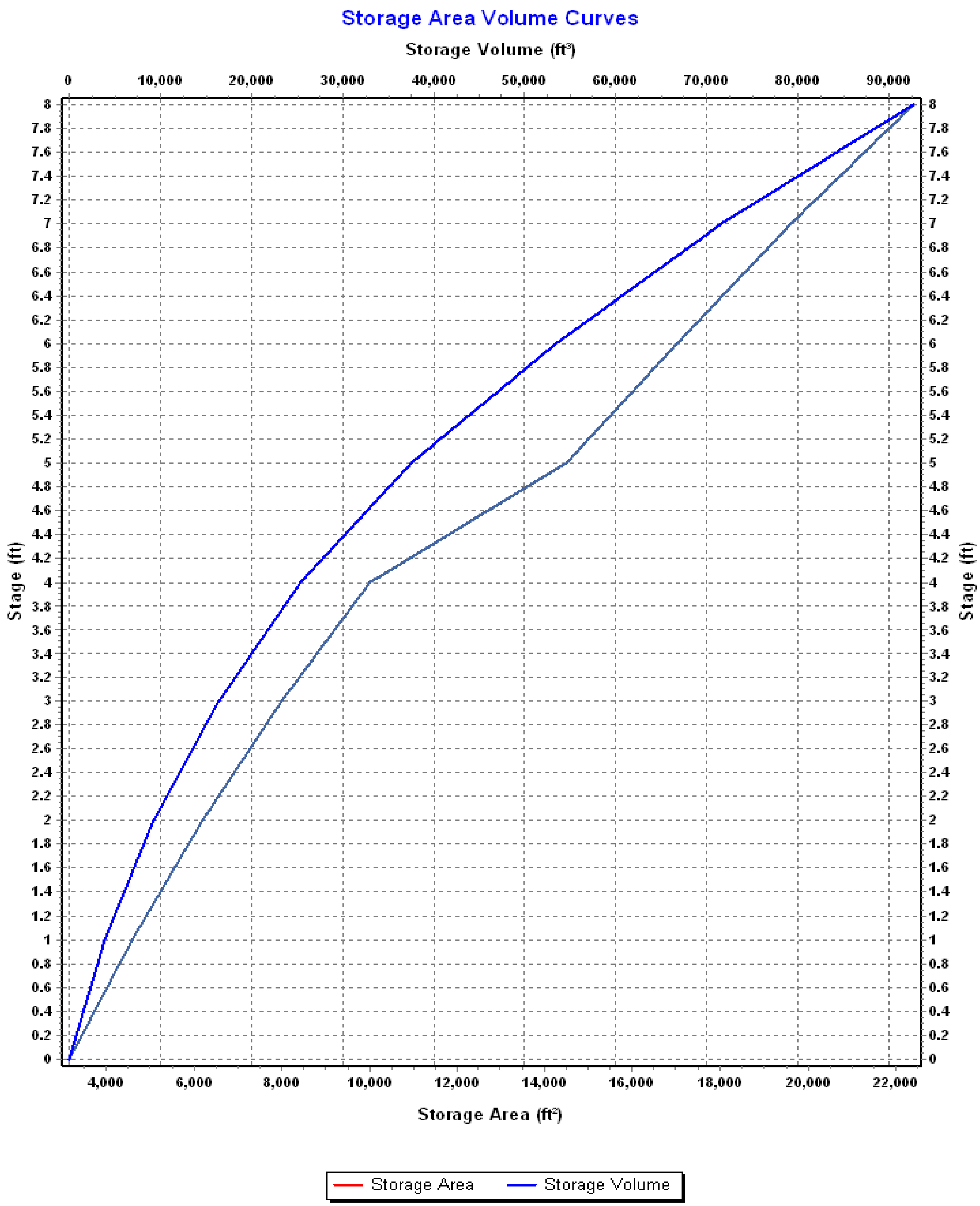
Input Data

Invert Elevation (ft) 568.00
Max (Rim) Elevation (ft) 574.00
Max (Rim) Offset (ft) 6.00
Initial Water Elevation (ft) 568.00
Initial Water Depth (ft) 0.00
Ponded Area (ft^2) 0.00
Evaporation Loss 0.00

Storage Area Volume Curves

Storage Curve : Storage-01

Stage (ft)	Storage Area (ft^2)	Storage Volume (ft^3)
0	3155	0.000
1	4581	3868.00
2	6200	9258.50
3	8000	16358.50
4	10000	25358.50
5	14500	37608.50
6	16994	53355.50
7	19600	71652.50
8	22400	92652.50



Storage Area Volume Curves
Storage Volume (ft³)
0
10,000
20,000
30,000
40,000
50,000
60,000
70,000
80,000
90,000
Stage (ft)
8
7.8
7.6
7.4
7.2
7
6.8
6.6
6.4
6.2
6
5.8
5.6
5.4
5.2
5
4.8
4.6
4.4
4.2
4
3.8
3.6
3.4
3.2
3
2.8
2.6
2.4
2.2
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
4,000
6,000
8,000
10,000
12,000
14,000
16,000
18,000
20,000
22,000
Storage Area (ft²)
Storage Area
Storage Volume

Storage Node : Stor-02 (continued)

Outflow Weirs

SN	Element ID	Weir Type	Flap Gate	Crest Elevation (ft)	Crest Offset (ft)	Length (ft)	Weir Total Height (ft)	Discharge Coefficient
1	Weir-02	Rectangular	No	573.00	5.00	16.00	2.00	3.33

Outflow Orifices

SN	Element ID	Orifice Type	Orifice Shape	Flap Gate	Circular Orifice Diameter (in)	Rectangular Orifice Height (in)	Rectangular Orifice Width (in)	Orifice Invert Elevation (ft)	Orifice Coefficient
1	Orifice-02	Side	CIRCULAR	No	9.00			568.00	0.61

Output Summary Results

Peak Inflow (cfs) 28.84
Peak Lateral Inflow (cfs) 28.84
Peak Outflow (cfs) 12.51
Peak Exfiltration Flow Rate (cfm) 0.00
Max HGL Elevation Attained (ft) 573.28
Max HGL Depth Attained (ft) 5.28
Average HGL Elevation Attained (ft) 569.07
Average HGL Depth Attained (ft) 1.07
Time of Max HGL Occurrence (days hh:mm) 0 12:39
Total Exfiltration Volume (1000-ft³) 0.000
Total Flooded Volume (ac-in) 0
Total Time Flooded (min) 0
Total Retention Time (sec) 0.00

Project Description

File Name .... 38333 Buckingham Compressor-POA3.SPF

Project Options

Flow Units .... CFS
Elevation Type .... Elevation
Hydrology Method .... SCS TR-20
Time of Concentration (TOC) Method .... SCS TR-55
Link Routing Method .... Kinematic Wave
Enable Overflow Ponding at Nodes .... NO
Skip Steady State Analysis Time Periods .... NO

Analysis Options

Start Analysis On	Jun 03, 2016	00:06:00
End Analysis On	Jun 04, 2016	00:06:00
Start Reporting On	Jun 03, 2016	00:06:00
Antecedent Dry Days	0	days
Runoff (Dry Weather) Time Step	0 01:00:00	days hh:mm:ss
Runoff (Wet Weather) Time Step	0 00:05:00	days hh:mm:ss
Reporting Time Step	0 00:06:00	days hh:mm:ss
Routing Time Step	30	seconds

Number of Elements

	Qty
Rain Gages	1
Subbasins...	2
Nodes...	2
Junctions	0
Outfalls	2
Flow Diversions	0
Inlets	0
Storage Nodes	0
Links..	0
Channels	0
Pipes	0
Pumps	0
Orifices	0
Weirs	0
Outlets	0
Pollutants	0
Land Uses	0

Rainfall Details

SN	Rain Gage ID	Data Source	Data Source ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)	Rainfall Distribution
1	Rain Gage-01	Time Series	TS-10	Cumulative	inches	Virginia	Buckingham	10	5.09	SCS Type II 24-hr

Subbasin Summary

SN	Subbasin ID	Area (ac)	Weighted Curve Number	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	Sub-ExPOA3	3.82	70.00	5.09	2.10	8.03	6.03	0 00:37:09
2	Sub-POA3	2.89	70.00	5.09	2.10	6.08	4.65	0 00:36:10

Node Summary

SN	Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft²)	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	Out-ExPOA3	Outfall	562.00					0.00	0.00					
2	Out-POA3	Outfall	562.00					0.00	0.00					

Subbasin Hydrology

Subbasin : Sub-ExPOA3

Input Data

Area (ac) 3.82
Weighted Curve Number 70.00
Rain Gage ID .... Rain Gage-01

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
-	13.52	-	70.00
Composite Area & Weighted CN	13.52		70.00

Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

Tc = (0.007 * ((n * Lf)^0.8)) / ((P^0.5) * (Sf^0.4))

Where :

Tc = Time of Concentration (hr)
n = Manning's roughness
Lf = Flow Length (ft)
P = 2 yr, 24 hr Rainfall (inches)
Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation :

V = 16.1345 * (Sf^0.5) (unpaved surface)
V = 20.3282 * (Sf^0.5) (paved surface)
V = 15.0 * (Sf^0.5) (grassed waterway surface)
V = 10.0 * (Sf^0.5) (nearly bare & untilled surface)
V = 9.0 * (Sf^0.5) (cultivated straight rows surface)
V = 7.0 * (Sf^0.5) (short grass pasture surface)
V = 5.0 * (Sf^0.5) (woodland surface)
V = 2.5 * (Sf^0.5) (forest w/heavy litter surface)
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)

Channel Flow Equation :

V = (1.49 * (R^(2/3)) * (Sf^0.5)) / n
R = Aq / Wp
Tc = (Lf / V) / (3600 sec/hr)

Where :

Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
R = Hydraulic Radius (ft)
Aq = Flow Area (ft^2)
Wp = Wetted Perimeter (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)
n = Manning's roughness

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	.8	0.00	0.00
Flow Length (ft) :	100	0.00	0.00
Slope (%) :	2	0.00	0.00
2 yr, 24 hr Rainfall (in) :	3.37	0.00	0.00
Velocity (ft/sec) :	0.05	0.00	0.00
Computed Flow Time (min) :	36.43	0.00	0.00

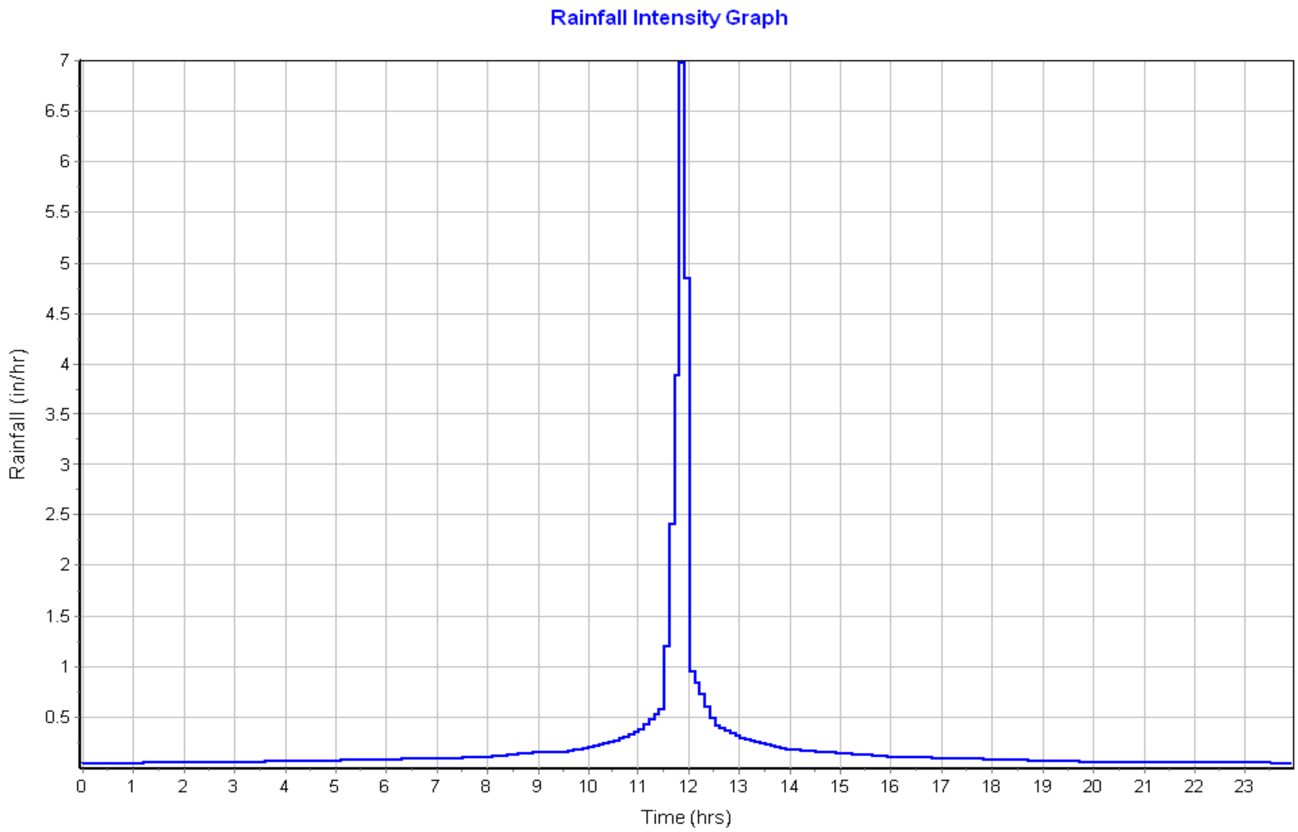
Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	126	0.00	0.00
Slope (%) :	3.17	0.00	0.00
Surface Type :	Unpaved	Unpaved	Unpaved
Velocity (ft/sec) :	2.87	0.00	0.00
Computed Flow Time (min) :	0.73	0.00	0.00

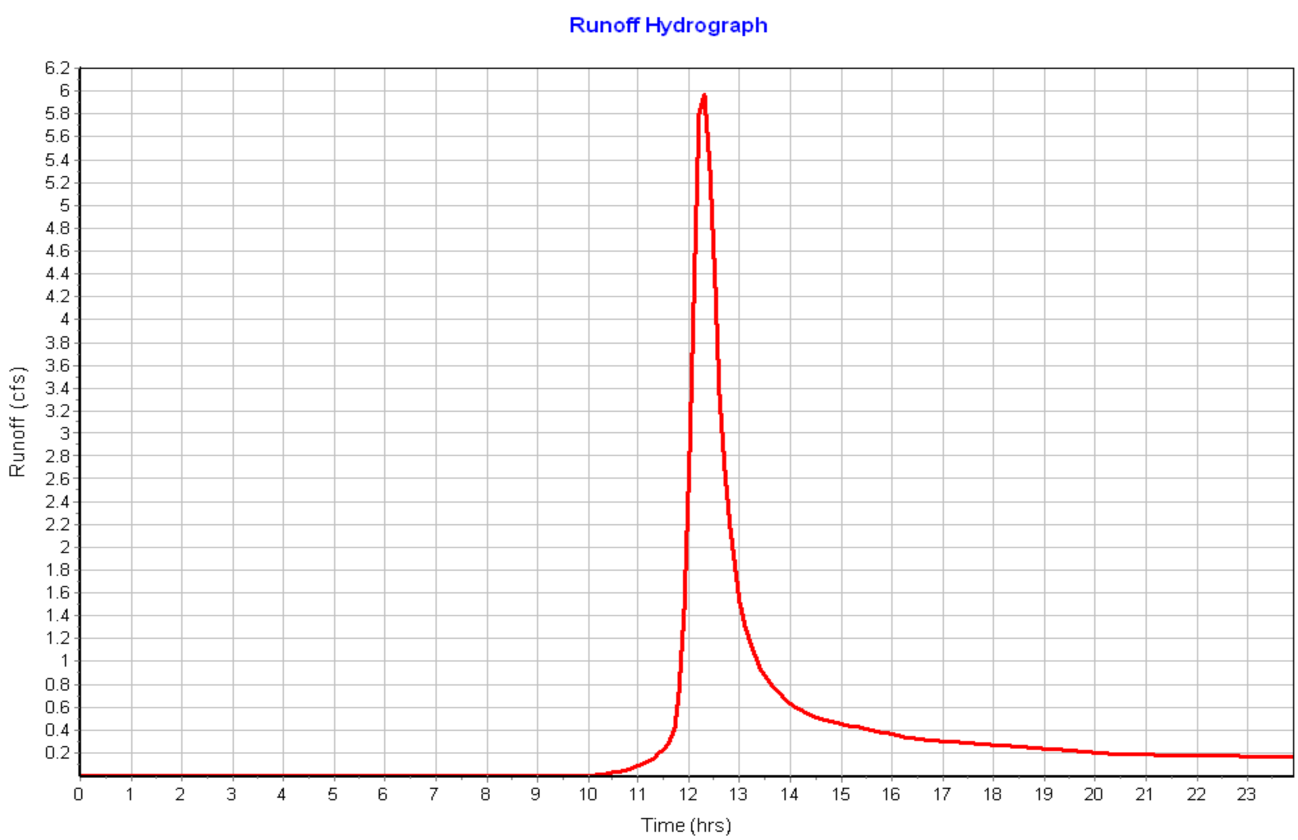
Total TOC (min) 37.16

Subbasin Runoff Results

Total Rainfall (in) 5.09
Total Runoff (in) 2.10
Peak Runoff (cfs) 6.03
Weighted Curve Number 70.00
Time of Concentration (days hh:mm:ss) 0 00:37:10

Subbasin : Sub-ExPOA3





Subbasin : Sub-POA3

Input Data

Area (ac) 2.89
Weighted Curve Number 70.00
Rain Gage ID .... Rain Gage-01

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Woods, Fair	2.89	B	70.00
Composite Area & Weighted CN	2.89		70.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	.8	0.00	0.00
Flow Length (ft) :	100	0.00	0.00
Slope (%) :	3	0.00	0.00
2 yr, 24 hr Rainfall (in) :	3.37	0.00	0.00
Velocity (ft/sec) :	0.05	0.00	0.00
Computed Flow Time (min) :	30.98	0.00	0.00

Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	300	570	0.00
Slope (%) :	2.7	2	0.00
Surface Type :	Unpaved	Paved	Unpaved
Velocity (ft/sec) :	2.65	2.87	0.00
Computed Flow Time (min) :	1.89	3.31	0.00

Total TOC (min) 36.18

Subbasin Runoff Results

Total Rainfall (in) 5.09
Total Runoff (in) 2.10
Peak Runoff (cfs) 4.65
Weighted Curve Number 70.00
Time of Concentration (days hh:mm:ss) 0 00:36:11

Subbasin : Sub-POA3