

L:1:2024/09/30-REC_Airport001-203-CON_Access_RoadDWGSheetCD4930.001-203C-024.dwg | Plotted on 9/26/2019 11:29 AM | by Kevin O'Meara

MS-19 Narrative

Part 1: Project Description

The purpose of this project is to complete an access road and associated turnaround road to a future Dominion Energy development located on Airport property. An additional road is located on the southeast extents of the site which will provide access to a future fuel farm associated with the Dominion Energy development. A portion of Thunderbolt Drive will be demolished prior to construction of the Dominion Energy access road. Approximately 5.26 acres will be disturbed for the completion of this project. Construction is anticipated to begin in the spring of 2019.

There are five outfalls associated with this project; four of these outfalls are connections to existing storm sewer systems. The adequacy of the existing systems to which the proposed systems are tied is shown in the storm sewer and hydraulic grade line computations. The remaining outfall, Outfall #1, is discharged through a proposed culvert as well as a proposed ditch into a man-made channel, which directs drainage through a downstream culvert. Aside from demonstrating the adequacy of this receiving channel, which is discussed here, a separate culvert calculation is included with these plans to demonstrate adequacy of the existing downstream culvert.

Outfall #1 is located near station 34+00 of the Fuel Farm Road, at the outfall of culvert 4-3 to 4-4. Three sections were analyzed at this outfall location, as well as an existing ground profile demonstrating section locations. The outfall channel is a man-made swale which directs drainage towards the downstream culvert, which is lined with well-established and actively maintained grasses. The geometry, both horizontal and vertical, of this receiving channel will remain the same post-construction as it is pre-construction.

An initial state permit for this project was obtained prior to July 1, 2014 and was subsequently renewed for one additional permit cycle, which is currently active and will continue to be active through June 30, 2019. See sheet 1C for acknowledgement of this permit and renewal. Per 9VAC25-870-47, this project shall therefore remain subject to the technical criteria set forth in Part IIC of the Handbook throughout the duration of the current permit cycle. Furthermore, the Airport has the option of obtaining one additional permit renewal (for a total of two renewal cycles), which extends Part IIC applicability through 2024. For these reasons, the calculations shown here satisfy the technical criteria as detailed in Part IIC of the Handbook.

Flow Calculations to MS-19 Sections

| Flow to MS-19 Section #1 | | | |
|--------------------------|------|-----------------|------|
| Area Number | Area | C-Factor | CA |
| 32 | 0.78 | 0.50 | 0.39 |
| 33 | 1.05 | 0.35 | 0.37 |
| 34 | 0.53 | 0.35 | 0.19 |
| 35 | 0.21 | 0.35 | 0.07 |
| M1 | 0.08 | 0.35 | 0.03 |
| Total: | 2.6 | | 1.0 |
| | | | |
| Weighted C-factor: | 0.39 | Controlling Tc: | 15.8 |

| | Intensity (in/hr) | Discharge (cfs) | Velocity (ft/s) |
|-----------|-------------------|-----------------|-----------------|
| 2-Year: | 3.5 | 3.6 | 0.9 |
| 10-Year: | 4.6 | 4.8 | 1.0 |
| 100-Year: | 5.9 | 6.2 | 1.1 |

| Flow to MS-19 Section #1B | | | |
|---------------------------|------|-----------------|------|
| Area Number | Area | C-Factor | CA |
| Flow to MS-19 Section #1A | 3.29 | 0.39 | 1.27 |
| M3 | 0.40 | 0.35 | 0.14 |
| Total: | 3.7 | | 1.4 |
| | | | |
| Weighted C-factor: | 0.38 | Controlling Tc: | 17.7 |

| | Intensity (in/hr) | Discharge (cfs) | Velocity (ft/s) |
|-----------|-------------------|-----------------|-----------------|
| 2-Year: | 3.3 | 4.6 | 1.4 |
| 10-Year: | 4.4 | 6.2 | 1.5 |
| 100-Year: | 5.7 | 8.0 | 1.6 |

Part 2: MS-19 Analysis

A detailed analysis of all areas draining to this outfall was performed and can be seen in the table entitled "Flow Calculations to MS-19 Sections", which is included with this narrative.

As these calculations demonstrate, the outfalls **will contain a 10-year storm in its banks, and the velocity of a 2-year storm will not cause any erosion to the banks of the outfall.** Therefore, no improvements are planned for the outfall as water quantity requirements are satisfied. The discharge to each outfall was determined using the appropriate methods based on drainage area size; the capacity and velocity in the channel was analyzed using Bentley® Flowmaster® V8i. The channel was assumed to have a Manning's n-value of 0.05. Below are the details of the outfall, with a summary of the flow conditions at that section. Discharge and velocity values for the corresponding "A" and "B" sections are found in parenthesis following the first section values (i.e. 1.80 ft/s (1.90, 2.00) indicate velocities of 1.80, 1.90, and 2.00 ft/s for sections 1, 1A, and 1B respectively). All supporting calculations may be found on subsequent plan sheets.

Part 3: MS-19 Section #1, 1A, 1B

The total area draining to section #1 is 2.64 acres (3.29, 3.69) with a weighted C-factor of 0.39 (0.39, 0.38). The 2-year post-development discharge is 3.6 cfs (4.3, 4.6) with a velocity of 0.9 ft/sec (1.0, 1.4). The 10-year post-development discharge is 4.8 cfs (5.7, 6.2) with a velocity of 1.0 ft/sec (1.1, 1.5). Refer to the following Bentley® Flowmaster® calculations for supporting documentation.

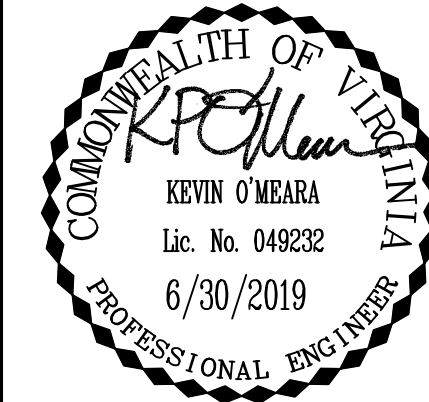
As discussed above, the 2-year storm velocity is less than the maximum permissible velocity of 6 ft/sec, as retrieved from Table 5-14 of the 1992 Virginia Erosion and Sediment Control Handbook, Chapter 5. Furthermore, the 10-year storm is contained within the channel banks, as seen on the following Bentley® Flowmaster® cross sections.

Therefore, MS-19 (water quantity) requirements are met for all points of analysis per section 4VAC50-30-40 (Minimum Standards) 19.b (2) (b) of the 2012 VA E&SC Regulations.

| Flow to MS-19 Section #1A | | | |
|---------------------------|------|----------|------|
| Area Number | Area | C-Factor | CA |
| Flow to MS-19 Section #1 | 2.64 | 0.39 | 1.04 |
| M2 | 0.65 | 0.35 | 0.23 |
| Total: | 3.3 | | 1.3 |

| | | | |
|--------------------|------|-----------------|------|
| Weighted C-factor: | 0.39 | Controlling Tc: | 16.7 |
|--------------------|------|-----------------|------|

| | Intensity (in/hr) | Discharge (cfs) | Velocity (ft/s) |
|-----------|-------------------|-----------------|-----------------|
| 2-Year: | 3.4 | 4.3 | 1.0 |
| 10-Year: | 4.5 | 5.7 | 1.1 |
| 100-Year: | 5.8 | 7.3 | 1.2 |



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EAST RAMP 3 ACCESS ROAD

HENRICO COUNTY - VIRGINIA

MS-19 NARRATIVE

JOB NO.

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